

The Investigation of Typical Pain Cognitive- Behavior Therapy and its computerized version effectiveness on reduction of pain intensity, depression, anger and anxiety in children with cancer

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Hamed Vajihe^{1*}, Beshldeh Kiumars², Najmeh Hamid², Sheikh Shabani Seyyed², Marashi Seyyed Ali², Kaveh Jaseb³

¹Clinical psychology Department, psychology department, shahid Chamran University, Iran

²Psychology Department, Shahid Chamran University, Ahvaz, Iran

³Thalassemia and Hemoglobinopathy Research Center, Jundishapur University of Medical Sciences, Ahvaz, Iran

Abstract

Objective: In this study, the effectiveness of typical pain cognitive-behavior therapy and its computerized version on reduction of pain intensity, depression, anger and anxiety in children with cancer were examined.

Methods: This research study had a pre-test and post-test test with the control group design. Two experimental groups (i.e., in person CBT group and computerized CBT program) were compared with a control group. In addition, the results were analyzed by appropriate statistical models.

Results: Cancer was one of the medical problems that were associated with pain combined with negative emotions such as anxiety, depression and anger. Negative emotions could reduce the quality of life, disruption of sleeping habits and eating behavior. Therefore, it was found that it is necessary to use psychological interventions to reduce the negative effects of pain and enhance the adjustment. The findings of this study indicated that both interventions could reduce the negative emotions associated with cancer in children.

Discussion: Experiencing painful procedures during the life are inevitable. On the other hand, poor pain management causes negative effects on the quality of life which results in negative effects that continue a long time after the painful experiences. Long-term negative effects of pain have large costs for society. Nowadays, computers are available in all over the world and computerized psychological interventions can reduce negative emotions such as psychological interventions. Therefore, these interventions can be compared to investigate if one can use computerized CBT in situations in which there is no access to psychologist. The results showed that there were no significant differences between the two interventions.

Conclusion: Therefore, the computerized program could be a useful substitute for in person psychological interventions for children who suffer from cancer.

Keywords: Pain, Children, Psychological intervention, Cancer, Anger, Anxiety, Depression.

Background

Since last decade, the epidemiology of pain in children has been focused. Childhood pain is important because of not only the challenges in routine people's lives but also its possible effects in the future. For instance, in their adolescence, children with abdominal pain are at increased risks of somatic symptoms, mental disorders, and hospital admissions for unexplained medical symptoms [1].

Children's memories of painful experiences can have long-term effects on their reaction to their later painful experiences and their acceptance of later health care interventions. What is remembered about the painful events in the past has an important role in predicting and responding to future problems [2].

The painful procedures are accompanied by negative emotions. In their research study, Matarazzo, et al. showed that higher levels of anger and depression were observed among chronic pain population [3]. Chronic pain in children is common [4,5]. Moreover, it can be accompanied by a significant disability [6]. This may continue to adulthood. Psychological treatment shows various types of interventions for different purposes

*Corresponding Author: Hamed Vajihe, Clinical psychology Department, psychology department, shahid Chamran University, Iran, Email: v.hamedivaji@gmail.com

(e.g., relieving pain and/or distress and improving self-efficacy). Reducing pain and distress, rather than increasing functional abilities, is usually the primary outcome variable [7]. Cognitive-behavioral therapies (CBT) have been effective for many chronic pain difficulties [8].

Significant portions of children who are in hospital receive inadequate assessment and management of pain [9-12]. This especially occurs in the context of procedural pain [10,13]. Moderate to severe pain in children is associated with short-term and long-term adverse physiological and psychological effects. Uncontrolled pain in newborns can change the process of pain, and perception can affect physiological, social and neurocognitive development outcomes. In contrast, effective pain control strategies are associated with faster and more complete recoveries and cost reductions to the health care system [9]. Despite the dramatic growth of therapeutic research, solution-based intervention based on evidence of effective tools for pain assessment, guide lines, pain management practice in hospitalized children still remains a concern [12,14]. As mentioned above, it is proved that CBT is an acceptable intervention for pain sufferers.

Due to the advancement of technology and the needs of health care, various treatment methods, such as internet-based therapy and Computerized Cognitive-Behavioral Therapy (cCBT) have been developed [15]. Internet-based therapy is effective for several disorders, such as anxiety and depression disorders [16]. For children and adolescents, the research on cCBT is still limited [17], but the results of which have been promising [18-23]. In some studies, the acceptance of treatment from the perspective of patients has been investigated [24,25]; cCBT is accepted as a therapeutic approach, which can overcome barriers such as time constraints [26,27].

Actually, pain management is generally expensive because of the need for long-term rehabilitation in multidisciplinary care [28]. Cognitive-Behavioural Therapy (CBT) is one of the most popular chronic pain treatments and is an effective and generous treatment for many psychiatric disorders, such as depression and anxiety [29]. Behavioural and cognitive therapies designed to reduce pain, distress and disability have been introduced since more than 40 years ago; they are now commonly used treatments for depression, anxiety disorders and chronic pain [30]. The basic principles of CBT for controlling pain are patient-based assistance to understand how cognition and behaviour can affect the experience of pain, coping skills teaching and cognitive restructuring. During treatment, patients are encouraged to apply their coping skills to a wide range of daily conditions [31]. One of the negative aspects of treatment with CBT is often related to developing countries; cost and inaccessibility make it an unavailable treatment. As Internet spreads across the globe, CBT can be implemented through Internet-based interventions [19].

Nowadays, kids are born at this technological era; they use computers, smartphones, laptops and computer games as part of their daily routine. They easily move in this environment and feel comfortable inside it. Therefore, it seems that the use of technology to help youth psychological problems. However, in spite of its beginning state, research this area is increasing in a great pace. There are several reasons why teenagers are reluctant to receive these benefits, including confidentiality, shyness and embarrassment of presence in mental health institutions and

beliefs concerning the idea that they are not understood or taken seriously. Lack of knowledge about the suitability of specific services and structural factors such as financial concerns, lack of access to services and long waiting lists are also among the barriers for individuals who need psychological help [32].

Using technology can eliminate almost all of these obstacles. Families can use computer-based programs at their homes for the sake of confidentiality issue; they receive their treatment without fearing of being seen in mental health clinics. Technology-based communication also has a non-inhibitory effect, which is due to anonymity; people tend to disclose themselves more often in this environment [33]. Therefore, young people probably feel that their records are kept more confidential in a computer environment. Thus, they are more comfortable to expose personal information. Not only do the vast majority of young people (at least in the developed countries) have access to computers and the Internet, but also it has been determined that the younger generation, especially teenagers, have been using the Internet to reach and receive text advice and these consultations. They can eliminate the obstacles that arise from face to face therapy [34]. In addition, most technology-based applications are consistently used. In other words, they are more reachable and accessible; people do not have to wait for treatment. They also can be used in a large scale. Therefore, technology is likely to be accepted among young people as a way to find help for their emotional concerns. That is why technology is able to eliminate the obstacles caused by face-to-face treatment [35].

The pain experience in cancer is widely recognized as a major threat to the quality of life; relief of pain is a priority in oncology care. As much as the disease progresses, it is necessary that pain treatment flows at different levels from the onset of the disease to the long-term conditions, even for those who are in the final stages of life [36].

Children with cancer often suffer from pain due to the activity of the disease or its treatment. Estimating the prevalence of pain in these children between 25% and 50% depends on the stage of the disease and the cause of the pain [37]. Therefore, one more painful chronic disorder in childhood is cancer. Because of the wide effect of children's cancer on how they and their families suffer from it, a computer program is designed which helps children in coping more effectively with these circumstances. In this study, this program is compared with in person Cognitive-Behaviour Therapy of Pain to examine if one can use this program instead of face-to-face psychological interventions. Because of some limitations in the availability of psychological services for these individuals, this computerized program may be a good alternative to such services and will provide them with more accessibility.

Methods

This research study has a pretest and posttest with the control group design. The population of this study included all cancer patients who were eligible for this study and referred to Ahvaz Shafa Hospital from the beginning of October of 2018 to the end of December 2018. Actually, some criteria were considered in this study: the individuals did not have a history of seizure, their age ranged from 9 to 12 years, they were literate, they failed to develop penetrating disorders (to the diagnosis of a psychiatrist), they suffered from one type of cancer, and they were fluent in

Persian. At first, individuals willing to participate in the study were randomly (using the lottery method) assigned to three groups (i.e., two intervention groups and one control group). In the CBT group and computerized CBT group, the treatment was individual. It should be noted that in order to reduce the bias, the data (i.e., pre-test and post-test) was collected by a master student of clinical psychology, who did not know the objective of the study. Then, with appropriate statistical models, the results of pre-test and post-test were compared.

Research instruments

Wong and baker's face scale

Children are able to describe their pain qualitatively through language which reflects their experience, and gradually calibrate their pain by applying different scales [38]. This scale designed by Wong and Baker in 1998, consists of faces and numbers scale. The face consists of six pictures of the child's face, each showing a different amount of pain. The left-hand side of the scale represents the absence of pain and the right image indicates the most severe pain. Numerically, number 1 means no pain, 1-2 indicates pain, 4-3 indicates slightly more pain, 6-5 represents much more pain, 8-7 shows severe pain and 10-9 represents the most severe pain. The validity and reliability of this scale have been confirmed in numerous studies [39]. Persian version of this scale has also been used in numerous studies [40]. In the Nick Fried study, the reported correlation coefficient was 82%.

Children's depression scale CDs

This questionnaire designed by Janbozorgi consists of 21 materials in 13 axes. This is the only Iranian questionnaire which is based on DSM. Scoring is based on the Likert method, from 0 to 4 for axes 1 to 12 and for axis 13 is 0 and 1. To obtain a total score, the scores in the 13th axis were summed up and divided by 9, and then the score of the other axes sum with the resulting number of 13th axes. In this questionnaire, a score higher than 9 is a sign of severe depression. This questionnaire was used in a study consisting of the sample of 1551 children and adolescents in Tehran, and Cronbach's alpha coefficient of 0.84 was obtained [41].

State-trait anger expression inventory

Spielberger developed this Inventory (STAXI). It is applicable to children aged 9 to 18 years [42]. In a descriptive study of Brabadi and Heidari Nasab, with a sample size of 556, the convergent and divergent validity of this scale calculated by Pearson correlation analysis. The scores of this scale were correlated by children's depression scales, apparent anxiety in children, aggression and lawless behavior. The reliability of the instrument was also measured using Cronbach's alpha coefficient and test-retest coefficient. The interval of 2 weeks was studied; the results of the research indicated the reliability (measured by the coefficients of the test) and show good internal (STAXI-2 C / A) and its subscales [43].

State Anxiety Scale - Spielberger's Anxiety Trait

This instrument was developed by Spielberger, et al. in the United States in 1973 to measure the anxiety of 12-9 year old children with a high scientific reputation and was used as a standard test in various research studies. In addition, in 2000, Mami Yanlou studied the reliability of this questionnaire under the supervision of professors of psychology using a re-test method. The reported

correlation coefficient of this test for Iranian children was 0.83. Yaghoobi, et al. investigated its reliability and reported it as 89%. The reliability of Spielberger's anxiety measurement instrument was calculated using Cronbach's alpha coefficient for open anxiety (84%) and hidden questionnaire (82%) [44].

Methods

The study's goals had been described to the participants, and written consents of parents and the participating child were taken. When the conditions have been met, the sample was selected through simple random sampling among eligible beneficiaries. To ensure the presence of the participants, an agreement including the number of sessions and the estimated duration was completed by the selected individuals. Then, using the Lottery method, they were divided into two 15-member experimental groups and one 15-member control group. At first, a pre-test was conducted. Then, the experimental group received psychological treatment for 45-minute 6 sessions (i.e., two experimental groups: ordinary CBT and computerize CBT programs). After the end of the sessions in the sixth week, the participants were re-evaluated. The therapeutic package was designed based on the articles in this area and the content of the pain control book. Three clinical psychology experts confirmed the content validity of this package. Supplementary information about the design and implementation of these two methods of intervention is being published in a separate study.

Results

In this study, multivariate analysis of covariance was used to examine the significance of the difference between the mean scores of the experimental and control groups. Prior to the implementation of the multivariate covariance analysis, its assumptions (i.e., normality, homogeneity of variances, and regression slope homogeneity) were examined. Based on the results of Shapiro and Wilk's tests, the normality of the data was not rejected ($P > 0.05$). In addition, Levin's test results were not significant for all variables (i.e., depression, anxiety, anger and pain), which indicates that the variance of scores was consistent. In addition, the interaction between dependent variables and consistency was not significant (0.692), which implies the establishment of regression slope homogeneity assumption.

Table 1 reports the mean and standard deviation of the variables in the pre-test and post-test phases. In addition, multivariate covariance analysis was used to study the first and the second hypotheses of the study. The results of this analysis are presented in the following table.

The results of Table 2 show that there is a significant difference between the experimental and control groups in terms of depression, anxiety, anger and pain ($p < 0.0001$). In other words, cognitive-behavioral therapy and its computerized version had been able to reduce depression, anxiety, anger and pain in the post-test.

In addition, in order to investigate if conventional cognitive-behavioral therapy and its computerized version differ in the severity of pain, depression, anger and anxiety in children with cancer, a series of t-tests were used. The tests compared pre-test and post-test differential scores in two intervention groups; the results are reported in Table 3.

variables	level	N.cases	Mean			SD		
			CBT	cCBT	control	CBT	cCBT	control
depression	Pre-test	45	15.07	16.20	15.93	7.360	4.329	5.574
	Post-test	45	8.60	10.93	16.27	5.962	3.011	5.637
anxiety	Pre-test	45	35.13	34.40	35.00	6.058	8.975	6.141
	Post-test	45	25.80	26.93	34.40	5.685	6.692	7.149
anger	Pre-test	45	18.47	16.07	19	3.758	4.284	2.903
	Post-test	45	15.27	14.13	18.33	2.987	3.482	2.845
pain	Pre-test	45	6.40	6.73	6.80	1.595	1.860	1.656
	Post-test	45	5.60	5.33	6.60	0.828	0.817	1.454

Table 1: Mean and standard deviation of the variables in the pre-test and post-test stages

Source	variables	Observed Powerb	df	Type III Sum of Squares	Mean Square	F	Sig.	Partial Eta Squared
pretest	depression	1	1	544.509	544.509	129.642	0.0001	0.77
	anxiety	1	1	1026.844	1026.844	82.618	0.0001	0.69
	anger	1	1	216.820	216.820	161.215	0.0001	0.81
	pain	1	1	24.485	24.485	45/790	0.0001	0.55
group	depression	1	1	404.005	202.002	48.095	0.0001	0.72
	anxiety	1	1	637.205	318.607	25.633	0.0001	0.57
	anger	1	1	53.550	26.775	19.909	0.0001	0.51
	pain	0.97	1	10.110	5.055	9.453	0.0001	0.33

Table 2: The results of covariance analysis in the ManCova test on the mean post-test scores of the variables (internal and comparative in the test and control group)

		Mean	SD	T	df	Sig
depression	CBT	6.47	15.07	1.057	28	0.300
	cCBT	5.27	8.60			
anxiety	CBT	9.33	35.13	1.178	28	0.249
	cCBT	7.47	25.80			
anger	CBT	1.93	15.27	2.271	28	0.031
	cCBT	3.20	18.47			
pain	CBT	0.80	6.40	-1.230	28	0.229
	cCBT	1.40	5.60			

Table 3: The comparison of pre-test and post-test differential scores in research variables.

As the above table shows, the two methods of intervention used in this study did not differ significantly in terms of the changes made in the dependent variable. However, it is shown that the typical intervention was more effective in the anger variable.

Discussion

An effective pain management program should target different dimensions of pain experience [45]. Various ways which focus on mental abilities and reduce symptoms include hypnosis, music therapy, thought stopping skills and other supported psychological methods [46]. Cognitive-behavioural therapies are among the most well-known methods for treating chronic pain and many psychological disorders, such as anxiety and depression [29, 47]. The underlying principles in cognitive-behavioural therapy are helping the patient understand how cognition and behaviour affect the experience of illness, and teaching coping skills and cognitive restructuring. Therefore, along with all the efforts made to get rid of the negative effects of cancer it is imperative that experts pay attention to psychological aspects of cancer.

Several studies have been carried out on pain control interventions in children in Iran, which have been shown to be effective in controlling and reducing pain severity and pain-related

psychological variables, such as anxiety and depression. A study was conducted to compare the effect of thought Distraction and to touch on the severity of pain among 5-10 children. There were two intervention groups and one control group (common pain control methods). There was no significant difference between the intervention groups, but both groups had significantly lower pain intensity than the control group [48]. In another study, the effect of thinking bias on bubble method on anxiety due to injectable procedures in school age children with thalassemia was investigated. In this study, an intervention group and a control group were compared. The mean of anxiety in the two groups did not show any significant difference before the intervention, but after the intervention, the mean of the intervention group was significantly lower than that of the control group. This indicates that the intervention was effective in reducing anxiety [49]. Several studies have also shown that deviation of thought during intravenous injection reduces the behavioral responses of pain, physiological indices and severity of pain [50]. Other methods used to reduce pain include the use of ice compress, music and relaxation [51], the results of a study indicates that all of these interventions have been effective. Only one study in Iran has been conducted to reduce pain by using psychological interventions in cancer patients. In this study, the effect of play therapy techniques on decreasing anxiety and increasing the positive emotions and the level of general adaptation in 12-9 year old children with leukemia was investigated. The results showed that this intervention was effective in reducing anxiety and increasing the level of positive emotions is effective and improved general adaptation [52]. By summarizing the studies, there are few interventions associated with pain control and other problems associated with the experience of cancer. In the study of the barriers to implementation of non-pharmacological methods of pain control in children and the strategies provided by nurses, the main reason for not implementing such interventions is mentioned as the shortage of personnel employed in hospitals

[53]. In fact, shortage service in managing negative effect of cancer in children is obvious. Furthermore, in the findings of this study, it is stated that therapeutic intervention had a significant efficacy on cancer negative effect reduction in children. Moreover, there was not any significant difference between the two forms of this intervention. This means that computerized CBT can be used as an effective intervention where psychological interventions are not available. In the present study's interventions, different aspects of pain negative effects on children were focused. Thus, different skills via psycho education, such as pain evaluation, behavioral activation, problem solving, relaxation, attention fraction, imagination techniques, and anger control were taught. The advantage of the present study therapeutic program is briefed sessions but wide area coverage. In addition, if this program delivered by CD, the other advantages are accessibility and low cost. The findings of this study can provide better Battle against cancer in the suffering people.

Conclusion

In conclusion, along with all the efforts made to get rid of the negative medical effects of cancer it is imperative, that experts pay attention to psychological aspects of cancer. Specialized and systematic interventions focusing on the negative psychological aspects of cancer can be designed and implemented as necessary part of treatment for individuals with special medical conditions, such as cancer. It is hoped that specialists and officials will pay more attention to children with cancer.

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