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The effect of an integrative nursing program on pain of school-age children with leukemia undergoing lumbar punctures

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Abstract---The purpose of this quasi-experimental research was to examine the effect of an integrative nursing program on pain of school-age children with leukemia undergoing lumbar punctures. The Gate Control Theory provided the conceptual framework for this study. The subjects were 30 leukemia children aged between 8-12 years old undergoing lumbar punctures with the pain scores of two or over and being treated with chemotherapy at Khon Kaen Hospital. The first 15 children were allocated based on a simple random sampling of the control group and the last 15 children in the experimental group. The research instruments of this study were a pain assessment form and an Integrative Nursing Program. Children in the treatment group received integrative nursing care. The experiment was divided into three periods, namely pre-trial, post-trial, and follow-up periods. The data were analyzed using frequency, percentage, mean, standard deviation, and t-test. The findings of this research revealed that children undergoing the Integrative Nursing Program had significantly less pain than children receiving conventional nursing care at the statistical level of .05. The children received integrative nursing care had significantly less pain in post-trial and follow-up periods than the pre-trial period at the statistical level of .05.

Keywords---school-age children, leukemia, integrative nursing program, pain score.

Introduction

Pain is an experience that all humans fear and try to avoid as it causes discomfort. School-age patients experience pain when they have physical tissue injury¹, resulting in both physical and mental suffering. In school-age patients, leukemia is the most common cancer found. Due to continuous treatment lasting many years, it is inevitable to face pain throughout the duration of the illness. One of the reasons of such pain comes from the procedures like injection, blood collection, lumbar punctures, and chemotherapy for examination and treatment, which could result in frequent and severe pain. It was found that the procedures most frequently encountered by children are lumbar punctures, which is the procedure that causes the most tissue injuries and it is the procedure that school-age patients need to receive throughout their treatment.

A lumbar puncture for chemotherapy starts at the induction of remission phase, but in the intensive treatment phase, children need to have a lumbar puncture once a month or once every 2-3 months. The chemotherapy treatment continues for 3-5 years and a follow-up will be carried out for at least 5 years after stopping the treatment. If the patient is not properly treated to relieve pain caused by lumbar punctures, pain will be perceived both physically and mentally. Therefore, resistance to and perception of pain quickly and severely develops. This will affect thoughts, behaviors, and attitudes towards the next lumbar puncture.² Because the age of 6-12 is the period when both concrete and abstract thoughts of school-age children develop, the children can recognize and feel pain. If they continue to face pain without relief, they will find discomfort and negative experiences, which will influence the behavior of the children, causing some school-age patients to resist and fail to cooperate in the treatment.³

At present, there are two methods of relieving pain from the procedure in children, namely, the pharmacological method, which is not an independent role that nurses can perform. It is also found that school-age pain relievers cause more complications and more severity than non-pharmacological pain relief,⁴ which is an independent role that nurses can perform, and this is one of the effective methods. Non-pharmacological pain relief is an effective method of relieving pain caused by needle-related procedures.⁵ The process of non-pharmacological nursing to relieve pain from physical intervention through any procedure has the main objective to block the transmission of pain signals according to the Pain Control Theory along the neural pathways to the central nervous system, such as by touching and rubbing the painful area, hugging, using heat in different ways, for example, hot water bags, herbal compress, or even using cold. For instance, an athlete who is injured may apply a cold compress immediately. The various methods are given in this example and the cognitive-behavioral intervention is the method by which nurses develop activities in hope of changing children's thinking and perception of pain through the perception of the midbrain. Then the activities are adjusted for emotional control to reduce the perception of pain, including providing information and knowledge before undergoing procedures, distraction by various activities, body and mind relaxation, and hypnosis.⁶

Integrative nursing is an activity that combines various pain relief methods. The Gate Control Theory of Melzack and Wall (1985) ⁷ is used as a conceptual framework for the development of nursing activities, which lead to pain relief. It is a combination of physical intervention, such as cold compression, and cognitive-behavior intervention, such as distraction to change the perception in the central nervous system and inhibit the brain stem function before the patient feels pain.⁸ The major activities consist of giving knowledge about lumbar punctures, hugging and touching gently, cold compression, and encouraging patients to listen to music, watch cartoons, listen to stories, etc.

The researcher was interested in studying the effect of the Integrative Nursing Program on relieving pain caused by lumbar punctures in school-age children to alleviate the effects and side effects of pain relievers and to benefit future pain experiences and treatments. The Gate Control Theory of Melzack and Wall (1985) was used as the conceptual framework of this study. The objectives were to examine the effects of the Integrative Nursing Program on pain in school-age children with cancer, to compare the levels of pain between the treatment and control groups, and to compare the levels of pain between the pre-trial, post-trial, and follow-up periods. Hypotheses were as the following: 1) School-age children with cancer receiving integrative nursing experience had less pain than those receiving conventional nursing. 2) School-age children with cancer receiving integrative nursing experience had less pain in the post-trial period than in the pre-trial period. 3) School-age children with cancer receiving integrative nursing experience had less pain in the follow-up period than in the pre-trial period.

Methods

This study employed a quasi-experimental design. The subjects were 30 leukemia children aged between 8-12 years old undergoing lumbar punctures with the pain scores of two or over, the instruments of this study were a pain assessment form and an Integrative Nursing Program. The Integrative Nursing Program consists of various activities, such as cold compress, embracing, touching, or doing favorite activities, watching favorite cartoons, listening to stories. The instrument used for data collection was the pain score assessment form. Two instruments, comprising a manual for organizing activities according to the Integrative Nursing Program and the Pain Score Assessment Form were tried out with 30 patients having characteristics most similar to the sample group, and then the Pain Score Assessment Form was used to determine the reliability through Cronbach's Alpha Coefficient, with the value of 0.89. There are three periods as follows: Pre-trial period, Trial period and Post-trial period

The researcher realizes and attaches great importance to the protection of the rights of the sample by strictly conducting research in accordance with ethical principles. The research participants received explanations of research objectives, processes, research methods, and benefits and were asked to sign a consent form to participate in the research, and they could withdraw from the research at any time. The research findings were reported as anonymously and there was no disclosure of the research participants' names and surnames. This research has been through the consideration of the Human Research Ethics Committee, Western University, HE-WTU 542757.

Results

The research results were presented in line with the objectives as the following: For the levels of pain between the treatment and control groups, the results were shown in Table 1.

Table 1. Pain scores of school-age patients with cancer in the pre-trial, post-trial, and follow-up periods in the group undergoing integrative nursing and conventional nursing using t-test for independent samples.

Conventional Nursing				Integrative Nursing			
Patient No.	Pre-trial	Post-trial	Follow-up	Patient No.	Pre-trial	Post-trial	Follow-up
1	4	3	2	1	4	3	1
2	4	3	2	2	4	3	1
3	4	3	2	3	4	3	2
4	4	3	2	4	4	3	2
5	4	3	2	5	4	3	1
6	3	2	2	6	3	2	1
7	3	2	2	7	3	2	1
8	3	3	2	8	3	2	1
9	3	3	2	9	3	3	1
10	3	3	2	10	3	3	1
11	3	3	2	11	3	3	1
12	3	3	2	12	3	3	1
13	3	3	1	13	2	2	1
14	3	3	1	14	3	3	1
15	3	3	2	15	2	2	1
Total	50	43	28	Total	48	40	17
Mean	3.33	2.87	1.87	Mean	3.20	2.67	1.13
SD	0.49	0.35	0.35	SD	0.68	0.49	0.35

From Table 1, it was found that the mean pain scores of school-age patients with cancer undergoing integrative nursing in the pre-trial, post-trial, and follow-up periods were 3.20, 2.67, and 1.13, respectively. Moreover, the mean pain scores of school-age patients with cancer undergoing conventional nursing in the pre-trial, post-trial, and follow-up periods were 3.33, 2.87 and 1.87, respectively. The researcher analyzed the variance of mean pain scores among school-age patients with cancer between the nursing method and the trial period, starting from the test of variance and covariance equivalence using Mauchly's Test. It is a test for the Sphericity property whose analysis result must not be statistically significant ($\text{sig.} > .05$). It was found that Mauchly's Test = 0.992 df= 2 sig.= .893, indicating that it was not statistically significant at the .05 level, which is in accordance with the preliminary agreement. The variance analysis of pain scores among school-age patients with cancer between the nursing method and the trial period revealed that the results of a multivariate analysis of pain scores among school-age patients with cancer between the nursing method and the trial period were different at a statistical significance level of 0.05 ($F_{2,27}=5.142$, $p= .013$). In addition, there was also a significant difference in pain scores for school-age patients with cancer at a different period at the 0.05 level. 0.05 ($F_{2,27}=155.311$,

$p = .00$). The results of the comparison of pain scores among school-age patients with cancer between the nursing method and the trial period are shown in Table 2.

Table 2 Results of the variance analysis of mean pain scores among school-age patients with cancer between nursing procedures and trial period

Source of variation	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>p</i>
Between subject					
Group (G)	1	2.844	2.844	7.724*	0.000
error	28	10.311	0.368		
Within subjects					
Time(T)	2	49.756	24.878	175.117*	0.000
TxG	2	1.622	0.811	5.709*	0.006
error	28	7.956	0.142		

* $p < .05$

From Table 2, it was found that the interaction between the nursing method and the trial period (T x G) had a statistically significant effect on the mean pain score of school-age patients with cancer at .05. This means that the results of the two nursing methods in the pre-trial, post-trial, and follow-up periods were different. It was also found that the time spent in the pre-trial, post-trial, and follow-up periods led to different pain scores of school-age patients with cancer with a statistical difference of .05, and the nursing method (G) led to a statistically significant difference in pain scores of school-age patients with cancer at .05. The analysis of the interaction between the nursing method and the trial period affecting mean pain scores in school-age patients with cancer is shown in Figure 1.

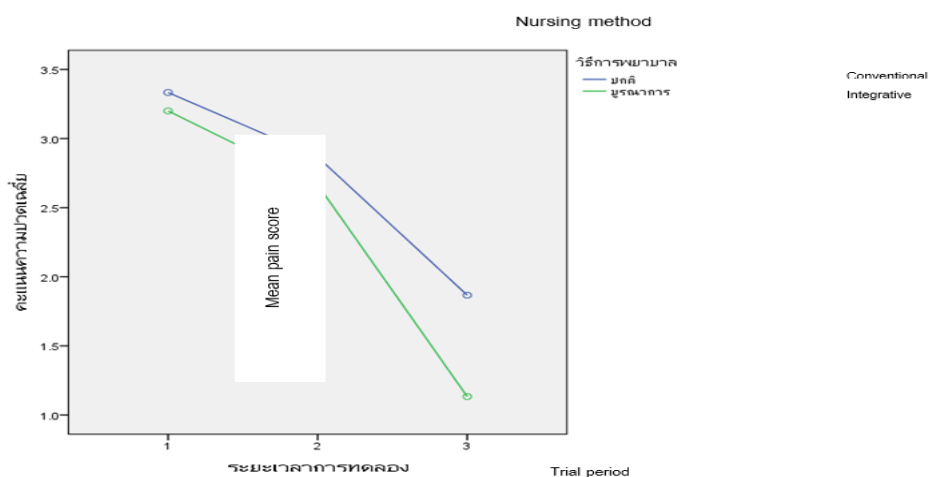


Figure 1. Line graph showing the interaction between the nursing method and trial period affecting the mean pain scores of school-age patients with cancer

From Figure 1, it was found that in the pre-trial, post-trial, and follow-up periods, school-age patients with cancer in the integrative nursing group and the

conventional nursing group had different mean pain scores, and the pain scores decreased over time. This showed that the trial period and the nursing method resulted in a reduction in mean pain scores among school-age patients with cancer. The researcher compared the mean pain scores of school-age patients with cancer between the integrative and conventional nursing groups, classified by trial period. The details are shown in Table 3.

Table 3. The results of the comparison of mean pain scores among school-age patients with cancer between the integrative and conventional nursing groups classified by trial period using Repeated Measure ANOVA

Period	Nursing Method	n	$\bar{X}$	SD	t	p-value
Pre-trial	Integrative	15	3.20	0.68	0.62	0.54
	Conventional	15	3.33	0.49		
Post-trial	Integrative	15	2.67	0.49	1.29	0.21
	Conventional	15	2.87	0.35		
Follow-up	Integrative	15	1.13	0.35	5.71*	0.00
	Conventional	15	1.87	0.35		

*p< 0.05

From Table 3, it was found that the mean pain scores of school-age patients with cancer undergoing integrative nursing had no statistically significant difference from those who received conventional nursing care. The integrative nursing group had lower mean pain scores than the conventional nursing group. Meanwhile, in the pre-trial and post-trial periods, both nursing methods had no differences in mean pain scores. The researcher compared the mean pain scores of school-age patients with cancer during the post-integrative nursing period and the pre-integrative nursing period as shown in Table 4.

Table 4. Comparative results of pain among school-age patients with cancer between the post-integrative nursing period and the pre-integrative nursing period using t-test for dependent samples

Period	n	$\bar{X}$	SD	t	p-value
Pre-trial	15	3.20	0.68	4.00*	0.001
Post-trial	15	2.67	0.49		

*p< 0.05

From Table 4, it was found that pain among school-age patients with cancer between the post-integrative nursing period and the pre-integrative nursing period was significantly different at the 0.05 level. Pain in the post-trial period was less than in the pre-trial period. The researcher compared the mean pain scores of school-age patients with cancer during the integrative nursing follow-up period and the pre-integrative nursing period as shown in Table 5.

Table 5 Comparison of mean pain scores among school-age patients with cancer between the integrative nursing follow-up period and the pre-integrative nursing period with t-test for dependent statistics samples

Period	n	$\bar{X}$	SD	t	p-value
Pre-trial	15	3.20	0.68	13.484*	0.000
Follow-up	15	1.13	0.35		

*p< 0.05

From Table 5, it was found that pain scores among school-age patients with cancer during the integrative nursing follow-up period and the pre-integrative nursing period were significantly different at the 0.05 level. The pain during the follow-up period was less than during the pre-trial period.

Discussions

1. An interaction between the trial method and the trial period was found. As integrative nursing is a combination of both physical and mental care based on related theories including the Pain Control Theory, the researcher used the principle of distraction by embracing and touching patients to create mental stability and reduce right brain stimulation. When a school-age child had a lumbar puncture or when a beta fiber was stimulated, it could reduce pain.¹¹ In addition, alleviating pain with a cold compress allowed the slow transmission of nerve impulses to perceive pain at the spinal cord level because cold reduced the sensations of nerve fibers that controlled the activity of tissues at the site of injury, which then slowed down the transmission of pain at the spinal cord level. Thus, the pain was also reduced.¹² This resulted in a decrease in pain perception in the brain, which is different from allowing the patient to face pain naturally. After that, the experience of positive perception was increased by allowing the children to do activities that they enjoyed including watching cartoons on mobile phones listening to stories or lullabies from parents. It was found that the use of instrumental music with patients 48 hours after general surgery patients led to a decreased pain level.¹³ It was a distraction and encouraged good imagination. It stimulated the right hemisphere of the brain, which is part of analytical thinking, resulting in the perception of pain as something that was not scary. Thus, the children were not stimulated emotionally. When they were satisfied, the body released a happy substance called endorphins, and the children completely forgot about the pain of lumbar punctures.¹⁴ In addition, according to a study of different types of music affecting pain in patients with cancer, it was found that having patients with cancer listen to music for 45 minutes twice a day for 3 days resulted in a statistically significant reduction in pain.¹⁵
2. School-age patients with cancer receiving integrative nursing had statistically significantly less pain than school-age patients receiving conventional nursing (p< .05) because integrative nursing was a new experience in coping with lumbar puncture pain with a combination of activities whose primary aim is to relieve pain. Then supportive activities were carried out to distract attention from pain. Finally, the children would have the idea that lumbar punctures are less scary and painless than in the

past. The activities had continuous processes and steps, which could help alleviate the pain. Meanwhile, for the children who received conventional nursing care without any supportive activities, the process of response to pain followed the mechanisms of the body and their bodies. Therefore, they experienced more and longer pain.¹⁶⁻¹⁷ Integrative nursing is an activity to alleviate pain for school-age children suffering from combined lumbar puncture procedures. It is purely the role of a nurse without the use of drugs, such as training children to remain still by doing meditation or listening to music that they like, called music therapy.

3. School-age patients with cancer receiving integrative nursing had less pain in the post-trial period compared to the pre-trial period at a statistical significance level of .05 ($p < .05$). This comes from the fact that integrative nursing is a combination of methods for taking care of both the body, the mind, and the cognitive system because the central cognitive mechanism could control the mechanism of the pain control gate to inhibit the activity of T cells. Thus, it can be explained that when children underwent lumbar punctures, their bodies and minds were in stressful situations. This is because the mind was the trigger and determined the perception of that stress, resulting in the feeling of more pain. However, when young patients listened to music or stories or watched cartoons, the auditory nerve impulses were transmitted to the central control system of the thalamus, cortex, and limbic system. The sound heard would change the emotions, feelings, and thoughts to become perception and recognition. This indicates that the commanding part of the mind was transformed into perceptions of satisfaction. Therefore, the stress level was reduced. It can also be seen that integrative nursing provided a better experience than conventional nursing.
4. School-age patients with cancer receiving integrative nursing had less pain during the follow-up period than in the pre-trial period with a statistical significance level of .05 ($p < .05$) as integrative nursing created a new experience in pain perception from lumbar punctures, helping school-aged patients to have a good experience, especially since school-age children are at the period of highest imagination. A combination of care for the body, mind, and the cognitive system adjusted the central control system of the thalamus, cortex, and limbic system to alter mood, emotions, and thoughts to become good perceptions and previous experiences. Therefore, the pain level during the follow-up period tended to decrease.

Recommendations for Future Studies

It is evident that integrative nursing programs are effective for school-age patients with cancer. Further studies on integrative nursing should be carried out in other treatments in order to compare the efficacy of this method for each disease in order to further improve its quality.

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