

The impact of exergames on cancer related fatigue among pediatric oncology patients: A qualitative approach

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Η επίδραση των ψηφιακών διαδραστικών παιχνιδιών άσκησης στην κόπωση που σχετίζεται με τον καρκίνο σε παιδιατρικούς ογκολογικούς ασθενείς: Μία ποιοτική προσέγγιση

Περίληψη στο τέλος του άρθρου

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Introduction: Cancer related fatigue is one of the most frequently reported and widespread symptoms experienced by pediatric oncology patients both during and after treatment. Participation in exercise has been shown to play a vital role in reducing children's perceived fatigue and at the same time is considered a safe and alternative intervention strategy. **Purpose:** The purpose of the present study was to investigate the impact of exergames on cancer related fatigue among pediatric oncology patients. **Material and Method:** Six pediatric oncology patients volunteered, aged from five to nine years old, who had been diagnosed with different types of cancer. A 12-week exercise program was implemented, by using the Xbox Kinect™ console. Frequency of attendance was three times per week, while duration was thirty minutes per training session. Data were collected via observations and individual interviews with the children and with one of their parents. **Results:** From the qualitative data analysis three major themes were conducted: a) Decrease of treatment side effects, b) Decrease of sleep disturbances, c) Decrease of psychological distress. **Conclusions:** In conclusion, the involvement of pediatric oncology patients in exergames, plays a decisive role in reducing cancer-related fatigue, while at the same time provides the opportunity to the children to exercise in a safe and controlled environment during their free time in the hostel.

Key-words: Exergames, cancer related fatigue, pediatric oncology

Introduction

Cancer-related fatigue is one of the most common and complex symptoms that cancer patients refer during the phase of treatment.¹ According to the National Comprehensive Cancer Network, cancer related fatigue is defined as “a distressing, persistent, subjective sense of physical, emotional, and/or cognitive tiredness or exhaustion related to cancer or cancer treatment that is not proportional to recent activity and interferes with usual functioning”.¹ Unlike the typical fatigue, is a symptom that does not recede after rest or sleep, while at the same time it has been reported that between 40% and 100% of the overall cases of patients suffer due to it.²⁻³

The etiology of cancer-related fatigue appears to be multifactorial, with the major causes being side effects of treatment, anemia, pain, nausea, sleep disorders, emotional distress and anxiety, and hospital environment.⁴⁻¹¹ With regard to pediatric cancer-related fatigue, it is considered to be one of the most common and most unpleasant symptoms which observed in children during treatment, especially in the first days of the beginning of a chemotherapy cycle.¹²⁻¹³

Concerning the consequences of cancer related fatigue which experienced by pediatric oncology patients, it seems that is responsible for the absence of the children from their daily activities, the need to rest due to lack of energy, the constant mood changes, the sleep disturbances, the social isolation, the children’s absence from school, the reduced school performance and the deterioration of the overall quality of life.¹⁴⁻¹⁵

However, it has been found that the involvement of pediatric oncology patients in exercise programs plays a decisive role in reducing the perceived cancer related fatigue, while at the same time is considered as a safe and alternative intervention strategy.¹⁶ The results of a meta-analysis study indicated that the involvement of pediatric oncology patients in exercise programs, especially of those aged from 6 to 18 years old, constitutes an intervention strategy that is considered as the most effective and the most highly recommended non-pharmacological intervention to reduce cancer related fatigue in children.¹⁷ What is more, in a related review, which aimed to evaluate various non-pharmacological intervention programs in perceived fatigue and psychological stress in pediatric oncology patients, exercise was found to play a vital role in reducing fatigue as well as psychological stress.¹⁶

An innovative and at the same time enjoyable type of exercise is the well-known “exergames”. According to Lieberman, the term “exergaming” consists of the combination of the words, exercise and game and is used to describe video games that promote physical activity,¹⁸ while the most popular exergaming consoles are the Microsoft’s Xbox Kinect and the Nintendo Wii™, which have attracted the interest of numerous researchers in the field of health, physical activity and education.¹⁹ Due to the increasing popularity of these games, plethora of health professionals have studied and used them in the past, arguing that exergames are beneficial for the improvement of both physical and mental health of the participants.²⁰⁻²⁶

Aim

Given that exergames is a more entertaining kind of physical activity, this study sought to evaluate whether exergames could reduce the perceived cancer related fatigue in six children who had been diagnosed with different types of cancer. More specifically, it was hypothesized that a 12-week hostel-based exergaming program with three 30-minute sessions per week would result in a significant reduction of the perceived cancer related fatigue among pediatric oncology patients, by using the Xbox 360 kinect console.

Material and Method

The selection of the participants in this qualitative study was purposeful.²⁷ In total, six pediatric oncology patients (N=6) who had been diagnosed with different types of cancer, aged from five to nine years old volunteered. The inclusion criteria in this research were the following: a) experience the same phenomenon (exergames), b) diagnosed with cancer, c) be in acute phase of cancer treatment. Participant’s characteristics are analytically presented in Table 1.

During the 12-week hostel-based exergaming program the main instrument was the researcher herself (1st author), as she was observing and keeping detailed notes in a field diary about the interventional program, events and discussions.²⁸

Participants took part in face-to-face, open-ended individual interviews. The interviews began with initial warm-up questions and general questions regarding the children’s cancer experience. As the interview proceed, attention was given to questions that focused on

Table 1. Characteristics of the participants

Age	Sex	Type of cancer
5	Female	<i>Acute Lymphoblastic Leukemia</i>
5	Male	Retinoblastoma
6	Female	Acute Myeloid Leukemia
6	Female	Acute Myeloid Leukemia
9	Female	Hodgkin's Lymphoma
9	Male	Nasopharyngeal Carcinoma

their cancer related fatigue symptoms and how their involvement in exercise made them feel. The participants were interviewed before the beginning of the exergaming program, as well as after the 6th and the 12th week. More specifically, interviews were conducted with the children (N=6) and with one of the parents of each child (N=6) for a total of 30-40 minutes. Interviews were audio recorded, transcribed verbatim and anonymized in line with ethical practice, in order to ensure the accuracy and authenticity. All measurements were performed in the playing room of the hostel, where the Xbox 360 Kinect console was located.

A 12-week hostel-based exergaming program was implemented by using the Xbox Kinect™ console. Frequency of attendance was three times per week, while duration was thirty minutes per training session. The exergames «Kinect sports», «Kinect sports-season 2» and «Kinect Adventures» were used. The program was individually adapted, instructed and supervised by the 1st author – personal trainer. The participants before the beginning of program had created their own Mii character (virtual self), according their preferences. In addition, participants in each training session had the opportunity to freely choose the games of their preference, as well as and the duration of the game, through a variety of sports and activities such as baseball, bowling, tennis, rugby, darts, golf, boxing etc. Children did not participate in the program when they had low platelet counts <20,000 / ml, anemia (hemoglobin <8g), fever (<38 ° C), nausea / vomiting, pain, dizziness and infections. Before the training program with exergames, children received an introductory tutorial on how to use the Xbox 360 Kinect console and its peripheral devices, as none of the

children had been involved in this type of physical activity in the past. Moreover, parents were informed about the aim and the design of the study and they signed a written informed consent. Also, verbal consent was given from the doctors and the psychologist, who supervised the children, in order to ensure that both the physical and psychological status of the participants at that time allowed them to participate in the program. Finally, approval was obtained from the Ethics Committee (EC) of Democritus University of Thrace (DUTH).

Qualitative analysis

In order to strengthen the validity of our findings, we tried to collect data through interviews and observations, with the purpose to obtain the same results from each research technique, so we could become sure that the data are valid. In the social sciences, triangulation constitutes a qualitative research strategy to test validity through the convergence of information from different sources in order to check the results of one same subject.²⁹

For the assessment of the qualitative data, interviews were transcribed verbatim and analyzed using thematic analysis.³⁰ In the beginning, all researchers read the transcripts and the text of observations in order to get an overall impression. In second phase, they identified and coded units of meaning representing participants' perceived experiences. Then, they grouped all the coded data under greater categories and compared them with the original. After this, they summarized the contents of each group to generalize the descriptions regarding the participants' experience. Finally, all authors discussed the coded data and agreed on the themes.³⁰

Results

From the qualitative data analysis three major themes were conducted from the two first authors of the present study, a) Decrease of treatment side effects, b) Decrease of sleep disturbances, c) Decrease of psychological distress (Figure 1).

The following is an analytical description of the themes which identified (Table 2):

Discussion

In the present study individual interviews and observations were conducted by the first researcher in order to evaluate the effect of a hostel-based exergaming program of three 30-minute sessions per week on participants' cancer related fatigue. Our results showed that the interventional program with exergames decreased the children's overall cancer related fatigue regarding the parameters:

Figure 1. Major themes which conducted from qualitative data analysis

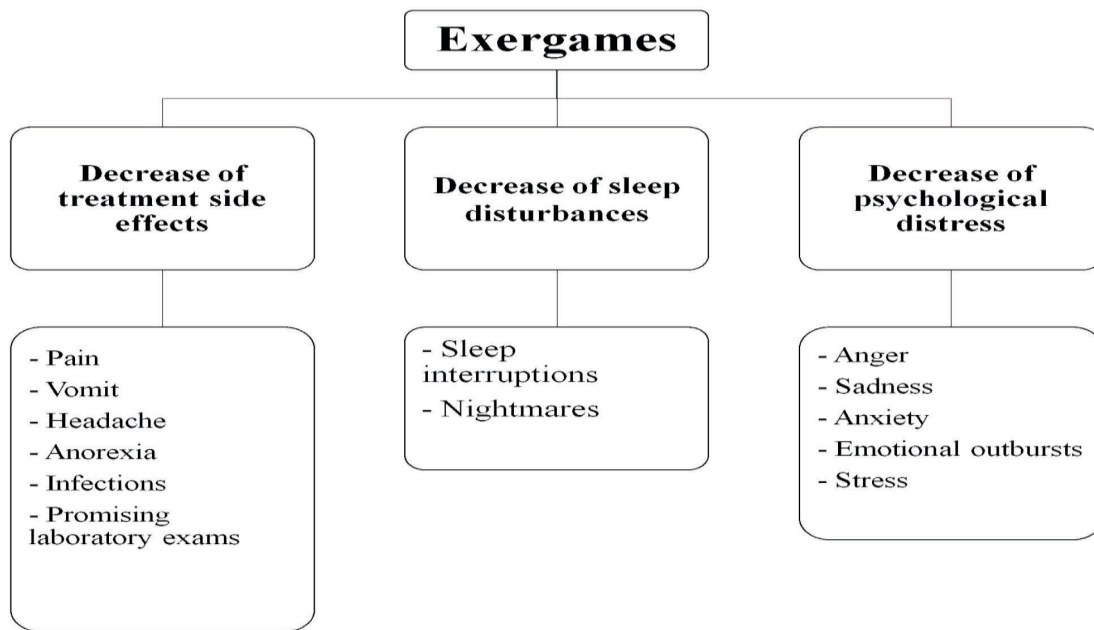


Table 2. The effect of exergames on children's cancer related fatigue

1st Theme - Decrease of treatment side effects	
Children	"I do not feel pain", "I rarely vomit", "I feel strong", "I eat normally, my favorite food is ...", "I am fine, I do not feel tired", "Sometimes I have headache, but not so intense"
Parents	"She/he doesn't report pain", "Since the program started she/he has more energy, she/he does not want to lie on bed all day as she/he used to do", "She/he has the willingness to do things during the day", " She/he doesn't have anorexia due to the treatment"; "... she/he had infections in the past, but during the exercise program we didn't have any problems., ...it was good that the children did not come in contact with the objects by using this console", "... the laboratory tests show promising results (no low white blood cell counts), she's/he's fine, we are good", "Sometimes she/he has nausea due to chemotherapy, but is normal"
2nd Theme - Decrease of sleep disturbances	
Children	"I sleep good ...", "I do not wake up during the night", "I do not feel tired in the morning ..., I want to play with the games, I get ready quickly and I come downstairs"
Parents	"She/he used to have nightmares but this period very rarely, this period she/he sleeps well", "She/he sleeps normally on her/his bed, not with me", "She/he doesn't have phobias during the night, sometimes she/he sleeps late, but she/he used to do this before she/he was diagnosed with the disease", "In generally she/he sleeps quite well"

3rd Theme - Decrease of psychological distress	
Children	"I do not feel angry", "I am happy that I play with these games", "I do not feel sad", "Step by step, everything will pass", "I do not feel anxious"
Parents	"She/he doesn't get angry so easily", "She/he has fewer emotional outbursts, such as anger, and stress", "She/he is happy and always looks forward to play with the exergames, (exergames) is the first thing that she/he wants to do as soon as possible when she/he wakes up in the morning", "She/he is excited with the program and constantly tells us what she/he did, that she/he won, "She/he is not sad, she/he generally is in a good mood and she/he is cooperative", "She/he is not so worried for the future"

a) Decrease of treatment side effects, b) Decrease of sleep disturbances, and c) Decrease of psychological distress during the phase of cancer treatment. Regarding the parameter "Decrease of treatment side effects" revealed that children after their involvement in the exergaming program didn't feel pain, they didn't feel tired, as well as they didn't have infections like they had before the beginning of the exergaming program, though they referred that sometimes were suffering from headaches. Moreover, according to their parents' statements, children's laboratory tests during the 12-week period of exergaming, were shown promising signs of recovery. Similarly to our results, other researchers found that the engagement of the oncology patients in exercise programs contributes decisively to the reduction of perceived pain and also to the reduction of the overall cancer related fatigue due to the clinical treatments.³¹ However, concerning the effect of exercise on the immune system and the infections in pediatric oncology patients, research has not concluded whether this type of intervention can enhance the child's immune system, but suggest that can be safely incorporated during the phase of cancer treatment.³²

Concerning the parameter "Decrease of sleep disturbances", from the respondent's answers was found that children didn't wake up during the night sleep, they didn't feel tired when they were waking up in the mornings, especially the days that they had to participate in the exercise program, as well as they didn't suffer from nightmares and phobias during the night in comparison with the past, when they had entered in anti-cancer treatment. In agreement with our results, other authors suggest that exercise is a useful treatment for improving sleep quality and reducing sleep medication use among children who had been diagnosed with cancer, both during and after cancer treatment.³³⁻³⁴

Finally, regarding the 3rd theme "Decrease of psychological distress" it was observed that the patients had a plethora of psychological benefits. They had fewer emotional outbursts, such as anger, stress and anxiety, they were more happy and optimistic for the future, while they were overwhelmed by feelings of pleasure and excitement due to their achievements during the exergaming sessions. Same results were

also conducted by other researchers, who had examined the perceived benefits of hostel-based exercise programs among clinical populations, arguing that exergaming is an alternative way of training which enhances participant's mood and also leads to a positive attitude towards exercise.^{21,24}

Limitations

To the best of our knowledge this is the first worldwide qualitative study which examined the effect of exergames with the use of Xbox 360 kinect console on cancer related fatigue in pediatric oncology patients. However, it is necessary to note that our small sample and lack of previous qualitative studies on this topic could be the limitations of the present study.

Conclusions-Suggestions

In conclusion, participants' involvement in exergames seems to be an alternative and a non-pharmaceutical strategy, which can reduce the perceived cancer related fatigue in pediatric oncology patients during the phase of cancer treatment. Future research is needed in order to overcome these limitations and provide more definitive results regarding exercise and cancer related fatigue in pediatric oncology patients.

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ABSTRACT

Η επίδραση των ψηφιακών διαδραστικών παιχνιδιών άσκησης στην κόπωση που σχετίζεται με τον καρκίνο σε παιδιατρικούς ογκολογικούς ασθενείς: Μία ποιοτική προσέγγιση

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Εισαγωγή: Η κόπωση που σχετίζεται με τον καρκίνο αποτελεί ένα από τα πιο συχνά και διαδεδομένα συμπτώματα που βιώνουν οι παιδιατρικοί ογκολογικοί ασθενείς τόσο κατά τη διάρκεια της θεραπείας τους, όσο και μετά την ολοκλήρωση αυτής. Έχει διαπιστωθεί πως η συμμετοχή σε άσκηση διαδραματίζει καθοριστικό ρόλο για τη μείωση της αντιληπτής κόπωσης των παιδιών, ενώ παράλληλα θεωρείται ως μία ασφαλής και εναλλακτική στρατηγική παρέμβασης. **Σκοπός:** Ο σκοπός της παρούσας μελέτης ήταν να διερευνήσει την επίδραση των ψηφιακών διαδραστικών παιχνιδιών άσκησης στην κόπωση που σχετίζεται με τον καρκίνο σε παιδιατρικούς ογκολογικούς ασθενείς. **Υλικό και Μέθοδος:** Συνολικά συμμετείχαν έξι παιδιατρικοί ογκολογικοί ασθενείς, ηλικίας από πέντε έως εννέα ετών, οι οποίοι είχαν διαγνωσθεί με διάφορες μορφές καρκίνου. Ένα πρόγραμμα άσκησης συνολικής διάρκειας 12 εβδομάδων εφαρμόστηκε, χρησιμοποιώντας την κονσόλα Xbox Kinect™. Η συχνότητα συμμετοχής ήταν 3 φορές την εβδομάδα, ενώ η διάρκεια συμμετοχής ανά προπονητική μονάδα είχε οριστεί στα 30 λεπτά. Τα δεδομένα συλλέχθηκαν μέσω παρατηρήσεων και ατομικών συνεντεύξεων με τα παιδιά και με έναν από τους γονείς τους. **Αποτελέσματα:** Από την ποιοτική ανάλυση των δεδομένων προέκυψαν τρία κύρια θέματα: α) Μείωση των παρενεργειών της θεραπείας, β) Μείωση των διαταραχών του ύπνου, γ) Μείωση της ψυχολογικής δυσφορίας. **Συμπεράσματα:** Συμπερασματικά, η συμμετοχή των παιδιατρικών ογκολογικών ασθενών σε άσκηση μέσω ψηφιακών διαδραστικών παιχνιδιών συντελεί καθοριστικά στη μείωση της κόπωσης που σχετίζεται με τον καρκίνο, ενώ ταυτόχρονα παρέχει την ευκαιρία στα παιδιά να ασκηθούν σε ένα ασφαλές και ελεγχόμενο περιβάλλον κατά τη διάρκεια του ελεύθερου χρόνου τους στον ξενώνα.

Λέξεις-ευρητηρίου: Ψηφιακά διαδραστικά παιχνίδια άσκησης, κόπωση που σχετίζεται με τον καρκίνο, παιδιατρική ογκολογία

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