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Effect of Music Medicine Intervention on Child`s Pain Level During Bone Marrow Aspiration and Lumber Puncture Procedures

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ABSTRACT

Objective(s): To determine the effects of music therapy on the pain level of children who undergoing lumber puncture and bone marrow aspiration, and to find out the relationship between children's pain and their socio-demographic characteristics during lumber puncture and bone marrow aspiration procedures.

Methods: A quasi-experimental design, conducted among 78 school age children of both genders in Nineveh governorate at Ibn-AlAtheer teaching hospital, consisted of music (study) group and the routine treatment (control) group. Objective pain scale and physiological parameters were recorded. The data analyzed by computer programs (SPSS) and using descriptive statistics and independent samples (t-test).

Results: The result revealed high significant differences in child pain score and physiological parameters (mean, SD) between the study (1.42, 0.541) and control group (2.37, 0.594). The level of pain for study group was (25) mild, (13) moderate, and (2) sever. On the other hand, the level of pain for control group was (1, 22, 35) as mild, moderate, and sever pain respectively, and the t test significance for pain level was (0.001) at p-value 0.01.

Conclusion: The music therapy intervention was effective in reducing the level of pain among children undergoing painful procedures (lumber puncture and bone marrow aspiration). This intervention can be used to decrease pain associated with invasive procedure and promote their compliance.

Recommendations: This study recommended music therapy to be as one of the nurse-led non-pharmacological intervention that use recorded music in all medical procedure. © 2023 College of Nursing. Published by University of Baghdad.

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تأثير الطب الموسيقي على مستوى الألم لدى الطفل أثناء إجراءات سحب سائل نخاع العظم والبزل القطني

المستخلص

الأهداف: الدراسة تهدف إلى تحديد آثار العلاج بالموسيقى على الألم للأطفال الذين يخضعون للبزل القطني وسحب سائل نخاع العظم وايجاد العلاقة بين آلام الأطفال وخصائصهم الاجتماعية والديموغرافية أثناء إجراء البزل القطني وسحب سائل نخاع العظم.

المنهجية: تصميم شبه تجريبي، تم إجراؤه على 78 طفلاً في سن المدرسة من كلا الجنسين في محافظة نينوى/ مستشفى ابن الاثير للاطفال، مقسمة إلى مجموعة دراسية وأخرى ضابطة. تم تسجيل مقياس الألم الموضوعي والمعايير الفسيولوجية. تم تحليل البيانات بواسطة برنامج (SPSS) باستخدام الاختبار التائي (t-test) والإحصاء الوصفي.

النتائج: كشفت النتائج عن فروق ذات دلالة إحصائية عالية في درجة الألم للطفل والمعايير الفسيولوجية (المتوسط والانحراف المعياري) ، بين عينة الدراسة (1.42، 0.541) والمجموعة الضابطة (2.37)، 0.594). وكان مستوى الألم في مجموعة الدراسة (25) خفيفًا، (13) متوسطًا، و (2) شديدًا. من ناحية أخرى، كان مستوى الألم في المجموعة الضابطة (1، 22، 35) كألم خفيف، متوسط ، وشديد على التوالي، وكانت أهمية اختبار t لمستوى الألم (0.000) عند قيمة .0.01 p

الاستنتاجات: استخدام الطب الموسيقي كان فعالاً في تقليل مستوى الألم لدى الأطفال الذين خضعوا لإجراءات مؤلمة. واستخدام هذا التدخل لتقليل الألم المرتبط بالإجراءات الطبية التداخلية وتعزيز الامتثال لها.

التوصيات: أوصت هذه الدراسة بأن يكون الطب الموسيقي من التدخلات التمريضية غير الدوائية في جميع الإجراءات الطبية.

الكلمات المفتاحية : الطب الموسيقي , الألم , سحب سائل نخاع العظم , البزل القطني

Introduction

Certain medical treatments can cause pain and stress in children and their families. This is especially crucial when these procedures may be repeated during the child's diagnosis and treatment (1). Experts and academics emphasize that being diagnosed with a chronic disease is an extremely distressing and stressful event for children and teenagers. The worst disease-related feelings are pain associated with therapy and diagnostic testing (2). Bone marrow is involved in variety of hematological and non-hematological disorders. The hematological disorders include acute leukemia, myeloproliferative neoplasm, hemato-lymphoid neoplasm, nutritional deficiency diseases. On the other hand, non-hematological disorders include infectious diseases infiltrating the bone marrow such as tuberculosis, parasitic infections and metastatic deposits, although several reasons for Lumbar Puncture (subarachnoid hemorrhage, meningitis, neurological disorders, demonstrate or manage disorders of Intracranial Pressure, and administer therapeutic or diagnostic agents (3). As contemporary medicine becomes more patient-centered and personalized to each

patient's specific needs, emphasis is being placed on minimizing discomfort associated with medical procedures (4). The medical records at Ibn-ALAtheer Teaching Hospital documented showed, in (2020) the hospital was achieved (324) bone marrow aspiration procedures and (955) lumber puncture procedures. While in 2021 the hospital reported (333) bone marrow aspiration procedures and (857) lumber puncture procedures (5). These numbers showed the medical needs for these important medical procedures which also required adequate nursing management.

Pain and anguish are frequently caused by procedures that infants and children must undergo as part of standard medical treatment (6). Long-term repercussions such anxiety of future medical procedures, higher pain sensitivity, and reduced efficacy of topical analgesics (7). There is an increasing awareness of how even modest unpleasant treatments, such as needle shots which can impact on a child positively (8).

The evidence-based literature on pediatric pain and therapy expands significantly. Treatment options for pediatric pain are constantly being examined, and new technology and delivery methods are becoming accessible on a daily basis (9). Unfortunately, despite progress in pediatric pain treatment, many children and adolescents continue to have improperly managed pain. Discomfort is a common occurrence in children, with more than 25% of children having pain during hospitalization (10). Pain treatment in children involves a complete strategy that includes evaluation, pain relief, and reassessment (11). Quantitative assessment for the degree of pain using a pain scale, whereas qualitative evaluation summarizes the features of the pain (12).

The American Music Therapy Association recommend to use music therapies within a therapeutic agenda. Music therapy is not merely a series of random, helpful encounters; it is goal-directed, structured, knowledge-based, and regulated (13). Music therapy therapists work with patients who have behavioral/emotional issues than any other group (14). Neuroimaging demonstrates that listening to loved music engages reward circuitry and that active musical engagement includes more brain areas than passive listening (15). It helps to relax physiological reactions, and order muddled emotions (16).

Music has long been supposed to cure, console, cause depravity, inspire political unrest, or increase intelligence (17). Modern, research-based music therapy and new, inclusive music relationships have emerged. Music therapy is both a health profession and a music profession, which adds to its tremendous variety (18). There are a few studies mapping on how people with chronic pain use music to self-care and to explore the role of music therapy in a hospital pain department. It offers potential for music therapy to be consider as a non-pharmacological intervention to assist children in developing music-based resources and strategies for managing chronic pain from medical procedures, further investigation is recommended (19).

Methods

Study Design and Setting

A quasi-experimental design that implemented the interventional program to ascertain the effectiveness of the music medicine intervention program for reducing pain of children undergoing Bone Marrow Aspiration and Lumber Puncture Procedures. The study is conducted at Ibn AL-Atheer pediatric hospitals/ hematology and oncology unit in Mosul city which is the only specialized hospital for pediatric care.

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Study Sample and Sampling

In order to get reliable data and a representative sample, a non-probability

sampling of (86) children referred from hematology and oncology unit to perform lumber puncture and bone marrow aspiration procedures. The sample divided into (40) child as study group which interact by music medicine program, and (38) child in control group without exposed to the program. The participants at age (6-12 years), did not suffer from hearing and mental impairment were included.

Data Collection and Study Instrument

The instrument of the study includes 3 parts; the sociodemographic characteristics of the participants (age, sex, residency, previous hospitalization), physiological parameters measurements, and Objective Pain Scale (OPS) [20]. This Objective Pain Scale element is a solid stand-alone pain score and classifying mild, moderate, and sever pain [18]. The OPS used to assess both the physiological measures of pain as well as the behavioral changes that follow pain or discomfort after surgical operations in children. It is applied on children 2 to 11 years of age, contain a 5 Parameters used in this score:(systolic blood pleasure, crying, movement, agitation, and verbal). Each parameter has 3 category score according to the child response as 0,1, and 2 degrees. Pain level divided as no pain (0), mild (1-2), moderate (3-6), and sever (7-10) of total degrees of the scale [21].

Validity and Reliability of the Study Instrument

The content validity determined by a board of (15) specialists in medical, nursing and art fields. The pilot study involved (10) child participate from Ibn Al-Atheer Teaching Hospital. The reliability was achieved through computation Alpha Cronbach correlation coefficient (0. 83) by SPSS program.

Ethical Consideration

The project of the study permissioned by the review board and the ethics committee in the College of Nursing, University of Baghdad. The purpose and the aim of the study stated for children and their parents. The informed consent form was agreed by the participants. The administrative arrangement was obtaining from Iraqi Ministry of Health, Central Statistical Organization, Ministry of planning, and Health Directorate of Nineveh government.

Statistical Analysis

The normality of variables was tested by Kolmogorov-Smirnov test; the data was normally distributed. Descriptive statistics: frequency, percentage, mean and standard deviation, were used to analyze the demographic data. The paired independent t-test used to compare Means and SD in the two groups. MANCOVA test to find out the association between demographical characteristics and pain level of control group. The significance level was set at $p<0.01$in all the tests. The statistical analyses conducted by SPSS version 26.

Results

Table1. Children and Family Sociodemographic Characteristic

Variable	Category	Study	%	Control	%	Total	%	Chi-squire		
								value	df	P value
Child age	Early school age	13	16.7	6	7.7	19	24.4	3.629	2	0.163
	Middle school age	13	16.7	12	15.4	25	32.1			
	Late school age	14	17.9	20	25.6	34	43.6			
Gender	Male	19	24.4	20	25.6	39	50	0.205	1	0.651
	Female	21	26.9	18	23.1	39	50			
Residence	Urban	20	25.6	17	21.8	37	47.4	0.216	1	0.642
	Rural	20	25.6	21	26.9	41	52.6			
Father	Illiteracy	16	20.5	15	19.2	31	39.7	7.041	3	0.71

educational level	Primary	10	12.8	8	10.3	18	23.1			
	Secondary	7	9.0	1	1.3	8	10.3			
	Bachelor degree	7	9.0	14	17.9	21	26.9			
Mother educational level	Illiteracy	26	33.3	19	24.4	45	57.7	8.021	3	0.46
	Primary	6	7.7	14	17.9	20	25.6			
	Secondary	1	1.3	3	3.8	4	5.1			
	Bachelor degree	7	9.0	2	2.6	9	11.5			
Father occupation	Employee	13	16.7	6	7.7	19	24.4	2.953	1	0.86
	Worker	27	34.6	32	41.0	59	75.6			
Mother occupation	Employee	2	2.6	2	2.6	4	5.1	0.003	1	0.958
	House wife	38	48.7	36	46.2	74	94.9			

No= Number, **f**= Frequency, **%**= Percentage, **M**= Mean, **SD**= Standard deviation, **df**= Degree of freedom, P value=0.05.

Table 1. shows that half of children were males (50%), high age for children was late school age (10-12 years) (43.6%). Concerning the residency of children, the highest percentage of children live in rural aria (52.6%). In the other hand the majority of father educational level was Illiteracy (39.6%) as well as the mother (57.7%). Finally, the father occupation was worker with (75.6%) and the mother occupation was housewife with (94.9%).

Table 2. Discretion of Children Medical Procedure Data

Variable	Category	Study group No.	%	Control Group No.	%	Total	%
Type of procedure	Bone marrow	14	17.9	14	17.9	28	35.9
	Lumber puncture	26	33.3	24	30.8	50	64.1
Duration of procedure	6-10 min	20	50.0	8	21.1	28	35.9
	11-15 min	20	50.0	30	78.9	50	64.1
Number of Previous PM/LP	First time	4	10.0	2	5.3	6	7.7
	Second time	6	15.0	8	21.1	14	17.9
	Three and more	30	75.0	28	73.7	58	74.4
Number of Previous hospitalizations	First time	0	0.0	0	0.0	0.0	0.0
	Less than 3	13	32.5	7	18.4	20	25.6
	3 and more	27	67.5	31	81.6	58	74.4

No= Number, **%**= Percentage.

Table 2. reveals that (64.1%) of children did lumbar puncture procedure, 33.3% in the study group, and 30.8% in the control groups. The study group has equals distribution according to duration of procedure while the majority of control group (78.9%) had long duration (11-15) minutes. The majority of study sample have been done the LP and BMP more than three times, and (74.5%) where admitted to the hospital three and more times.

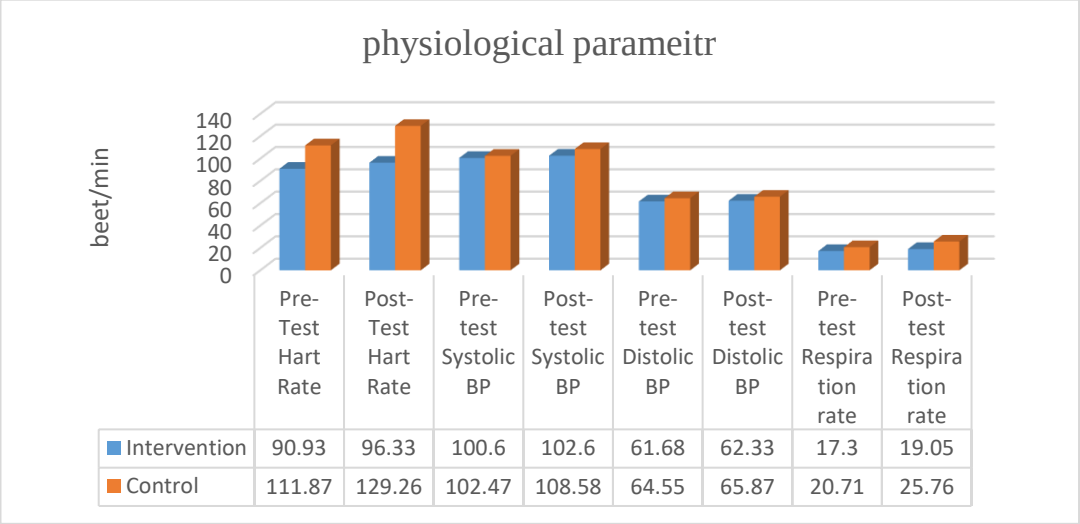

Figure 1. Mean Deference of Children Physiological Parameters

Figure (1) shows different of child's physiological parameters between intervention and control groups, a significant deference sowed in pretest heart rate, pretest respiration rate, posttest heart rate, posttest systolic blood pressure, and posttest respiration rate (P value = 0.001, 0.001, 0.001, 0.033, 0.001), respectively.

Table 3. Children's pain level post music intervention program (N=78)

Group	No.	Score of pain level						T – test				
		Mild		Moderate		Sever		Mean	SD	t	df	P value
		No.	%	No.	%	No.	%					
Study	40	25	62.5	13	32.5	2	5	1.43	0.541	7.355	75.870	0.000
Control	38	1	2.63	22	57.89	15	39.48	2.37	0.594			
Total	78	26		35		17						

M= Mean, **SD**= Standard deviation, **t**= t-test, **df**= Degree of freedom, P value at 0.01.

Table (3) shows that the majority of the sample surfing from deferent level of pain after BMA and LP (62.5, 32.5, and 5%) as a mild, moderate, and sever pain respectively. Also, there was a highly significant difference between study and control groups regarding use of music therapy for decreasing the children's pain level.

Discussion

The current study included 78 children consented from Ibn-AL-Atheer Pediatric Teaching Hospital that covered a hole Nineveh Governorate and nearby cities. The most age group that visits the hematology and oncology sector are a late school age between (10-12) years. Genders of both boys and girls are equal in numbers with a small difference, the equal sample of genders might be due to nearby of statistics numbers for both boys and girls and accidentally to schedule of patients visits. This finding disagrees with a study stat that more than half of children were early school age (6-8 years) [22]. According to another study showed that (50%) of their sample within age groups (6-7) years, and (60%) were males [23].

Also, the result show that male-female ratio was equal and this finding are similar to the anther study that stat the study sample represents approximately a half of the sample was boys [24]. While a study conducted in Baghdad documented that the majority of the sample were females [25].

The result show high percentage of

procedures was lumbar puncture procedures and approximately equal between the study and control groups. This result unlike previous result where 20% of the subjects underwent LP, 4% underwent BMA, and 76% experienced both procedures at the same time [(1)]. While the majority of another study sample was LP [(26)]. and the result of current study similar to earlier study the majority of their sample where LP procedure [(27)]. This percentage might be related to the age group of children, which was limited to a certain age group according to the criteria. In that harmony the time of the process is comparable to a greater visual analog scale score, the intensity of pain was greatly decreased when conducted by an experienced physician or took less than 10 minutes [(28)].

Moreover, result of the study shows a substantial mean difference between the treatment and control groups in terms of intervention duration (p=0.007). The result of current study similar to another study about the therapeutic group's invasive procedure was shorter than the control groups. (p=0.003) [(1)].

The number of previously surgical or medical hospitalizations, and how many times undergo LP/PMA were important which reflects the effect on children's pain perception related to previous experiences (p = 0.119), (p = 0.157), and (p = 0.808), respectively. This result supported by study indicate that clinical background characteristics such as span of development (p=0.76), frequency of operations (p=0.24), and history of hospitalization (p=0.20) did not vary [(1)].

This study showed different of child's physiological parameters between intervention and control groups, and indicate a significant difference sowed in Pretest Heart Rate, Pretest Respiration Rate, Posttest Heart Rate, Posttest Systolic Blood Pressure, and Posttest Respiration Rate (P value = 0.000, 0.000, 0.000, 0.033, 0.00), respectively. This result supported by another study revealed changes in heart rate that were time-dependent. Reduced heart rates after the lullaby (P= 0.001) and the rhythm for the intervention group (P= 0.04). Sucking behavior was altered by rhythm sound treatments (P =.03). After the intervention, entrained breath sounds resulted in decreased heart rates (P=0.04) and variations in sleep patterns (P=0.001). Parent-preferred lullabies increased caloric intake (P = 0.01) and sucking behavior (P = 0.02). Parental stress perception was reduced by music (P 0.001) [(29)].

The findings of the study disagree with the finding of study that indicate no significant differences were observed between groups at baseline of vital signs. There were no significant variations between groups when vital signs were compared before and after BMA (P >0.001) the disagreement related to use of distraction method only that help in pain and anxiety and not interfered with physiological parameters [(30)].

The findings of the study indicated that there was a highly significant difference between study and control sample regarding use of music therapy for decreasing the children's pain level. This result agrees with

a recent study state that there was a statistically significant difference in pain score over time (p =0.001). And correlating relationship was found between pain score of VAS over time in all patients, and they conclude was that music therapy decreased the pain level of patients [(31)]. Another study indicates there was a significant decrease in pain levels in the test group (P = 0.003). while in control group there was no substantial decrease in pain score (P = 0.356) [(32)].

Conclusion

The current study concluded that, using of music medicine intervention was effective in reducing pain level among children undergoing painful procedures. using of music during painful medical.

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