

THE EFFECT OF SELF-SELECTED DISTRACTION TECHNIQUE ON THE PAIN CAUSED BY VENIPUNCTURE IN EARLY ADOLESCENTS WITH CANCER

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ABSTRACT:

Background: Early adolescents with cancer suffer from pain caused by treatment procedures. They reported the pain from venipuncture made them suffer more than their disease. Unmanaged pain has been associated with their development and quality of life. Distraction has been demonstrated to reduce pain in early adolescents. The purpose of this study was to test the effect of the self-selected distraction technique on the pain caused by venipuncture in early adolescents with cancer.

Methods: A quasi-experimental post-test design with control group was used. Participants were 50 adolescents with cancer (age 10 to 15 years), from the out-patient oncology clinic of a tertiary level hospital in Bangkok. The control group received the routine care, while the experimental received the self-selected distraction during the venipuncture. They were matched pairs on gender, 25 participants in each group. Research instruments included the self-selected distraction technique (listening to music or playing a computer game), demographic data sheet, and the visual analogue pain scale. All instruments were tested for content validity. The reliability of the visual analogue pain scale was 0.99. Data were analyzed by descriptive statistics, Fisher's exact test and independent t-test.

Results: Early adolescents with cancer who received the self-selected distraction technique during venipuncture had significantly lower mean pain score than those in the control group (1.33 vs 4.30, $p < .001$).

Conclusion: This study shows the effect of self-selected distraction technique with a simple and quick way for decreasing the pain caused by venipuncture among early adolescents with cancer.

Keywords: Self-selected distraction; Pain; Early adolescent; Venipuncture

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INTRODUCTION

Childhood cancer is a major public health problem. About 175,000 children and adolescents are diagnosed with cancer annually around the world. An estimated 150,000 live in low- and middle- incomes countries, and in a growing number [1]. Many cancers are treatable and more than 80 percents of children and adolescents survive [2]. Although the survival rate is increasing, the children and adolescents with cancer still suffer with the

procedures of the treatment than with illness itself. They had to be undergone multiple, cyclic painful venipuncture procedures throughout their cancer treatment processes [3].

Painful venipuncture of early adolescents with cancer is more challenging than that of other children age groups as a result of their unique developmental and psychosocial aspects. Previous studies using magnetic resonance imaging of brains during early adolescence (i.e., 11 to 14 years of age) have demonstrated that the emotional effects of cancer during this critical time can be disruptive to the growth process necessary for adulthood. They

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are more vulnerable to disruption of executive functions like abstract reasoning and problem solving compared with the later phase (i.e., 15 to 21 years of age) or even preadolescence (i.e., 6 to 10 years of age) [4, 5]. Early adolescents with cancer self-reported greater emotional distress, including anxiety, somatization, and depression, compared with others at the similar age [6]. If unmanaged, pain can result in a variety of negative long-impacts. These effects included increased morbidity and mortality throughout their lives as a result of chronic avoidance of the medical procedures [7]. Therefore, pediatric nurse oncologists and other members of the health care team play important supportive roles in managing pain effectively and appropriately to early adolescent developmental stage.

Distraction is one of the most commonly recommended as the most effective cognitive-behavioral intervention to reduce pain in children and adolescents [8]. It has been referred to as cognitive refocusing, which deviated individual's attention away from a noxious stimuli and is instead focused on more a pleasant feeling. Consequently, pain perception is reduced [9]. The pain does not actually disappear, but distraction increases the pain threshold and reduces pain perception and other feeling such as anxiety and fear which are related to pain cycle [10, 11]. Many evidences show that both active and passive distraction can decrease pain in children and adolescents such as watching virtual reality, listening to the music and playing game [8, 12]. Given that early adolescents use more cognitive strategies and are more independent than younger children, they exhibit a high degree of control in their response to pain [13]. The distraction technique that most effectively matches early adolescent developmental stage and appealing to them will be most beneficial for them.

Self-selected distraction is a method of giving control to early adolescents with cancer. Few researches have examined its effect. Windich-Biermeire et al. [14] found that self-selected distracters (i.e. bubbles, I Spy: Super Challenger book, music table, virtual reality glasses, or handheld video games) had the potential to reduce fear and distress during port access and venipuncture in adolescents with cancer. The impact of early adolescent's choice is deserving of consideration as studies have noted differences in adolescent preferences of distracters, which may differentially maximize treatment efficacy during a given procedure [15]. In Thailand, there has been no

research evaluating these techniques to minimize procedural pain in this population. As a negative memory of painful needle-based procedures, it may result in exaggerated memories of the pain and heighten distress during subsequent procedures [16]. The alleviation of pain caused by venipuncture procedures is an important issue in terms of the early adolescent's reactions to future painful events and acceptance of subsequent health care interventions [17]. Thus, this study was aimed to create a sense of control in early adolescents by giving them a choice (listening to music or playing a game) based on personal preference and interest. The study findings could boarder our understanding of self-selected distraction, a non-pharmacological intervention, as a developmentally appropriate technique on pain among early adolescents with cancer undergoing venipuncture. The study examined the effect of the self-selected distraction technique on pain caused by venipuncture in early adolescents with cancer.

METHODS

Setting and sampling

This quasi-experimental non-equivalent control group, post-test design was conducted at the venipuncture room of the oncology clinic, outpatient department of Queen Sirikit National Institute of Child Health, Bangkok, Thailand between December 2015 and March 2016.

Total of 50 early adolescents, ages 10 to 15 years, diagnosed with cancer, no analgesic drugs for 4 hours prior to the studied, able to understand and speak Thai, having a physician's order for a venipuncture for the blood collection, able to hear and see, having at least one previous venipuncture experience, no cognitive impairment, and sensory deficits or pathological conditions of the palm were recruited. They were divided into two groups with 25 each. The groups were matched for gender since there is evidence for sex differences in the pain experience of pediatric oncology patients. The two groups were randomly assigned to the control group (routine venipuncture care) and the experimental group (routine venipuncture care plus self-selected distraction technique) during their venipuncture. Three were excluded as the first venipuncture attempts were unsuccessful.

The sample size was determined by using the master table prepared by Burns and Grove [18] with the statistical power of .80, a .55 effect size, and a significance of .05 for two-tailed test. The appropriate sample size was 22 participants per

group. This study used 14 percent of participants over the requirement.

Research instruments

Experimental instruments were: 1) the self-selected distraction technique protocol, 2) music for distraction which provided 3 easy listening well-known Thai songs obtained permission to use from Grammy Company Limited. The music stimulated auditory sensory and 3) computer games by “iSpot Japan”, a free game from copyright. The game required to “find the difference” puzzles, with two pictures, depending on the selected difficulty level (ranged from 3, 4 or 5 differences in each picture) for 10 pictures per level. This game stimulates the participants through visually challenging puzzles. Sound effect (auditory stimulation) was also added into the game, as background music. Additionally, this game stimulated the tactile senses by touching the screen to indicate the differences, 4) Panasonic RP-HX350E headphones and 5) smartphone use for presentation of music and games.

Data collection instruments were: 1) the demographic data sheet and 2) the Visual Analogue Scale (VAPS) for pain assessment. VAPS has been used to evaluate pain intensity in children. VAPS uses a 10 centimeters (100 mm) in length, horizontal line with no marking on the scale except “no pain” on the left end and “very severe pain” on the right end. The score is determined by measuring the distance on the line between the “no pain” anchor and the participants’s mark, providing a score of cm with two decimal place range from 0–10 cm.

All instruments were validated for content validity by 5 professional experts, except for VAPS. The self-selected distraction technique protocol was tried out with 3 early adolescents who had same sample characteristic. The VAPS is widely used for pain perception with well-established validity and reliability for children. Test-retest reliability for VAPS in previous studies has showed strong correlations in adolescents during acute medical procedures, 0.99 [19, 20].

Data collection

The study was approved by the Ethic Committee of Queen Sirikit National Institute of Child Health (ZIRB00007346). Eligible early adolescents and their parents were approached about the study, and all agreed to enroll. After parent had signed a consent form, the youth assent was obtained. Basic demographic data (age, gender, level of education and diagnosis diseases) were

recorded. All early adolescents received routine venipuncture for collection of blood from a vein for laboratory test. The routine included applying the tourniquet, cleaning the puncture site, inserting the needle; drawing the blood, releasing the tourniquet, placing a gauze pad over the puncture site, extracting the needle and immediately applying pressure. They were conducted in the same setting with the same surrounding environment by same three oncology nurses. All nurses had more than 3-year experiences of performing venipuncture.

Intervention conditions

Early adolescents received routine venipuncture with self-selected distraction technique. They were given a choice of playing a Spot the differences pictures puzzle game or listening to easy listening music installed on a smartphone while wearing headphones. The headphones were comfortable fit. A proper earphone fit helps prevent the interference sound from other sources during the experimental period. The music volume could be adjusted as desired by the participants. Self-selected distraction began at 1 minute before the venipuncture and continued until the end of venipuncture procedures. On average the distraction was used for 3 minutes during venipuncture procedure.

Outcomes

Right after venipuncture procedure, the pain perceptions in both groups were evaluated using VAPS. They were asked to mark on the line the point that they felt which represented their perception of their pain during the puncture.

Data analysis

Descriptive statistics were used to assess demographic data and self-selected distracters based on sex preferences and interests. The Fisher’s exact test was used to assess the homogeneity of the two study groups in terms of age, gender and educational level. The independent t-test was used to compare children’s pain between two groups. Two-tailed *p-values* of less than 0.05 were considered significant.

RESULTS

A total of 50 early adolescents were included in this study, 25 in each group. The two groups were matched by gender and comprised predominantly males (72% in both groups). The mean age of the experiment group was 12.0±1.51 years and the mean age of the control was 11.8±1.96 years (*p* = 0.63). Most of the participants in both groups were

Table 1 Demographic characteristics of the participants

Characteristics	Control group		Experimental group		p-value*
	(n = 25)		(n = 25)		
	n	%	n	%	
Gender					1.00
Male	18	72	18	72	
Female	7	28	7	28	
Age (years)					1.00
10-12	16	64	17	68	
13-15	9	36	8	32	
Mean±SD	12.0±1.51		11.8±1.96		
Education					0.75
Primary school	17	68	19	76	
Secondary school	8	32	6	24	
Types of cancer					0.47
Leukemia	11	44	15	60	
Lymphoma	8	32	5	20	
Bone cancers	3	12	1	4	
Bain & CNS tumor	3	12	4	16	

* Fisher's exact test

Table 2 Comparison of the pain scores of the control and experimental groups

Groups	Pain scores		
	Range	Mean	SD
Control (25)	1.1 - 10	4.30	1.70
Experimental (25)	0 - 5.1	1.33	1.30

() number of participants, p-value <.001 by independent t-test

studying in primary school (68% vs 76%, $p = 0.53$). The majority were diagnosed with leukemia (60% vs 44%). There were no statistically significant differences between groups in gender, proportion of younger (10-12 years old) and older adolescents (13-15 years old), education level and types of cancer (see Table 1). Regarding distraction technique preferences for venipuncture, 14 of 25 (56%) in the experimental group chose game and 11 of 25 (44%) chose music. Gender preferences on type of distracters were similar, 55.56% of male and 57.14% of female chose game and 44.44% of male and 42.86% of female chose music.

The mean self-reported pain scores, showed in Table 2, were significantly lower in the experimental group compared to the control ($p < .001$). Early adolescents who used the self-selected distraction technique during venipuncture had mean score of 1.33 (SD = 1.30) while those in the routine care group had mean score of 4.30 (SD = 1.70).

DISCUSSION

Based on the result of this study, the self-selected distraction is an effective intervention to

reduce pain during venipuncture in early adolescents with cancer. The explanation is that distraction works through a process of attention with the use of five senses to reduce pain of invasive procedures [21]. In general, the acute pain caused by tissue damage stimulates peripheral nerves to send the pain sensation to brain and transmits nerve impulses to open the gate of pain at the spine before sending it to thalamus to translate the nerve impulses to pain at the cortex [22]. However, when early adolescents are actively playing Spot the difference puzzle games or listen to the easy listening music relate with increased cognitive activity, it helps divert their thoughts from the venipuncture experience and refocus their attention on the games or music which they feel joyful. It can inhibit the transmission of pain signals to the brain. The magnitude of distracter from pain perception increases when early adolescents are allowed to choose a distracter based on their personal preferences, individual characteristic and level of attraction. It may also foster a sense of mastery and control over the pain stimuli and empower their coping. Moreover, self selecting the distracter is more effective in sustaining their interest and consequently

consuming most of their attention and leaving cognitive capacity for attending to the painful event [14]. Previous research has also confirmed that active distraction with electronic games increases pain tolerance and reduces pain [21].

These findings disagree with previous studies which reported no reduction in pain when using self-selected distractions during needle related procedures in children and adolescents. Pilot research by Jeffs [23] examined the effect of 2 distraction techniques on pain and anxiety associated with allergy testing in adolescents, ages 11 to 17 years. They reported no differences in pain rating among the groups of self-distraction (music, audio books or videos), a nursing recruitment video group and a control group. However, less pain was associated with lower anxiety and greater engagement with distraction. Windich-Biermeier et al. [14] investigated the effect of self-selected distracters from variety of distraction (i.e. bubbles, I Spy: Super Challenger book, music table, virtual reality glasses, or handheld videogames) on pain, fear, and distress caused by venipuncture in children and adolescents with cancer, ages 5 to 18. They reported no significant difference in pain between groups, though it tended to be lower in the intervention group [14]. Possible causes of these findings could be due to the difference between wide range of participant's age (5-18 years old with an average age of 9.9 years) which is younger than participants in this present study (11-15 years) and the type of distracters. These paradoxical results strongly support the suggestions from previous research [8, 11, 12, 14]. When planning pain management, one has to be concerned about both the distracter and the appropriateness of technique applied with age characteristics, level of sensory input, and ability to involve active cognitive or motor responses of the recipients.

CONCLUSIONS

Venipuncture may seem like a minor medical procedure but can create significant pain and distress for early adolescents, cause adult caregivers' anxiety, and be challenging events for nurse and the health care team. The evidence from this study supports the self-selected distraction by playing a computer Spot the differences puzzle or listening to easy listening music installed on a smartphone while wearing a headphone in alleviating pain perception in early adolescents with cancer underwent venipuncture. We recommend presenting choice of

these distracters and allowing them to play without disturbing them till completion of the venipuncture procedure. This is a non-pharmacological intervention and is easy-to-use in early adolescents with no staff training requirement.

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