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ORIGINAL ARTICLE

Virtual reality and play therapy in the management of pain and anxiety in children and adolescents undergoing cancer treatment: quasi-experimental study

Realidade virtual e ludoterapia no manejo da dor e ansiedade de crianças e adolescentes em tratamento oncológico: estudo quase experimental

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ABSTRACT

BACKGROUND AND OBJECTIVES: Virtual reality (VR) and play therapy represent important methods to be implemented in the face of painful processes faced in the therapeutic path of children and adolescents with cancer. The objective of this study was to investigate the influence of VR and play therapy with board games for pain reduction in children and adolescents undergoing cancer treatment.

METHODS: This is a quasi-experimental study, with non-probabilistic sampling. The population consisted of children and adolescents treated at the pediatric oncology unit of a public hospital in Paraíba state. Data collection occurred in the following stages: application of a form with demographic and clinical data of the child; assessment of pain and anxiety in children and adolescents allocated to control, VR and play therapy groups before any procedure during hospitalization, such as medication administration, dressings and afterwards. For data analysis, the Statistical Package for the Social Sciences (SPSS) software was used.

RESULTS: Of the 34 participants evaluated, 59% were male, 79% aged between 4 and 10 years and 58% diagnosed with leukemia. As for pain, 3% reported moderate pain before the implementation of the treatments, and after the practices there was a reduction in the pain score in the VR group. 12% of those assessed had symptoms indicative of anxiety. There was a decrease in heart rate (HR) in all groups, with no difference in the control group.

CONCLUSION: VR and play therapy have proven to be effective resources for pain relief in children and adolescents, inserting themselves as attractive forms of humanized care.

KEYWORDS: Cancer pain, Child, Hospitalized child, Play therapy, Virtual reality.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A realidade virtual (RV) e a ludoterapia representam importantes métodos não farmacológicos disponíveis para auxiliar no enfrentamento de processos dolorosos agudos e crônicos de crianças e adolescentes durante o tratamento do câncer. O objetivo deste estudo foi investigar a influência da RV e da ludoterapia com jogos de tabuleiro na redução da dor e da ansiedade em crianças e adolescentes hospitalizados para o tratamento oncológico.

MÉTODOS: Trata-se de um estudo quase experimental, com amostragem sem randomização. A população foi constituída por crianças e adolescentes atendidos na unidade de Oncologia pediátrica de um hospital público paraibano. A coleta de dados ocorreu nas seguintes etapas: aplicação de formulário com dados demográficos e clínicos da criança e avaliação da dor e ansiedade nas crianças e adolescentes alocados nos grupos controle, RV e ludoterapia antes de algum procedimento durante a hospitalização, tal como administração de fármacos, curativos e pós-operatório. Para a análise dos dados, utilizou-se o programa *Statistical Package for the Social Sciences* (SPSS).

RESULTADOS: Dos 34 participantes avaliados, 59% eram do sexo masculino, 79% com idade entre 4 e 10 anos e 58% com diagnóstico de leucemias. Quanto à dor, 3% referiram dor moderada antes da implementação das terapias, sendo que após as práticas houve diminuição do escore de dor no grupo RV. Doze por cento dos avaliados apresentaram sintomas indicativos de ansiedade. Verificou-se diminuição da frequência cardíaca (FC) em todos os grupos, sem diferença para o grupo controle.

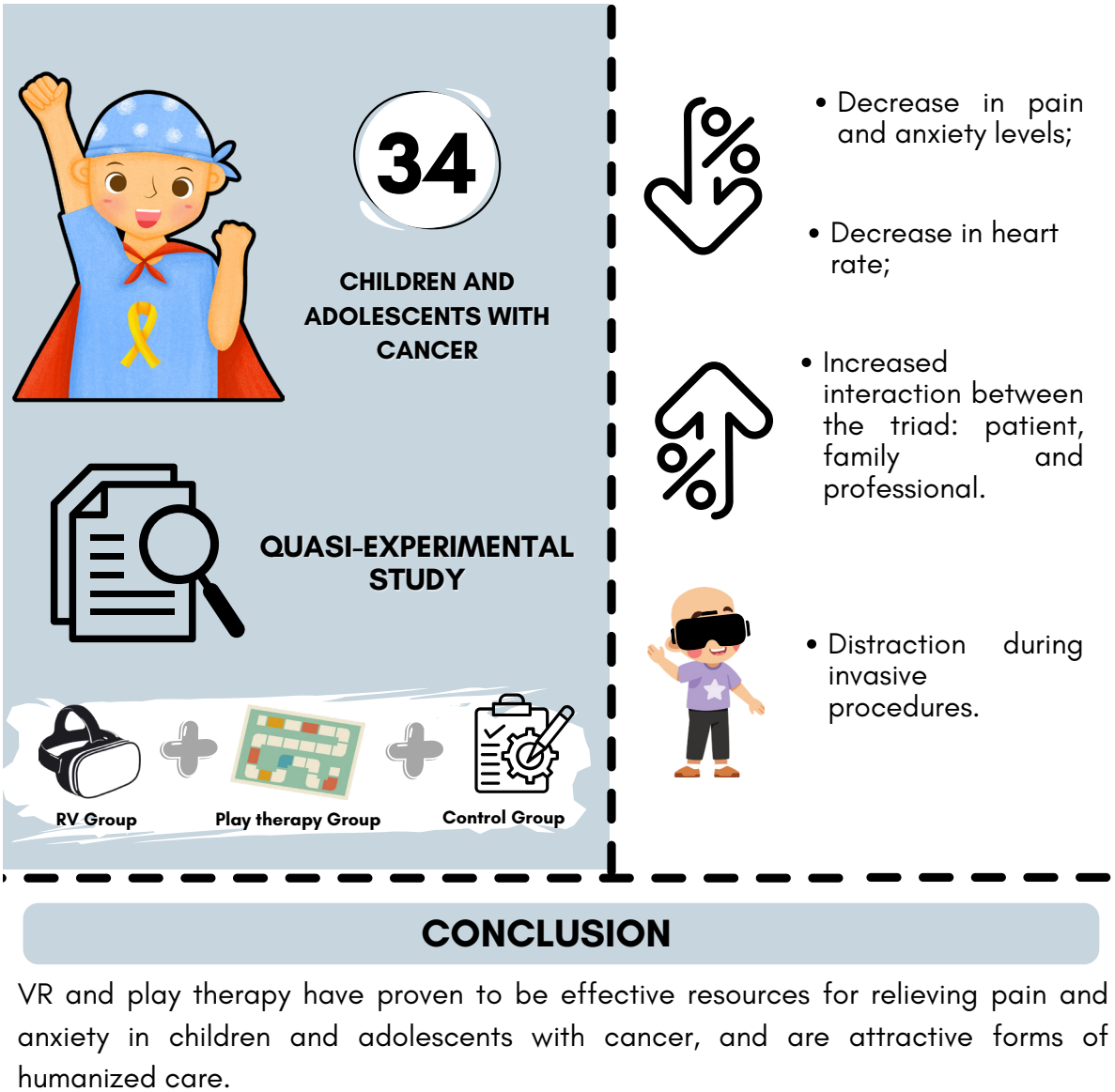
CONCLUSÃO: A RV e a ludoterapia demonstraram ser recursos eficazes para fins de alívio da dor em crianças e adolescentes, inserindo-se como formas atrativas para o cuidado humanizado.

DESCRITORES: Criança, Criança hospitalizada, Dor do câncer, Ludoterapia, Realidade virtual.

HIGHLIGHTS

- Virtual Reality (VR) has proven to be an effective therapeutic intervention for reducing pain levels in children and adolescents undergoing cancer treatment
- Strategies such as playfulness and VR were presented as tools that soften the impact of cancer treatment
- The VR group was able to significantly reduce the clinical parameters analyzed among the participants

GRAPHICAL ABSTRACT



INTRODUCTION

Cancer is defined as the disordered growth of cells in the body, with an estimated 8,000 cases a year in children and adolescents. The most common types of cancer in this population are tumors that affect the central nervous system, the lymphatic system and leukemias[1].

Among the forms of cancer treatment are radiotherapy, surgery and chemotherapy, which are associated with cardiovascular cytotoxicity and neurological, hematological and metabolic conditions, among others, leading to longer hospital stays[2].

Therefore, the treatment of childhood cancer has a profound impact on children and their families, requiring comprehensive, multidisciplinary and humanized care. Prolonged follow-up and emotional support are essential to relieve uncomfortable symptoms such as pain and anxiety, as well as minimizing sequelae and ensuring a better quality of life[3].

Pain is often associated with cancer and represents a cognitive and emotional experience, influenced by biological, psychological and social issues[4,5]. Extreme anxiety can manifest itself in a multifactorial way, both with physical symptoms such as tremors, sweating, crying, agitation, fighting and flight behavior, but it can also trigger emotionally traumatic outcomes in children, leading to psychological and behavioral changes such as: sleep disturbances (including nightmares), nocturnal enuresis, eating disorders and anxiety over separation from parents[6].

In this context, some measures can be implemented during hospitalization to relieve various symptoms. Among these measures is play therapy, which is a strategy that provides patients with the development of skills, promotes entertainment, well-being and works as a non-pharmacological alternative[7,8]. In addition to traditional play activities, Virtual Reality (VR) is increasingly being used and implemented in services as a form of distraction to reduce pain, anxiety and anguish during a procedure, such as chemotherapy, as well as the negative feelings that the hospital environment itself provides[9].

By achieving a sense of presence in the virtual world, VR allows the patient to feel part of that world. Therefore, these qualities used in therapeutic VR can help patients with their health outcomes, by distracting them from unpleasant stimuli and invasive procedures[10].

Bearing in mind that cancer is a disease that causes sudden changes, not only in the physical state of the child and/or adolescent, but also in their socio-affective, psychological and spiritual contexts, as well as for their family and friends, who jointly experience feelings such as fear, pain, anguish, uncertainty and anxiety. It is necessary to implement a variety of strategies to deal with this process, as well as to provide humanized, welcoming and playful care by the entire healthcare team[11,12].

The present study's objective was to investigate the influence of VR and play therapy in reducing pain and anxiety in children and adolescents undergoing cancer treatment. This study is justified by the need to contribute to innovations in humanized care and to support future research into pain and anxiety management in pediatric oncology.

METHODS

This is a quasi-experimental quantitative study with non-probabilistic sampling by convenience, single blind, carried out in the pediatric oncology ward of a public hospital located in the municipality of Campina Grande, Paraíba state. The location was chosen because it is a reference in teaching and health care for cancer treatment in children and adolescents.

The study participants included children and adolescents aged between 4 and 17 admitted for treatment to the pediatric oncology unit. The selection of participants was based on the public's better understanding of the technologies implemented, and they were allocated according to the collection sequence in the control, VR and board game groups. Thus, in week 1 of collection, all eligible participants were included in the control group, in week 2 in the VR group, in week 3 in the play therapy group and so on until all the children and adolescents registered for cancer treatment at the service were completed. Children and adolescents with visual problems or who were not interested in using the VR glasses, those with cognitive and learning problems, those under the effect of anesthetics during the immediate postoperative period or sedated, and those with contact precautions were excluded.

Data was collected between October and December 2023. The instruments used were: a) a form that included demographic and clinical data on the patients with questions relating to gender, age, schooling, length of stay in the hospitalization unit, type of tumor, type of treatment and frequency of sessions; b) verification of heart rate (HR), oxygen saturation (SpO_2) and axillary temperature (T°C) for all groups, with a new assessment being made in the VR and play therapy groups, of HR, SpO_2 and T°C, after the implementation of the therapeutic approaches.

A Faces scale adapted for the Brazilian reality was used to assess pain, with a score of 1 to 5[13]. In this analysis, the child chose the face that best illustrated their pain and was evaluated through self-report. The scale was used at the time of collection in all groups and after the interventions had been applied only in the VR and play therapy groups.

To assess anxiety, a form from the Multidimensional Anxiety Scale for Children (MASC)[14] was used, which assesses anxiety symptoms in children and adolescents. The instrument consists of 39 items assessed on a 4-point Likert scale, which involves factors such as physical symptoms, danger avoidance, social anxiety and separation anxiety, with a score of 56 being the cut-off point for indicating anxiety. The scale was applied at the time of collection to all those assessed.

Initially, the children, adolescents and their guardians were informed about the data collection procedures, the risks and benefits of the research, and in agreement, the Free and Informed Consent Term (FICT) was signed.

After checking the eligibility criteria, the study participants were approached at the establishment mentioned and the procedures carried out in conditions of privacy and respect, thus guaranteeing anonymity in participation.

After the demographic and clinical data forms were completed for the children and/or adolescents taking part, the interventions were implemented for each group per collection week, followed by a new assessment of the outcome variables (pain score, HR, T° and SpO_2).

Participants in the control group received standard care, including instructions such as getting plenty of rest, eating small, frequent meals and reporting any discomfort at the infusion site if they were receiving intravenous infusion and antiemetics as needed, without distracting intervention.

The participants in the VR group wore specific VR glasses for cell phones, branded thecoopidea, with one of the three apps selected by the child and/or adolescent during some invasive procedures (Figure 1), under the written permission and consent granted by their guardians for the use of the image. The options suggested for viewing on the visual device were swimming with marine animals underwater (Ocean Rift), riding a rollercoaster (Rilix VR) and exploring a forest through the eyes of forest species (In the eyes of animal). The exposure time for the activities was approximately 3 minutes and 35 seconds for each child/adolescent. These apps are commercially available and were used in the research because they were exciting, relaxing and interesting for the study audience.

As for the play therapy group, a board game on the theme of childhood cancer was used, distributed by the Maurício de Souza Institute's Dodói Project to cancer treatment referral services across the country, which provides information on the most common side effects of cancer treatment and coping

strategies (Figure 2). The game lasted approximately 5 minutes and the child/adolescent played with the researcher.

The project presented is in accordance with Resolution No. 466/12 of the Brazilian National Health Council, which guides the practice of research with human beings, and was submitted to the Research Ethics Committee through the Brazil Platform and approved under opinion number 6.239.604.

Figure 1. Patient wearing virtual reality goggles during bandaging, 2023.

Statistical analysis

To analyze the data, it was compiled in the Microsoft Excel® database, using the double-entry validation technique to detect inconsistencies. For the statistical analysis, the data was imported into the Statistical Package for the Social Sciences (SPSS) version 20.

Initially, the distribution of the variables was assessed using the Shapiro-Wilk test, and the absolute and relative frequencies were also analyzed, as well as the mean and standard deviation in the case of normality or median in the case of non-normal distribution, of the data related to the sociodemographic and clinical characteristics of the children and adolescents and questions about pain and anxiety in the three groups. Subsequently, the pain score and clinical data (HR, T° and SpO_2) were compared before and after VR and board games, in comparison with the control group, using the t-test for paired samples. All variables were analyzed considering a 95% confidence interval.

RESULTS

Thirty-four children and adolescents took part in this study, 10 patients in the VR group, 13 patients in the play therapy group

Figure 2. Dodoi Project Trail. Source: Instituto Maurício de Souza, 2023.

and 11 patients in the control group. Most of the interviewees were male (59%), said they were brown (56%), were in the pre-school age group (44%), in pre-school or in elementary school (1st to 5th grade; 52%). Regarding their beliefs, 50% said they were evangelicals, with 74% of the participants coming from urban areas. As for the degree of kinship of those responsible for the children and adolescents, the majority were mothers (85%; Table 1).

As for the information collected about the hospitalization process and cancer treatment, 90% of the VR group underwent chemotherapy, 92.3% of the group that received play therapy, and all of the control group underwent the same type of treatment. With regard to the number/frequency of sessions, the majority (74%) underwent them once a week, including oral treatment; with regard to the length of stay in the hospitalization unit, 52.9% of the patients were hospitalized for between 1 and 15 days (Table 1).

Among the most common types of cancer were leukemias, diagnosed in 58% of those assessed. As for the time since diagnosis, 64% of patients reported a diagnosis between 1 and 3 years prior to the time of the interview.

Table 1. Characterization of the participants before and after application of the therapies, 2024.

Characteristics	Participants		Virtual Reality		Play Therapy		Control	
	Total							
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Participants	34	100	10	29.4	13	38.2	11	32.4
Age								
Pre-school	15	44	4	40	5	38.5	6	55
School	12	35	5	50	4	30.8	3	27
Adolescent	7	21	1	10	4	30.8	2	18
Ethnicity/color								
White	15	44	5	50	4	30.8	6	55
Brown	19	56	5	50	9	69.2	5	45
Gender								
Female	14	41	5	50	5	38.5	4	36
Male	20	59	5	50	8	61.5	7	64
Belief or religion								
Catholic	14	41	5	50	3	23.1	6	55
Evangelical	17	50	4	40	10	76.9	3	27
Other	3	9	1	10	-	-	2	18
Schooling (in years of study)								
Doesn't study	7	21	1	10	3	23.1	3	27
Pre-school	9	26	3	30	3	23.1	3	27
1st to 5th year	9	26	4	40	2	15.3	3	27
6th to 9th year	6	18	1	10	4	30.8	1	9
1st to 3rd year high school	3	9	1	10	1	7.7	1	9

Table 1. Continued...

Characteristics	Participants		Virtual Reality		Play Therapy		Control	
	Total							
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Origin								
Urban area	25	74	6	60	10	76.9	9	82
Rural area	9	26	4	40	3	23.1	2	18
Length of stay in hospital (days)								
0	8	24	2	20	4	30.8	2	18
1 to 15	18	53	6	60	7	53.8	5	45
16 to 30	4	12	1	10	1	7.7	2	18
31 to 60	3	9	-	-	1	7.7	2	18
61 or more	1	3	1	10	-	-	-	-
Degree of kinship								
Mother	29	85	10	100	10	77	9	82
Father	4	12	-	-	2	15	1	9
Other	1	3	-	-	1	8	1	9
Diagnostic time								
0 to 6 months	8	24	5	38.5	5	38.5	1	9
6 months to 1 year	4	12	2	15.4	2	15.4	2	18
1 to 2 years	9	26	3	23.1	3	23.1	4	36
2 to 3 years	9	26	2	15.4	2	15.4	3	27
3 years or more	4	12	1	7.7	1	7.7	1	9
Type of tumor								
Leukemias	20	58	5	50	6	46.1	9	82
Lymphomas	6	18	3	30	3	23.1	-	-
Other tumors	8	24	2	20	4	30.8	-	-
Type of treatment								
Chemotherapy	32	94	9	90	12	92.3	11	100
Chemotherapy and radiotherapy	1	3	1	10	1	7.7	-	-
Surgery	1	3	-	-	--	-	-	-

Table 1. Continued...

Characteristics	Participants		Virtual Reality		Play Therapy		Control	
	Total							
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Frequency of sections								
every 7 days	25	74	7	70	7	53.8	10	91
every 15 days	1	3	-	-	1	7.7	-	-
every 21 days	2	6	-	-	2	15.4	-	-
2x a week	1	3	1	10	-	-	-	-
Oral	1	3	1	10	-	-	-	-
Performing tests	3	9	-	-	3	23.1	-	-
Not established	1	3	-	-	-	-	1	9
Anxiety								
Yes	4	12	-	-	3	23.1	1	9
No	30	88	10	100	10	76.9	10	91
Pain before								
Painless	32	94	9	90	13	100	10	91
Mild	1	3	-	-	-	-	1	9
Moderate	1	3	1	10	-	-	-	-
Pain afterwards								
Painless	32	94	9	90	13	100	10	91
Mild	2	6	1	10	-	-	1	9

According to the MASC assessment, 12% of those assessed had symptoms of anxiety. With regard to pain, 3% reported moderate pain before the implementation of the therapies, and after the practices there was a decrease in the pain score, with no more complaints of moderate pain.

Based on the data collected, it was observed that the use of VR goggles showed a significant reduction in moderate pain before and after its implementation, proving to be an effective non-pharmacological therapy for reducing pain symptoms.

In terms of HR, SpO_2, temperature and pain per group, there was a significant reduction in temperature and pain only in the VR group. As for HR, there was a decrease in all groups, with no difference in the control group in this assessment (Table 2).

DISCUSSION

Considering that the level of anxiety and stress can affect the level of pain experience during hospital procedures, various interventions have been proposed in order to distract and entertain children and thus consequently reduce these negative effects in cancer patients.

According to the data from this study, it was possible to observe a significant reduction in the pain assessment score in the group that used VR, demonstrating that it is an important non-pharmacological strategy for promoting distraction from the hospitalization process. In this way, VR can reduce suffering and anxiety by altering the path of pain signals in the central

Table 2. Evaluation of vital signs and pain scale obtained in all groups.

Variables	Virtual Reality			Play Therapy			Control		
	Before μ(±)	After μ(±)	p-value	Before μ(±)	After μ(±)	p-value	Before μ(±)	After μ(±)	p-value
HR	103.5 (15.95)	97.9 (13.79)	0.001	100.4 (17.25)	96 (9.30)	0.006	105 (10.98)	103.64 (15.08)	0.002
SpO_2	98.9 (0.73)	99.2 (0.63)	0.120	98.38 (0.65)	98.31 (0.75)	0.765	98.73 (1.00)	99.09 (0.83)	0.329
Temperature	36.2 (0.34)	36.0 (0.41)	0.036	36.3 (0.26)	36.0 (0.54)	0.735	36.4 (0.34)	36.2 (0.56)	0.119
Pain	0.5 (1.58)	0.3 (0.94)	0.000	0	0	-	0.3	0.3	-

HR: heart rate, SpO_2: oxygen saturation.

nervous system, distracting attention from the painful stimulus, reducing activation in brain regions connected to pain, such as the thalamus, insula and anterior cingulate cortex, resulting in proportionally lower pain levels, affecting the interpretation of pain and reducing brain activity related to the pain symptom[15].

An integrative review carried out with pediatric burn patients showed that the use of VR in this population helped reduce the pain threshold by stimulating brain regions, preventing the child from focusing on the pain pathway when changing dressings[16].

In relation to the evaluation of the clinical parameters analyzed, it was noted that temperature, pain and HR were significantly reduced in the group that used the VR glasses. In line with these analyses, a randomized clinical study with pediatric patients admitted to a Surgical Intensive Care Unit found that there was a greater reduction in HR and pain intensity in the group that used the intervention with the VR device, when compared to the control group[17]. Thus, demonstrating the effective contribution of VR in the management of pediatric pain in various areas of health, proving to be an effective non-pharmacological therapy.

Similarly, it was also observed that some children showed signs of anxiety, specifically in the play therapy group, in line with the study which stated that children undergoing cancer treatment do not have sufficient understanding to cope with the changes resulting from lengthy and painful treatment, thus contributing to their increased suffering[18].

Therefore, it can be seen that play therapy is ideal for contexts where the focus is on emotional expression and social interaction, especially for children, while virtual reality is more focused on the immediate control of pain and anxiety, and can be applied to a wide range of ages.

Interventions that use play strategies have a positive effect on relieving anxiety symptoms and improving the emotional state of hospitalized children and adolescents. A study carried out in Hong Kong with 304 Chinese children admitted to the city's two largest acute care public hospitals found that children who received play interventions while hospitalized showed a reduction in negative emotions and experienced lower levels of anxiety when compared to the control group[19].

Although in this study no differences were observed between the play therapy and control groups in the clinical evaluation, there was a significant reduction in heart rate, as well as a calmer and more relaxed behavior in the play therapy group. Accordingly, a study carried out with 65 children showed that the effects of a play therapy program resulted in a reduction in anxiety and fear levels during medical procedures[20].

Furthermore, in a systematic review conducted with a specific focus on distraction through the use of VR in children with neoplasms undergoing various procedures, a significant reduction in pain during procedures such as venous access and blood collection was highlighted, highlighting the relevance of distraction during such procedures, especially those that combine technology with care[21].

As for the main difficulty in implementing the interventions, it was observed that children with irritable side effects resulting from exposure to cancer treatment were resistant to using the virtual device. In addition, patients in the older age groups did not show much interest in the board games. Therefore, it would be interesting to develop new games that involve more advanced age groups, facilitating the implementation and effectiveness of play therapy, in parallel with training and improvement in the area for the professionals involved, so that they introduce and emphasize the importance of play practice in pediatric care[22]. There is also little availability of VR glasses in health services, mainly due to their high cost, which hinders their use in the care of hospitalized children and adolescents.

In view of the data presented, it was clear that the interventions implemented proved to be effective in terms of more humanized, gentle and quality management for children and adolescents in pediatric oncology, strengthening the bond between professional and patient.

CONCLUSION

The study showed that the implementation of non-pharmacological strategies involving playfulness and technology emerge as promising interventions to alleviate pain and anxiety resulting from the negative impacts of invasive and painful procedures and care in children and adolescents hospitalized during cancer treatment. Thus, both approaches can be effective

and complementary, depending on the clinical context and the patient's needs. In pediatric oncology patients, for example, the combination of play therapy for emotional support and VR for analgesia can offer excellent results, as well as providing greater interaction between the triad of patient, family and team.

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