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InterACTIV: An Exploratory Study of the Use of a Game Console to Promote Physical Activation of Hospitalized Adult Patients With Cancer

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The positive influence of physical exercise on patient-reported outcomes (i.e., symptoms, function, or quality of life) in patients with cancer is well established (Knols, Aaronson, Uebelhart, Fransen, & Aufdemkampe, 2005; Schmitz et al., 2005). However, motivating patients to adhere to physical exercise plans remains challenging (Baumann, Schüle, Kraut, & Fauser, 2005). In addition, behavioral therapy measures are used to minimize psychosomatic reactions in patients with cancer during radiotherapy and chemotherapy (Burish, Carey, Krozely, & Greco, 1987; Kolko & Rickard-Figueroa, 1985; Redd et al., 1987). However, computer games have been used sporadically for the management of side effects. Vasterling, Jenkins, Tope, and Burish (1993) showed that, in addition to increasing imagination and relaxation, simple cognitive distractions created by computer games are effective in reducing side effects from chemotherapy. Schneider and Hood (2007) also showed that virtual realities in computer games are effective in distracting patients during chemotherapy application. Diminished sense of time is achieved irrespective of sex, age, or playing frequency (Wood, Griffiths, & Parke, 2007). The feeling of a loss of time was dependent on the quality of the computer game, its complexity, game levels, and structure. The experience had a positive impact on players' state of relaxation and stimulated a temporary escape from reality. Players used computer and video games as alternative coping methods (Wood & Griffiths, 2007). For patients in burdensome situations, video games could support coping and thus reduce side effects of radiotherapy and chemotherapy (Kato, Cole, Bradlyn, & Pollock, 2008).

Purpose/Objectives: To explore the application of the Nintendo Wii™ game console to motivate hospitalized adult patients with cancer to be physically active during treatment periods.

Design: An exploratory study with a mixed-method approach, including descriptive statistics and Mayring's qualitative data evaluation method.

Setting: The Department of Radiation Oncology at the University Hospital in Halle (Saale) in Germany.

Sample: Convenience sample of 7 adult inpatients.

Methods: All patients received physical training for five days for 30 minutes per day with Nintendo Wii. After the last training session, patients were interviewed using a semistructured guideline.

Main Research Variables: Applicability of a motion-activated game console during inpatient treatment periods, patients' distraction from the hospital environment.

Findings: In general, the use of a motion-activated game console in a hospital environment was evaluated positively. Participants showed a high degree of acceptance using this kind of physical activity. Because of the Nintendo Wii, the majority of individuals felt stimulated to become physically active during hospitalization. In addition, all patients lost time awareness and felt distracted from the daily hospital routine. A majority of the patients reported an improved mood state from the game sessions.

Conclusions: The results indicate that a motion-activated game console could be useful to motivate adult patients with cancer to be physically active during hospitalization.

Implications for Nursing: Nurses can recommend the use of game consoles such as the Nintendo Wii for physical exercise; in addition, the motivational effects of playing motion-activated game consoles might be particularly helpful for patients with cancer-related fatigue to overcome barriers and begin exercise.

According to the current state of research, however, no studies provide data on how patients with cancer experience the use of motion-activated game consoles.

Theoretical Background

Patients' ability to cope with stress and their self-efficacy perception are major factors influencing distraction and well-being resulting from physical activities. Lazarus and Launier's (1981) cognitive-psychological approach focused the subjective evaluation of negative emotions such as stress, anxiety, and aggression. *Stress* is defined herein as a transaction between environment and person, meaning that psychological stress arises through the cognitive evaluation of people's relation to their environment (i.e., whether they perceive it as challenging, menacing, or harmful). The affected person assesses possible risks in the primary evaluation (incident perception) based on that environmental information. In addition, a secondary evaluation (resource perception) is made, which assesses the coping resources defined by a person's characteristics, their self-efficacy perceptions, competences, and goals, as well as environmental characteristics. Principally, two types of coping strategies result from these evaluations. Problem-oriented coping strategies aim to adjust patients' behavior to solve problems, whereas emotion-oriented coping aims to adjust the behavior to achieve alleviation of straining circumstances.

Self-efficacy theory is based on the assumption that individual actions might lead to a subjective experience of being in control (i.e., mastery or challenge-skill balance) (Bandura, 1995, 1997). In a sample of patients undergoing orthopedic surgery, Stoll (1999) and Stoll and Schega (2000) showed that physical exercise could increase self-efficacy and decrease trait anxiety. Patients learned that obstacles could be overcome by sports therapy or physical activation programs. That experience caused a sense of "feeling better." In addition, efficacy beliefs played a key role in the self-regulation process of motivation.

Patients may motivate themselves and guide their anticipated actions by forethought of the exercise and their perceptions of achievable goals. Individuals anticipate likely outcomes of prospective actions. They set goals for themselves and plan courses of action designed to attain perceived benefits. Therefore, they will mobilize the resources at their command and level of effort needed to succeed (Hobfoll, 1988; Stoll, 2001). Patients may gain an increased sense of control achievement and self-efficacy through self-mastery of skills by using motion-activated game consoles.

The evidence for effects of motion-activated computer and video games in adult patients with cancer is insufficient. Therefore, the aim of this study was to gain insight into how patients perceive the applicability of the

Nintendo Wii™ game console regarding motivation for physical activity during treatment periods. A second aim was to determine the extent to which the Wii games facilitated patients' distraction from the hospital environment.

Methods

The exploratory study was planned, carried out, and evaluated as a mixed-method approach with regard to the basic principles of the International Conference on Harmonization Note for Guidance on Good Clinical Practice, combining quantitative description of the trial population with qualitative analysis of interview data, according to Mayring (2003), to assess patients' experience.

The study was approved by the ethics commission of the Medical Faculty of the Martin Luther University Halle-Wittenberg in 2009. The report followed the recommendations of the Consolidated Criteria for Reporting Qualitative Research (Tong, Sainsbury, & Craig, 2007). The title "InterACTIV" was chosen because of the corresponding meaning of the interactive character of the game console and the aim to motivate patients to improve physical activity.

Patient Selection

Patients with cancer receiving radiotherapy or combined radio-chemotherapy and scheduled for an inpatient stay of at least five days were included regardless of type of malignancy. Their physical functioning status according to the Eastern Cooperative Oncology Group guidelines needed to be grade 2 or better. Previous experience with game consoles was not among selection criteria. Patients with insufficient proficiency in spoken or written German were excluded. All participants were informed about the study and provided written informed consent. Patients were recruited by the researchers in face-to-face interviews. Prior to the investigation, the researchers did not have any kind of relationship to the participants, nor did they have any influence on the patients' treatment beyond the study intervention. The target sample size was eight patients, according to the pilot character of the study emphasized on qualitative methods.

Setting

The study took place between July 27, 2009, and September 4, 2009, in the Department of Radiation Oncology of the University Hospital in Halle (Saale), Germany. Wii sessions and interviews took place in a quiet, separate room. The games were presented through a video projector. Hardware and software were supplied by the Institute for Health and Nursing Science in the Medical Faculty at Martin Luther University Halle-Wittenberg in Germany.

Data Collection

Prior to the intervention, each participant was assessed for activity behavior using the **General Activity Questionnaire** (Ainsworth, Jacobs, & Leon, 1993) and for health-related quality of life (HRQOL) using the **European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire–Core 30 (EORTC QLQ-C30)**, version 3.0 (Aaronson et al., 1993). Both questionnaires for quantitative description showed adequate validity and reliability through psychometric testing.

Postintervention, study participants were questioned verbally regarding their experiences with the motion-activated game console Nintendo Wii. The questioning was done using a semistructured interview guideline (e.g., participants were asked “How did you feel during the session?”). The interviews were tape-recorded and subsequently transcribed.

Procedure

All patients used the Nintendo Wii game console continuously for at least 30 minutes per day for a minimum of five days. Research staff members were present during all sessions to help with user problems or to take an active part in the game, at the patient’s request. The first session started with an introduction on how to use the device. The instructor provided an overview of available games, including information about the physical strain (e.g., heart rate) of each. Heart rates were taken from healthy volunteers prior to implementation. Patients were free to choose from the following games for each session: “Wii Sports,” “Family Trainer,” “Sports Island,” and “Family Ski and Snowboard.”

Data Analysis

The data analysis used mixed methods. Description of study population regarding activity behavior and HRQOL, as well as the closed-question part of the interview guideline, was evaluated quantitatively with SPSS®, version 17.0, using descriptive statistics, including means and frequencies.

Mayring’s (2003) method was used for qualitative data analysis of the interview guideline. That method enabled an objective, systematic description of fixed communication (i.e., the transcriptions of problem-orientated or focus in-

terviews). Analysis was performed according to explicit rules to guarantee validity of the analysis. The material was investigated considering the designated question and detection of inherent categories throughout the patients’ answers. The analysis was guided by theory and applied a conclusive method to develop a system of categories. Those were developed considering theory and transcript material, and had been revised and retested during the analysis process. Subsequently, the results were interpreted regarding the main research question.

Qualitative data analysis was evaluated as recommended through content analysis quality criteria (e.g., intersubjective plausibility test).

Results

A total of seven participants were recruited (five men and two women) (see Table 1). Eleven patients refused to participate because of a weak health condition (n =

Table 1. Description of Participants

Patient	Disease ^a and Treatment	Experience With Console	Ease of Hardware Handling ^b	Difficulties With Software
47-year-old man	Rectal cancer cT3N1M0 (neoadjuvant chemoradiation with capecitabine and oxaliplatin)	Yes	6	No
47-year-old woman	Brain metastases and breast cancer (whole-brain radiotherapy)	No	4	Yes
53-year-old man	Esophageal cancer cT4N2M1 (radical chemoradiation with cisplatin and 5-fluorouracil)	No	2	No
55-year-old man	Non-small cell lung cancer cT4N2M0 (radical chemoradiation with cisplatin and vinorelbin)	No	5	Yes
61-year-old man	Non-small cell lung cancer cT2N2M0 (radical chemoradiation with cisplatin and vinorelbin)	Yes	3	No
63-year-old woman	Tongue cancer cT4N2M0 (radical chemoradiation with cisplatin)	No	3	No
70-year-old man	Small-cell lung cancer cT4N2M0 (radical chemoradiation with carboplatin and etoposide)	No	4	No

^aAbbreviations of tumor stages, according to Sobin, Gospodarowicz, and Wittekind, 2009.
^bNumeric rating scale with a range of 0–10, where 0 = very easy and 10 = extremely difficult

4), the intervention not meeting their expectations (n = 1), or difficulties in handling the device (n = 2). Four patients refused without giving reasons.

Regarding physical activity behavior, three participants stated that they had been exercising once or twice a week since leaving high school and four had not exercised at all. However, none of them had continued exercising four weeks prior to hospitalization.

To provide information about participants' constitution, the authors did a standard assessment with the EORTC QLQ-C30 questionnaire and compared the perceived quality of life with reference data from the healthy German population (Schwarz & Hinz, 2001). The majority of participants showed reduced scores on all subscales, as well as reduced functionality and increased symptom intensity within all subscales compared with healthy volunteers (Schwarz & Hinz, 2001).

Semistructured interviews performed according to the guidelines lasted a mean of 13 (range = 10–20) minutes. After the recording and scientific transcription, all information of interest was marked in a first search scan. The classification into categories was done in a second scan; often, the exact wording was used. An interpretive evaluation of the detected relevant statements was done in the last step.

Three patients responded positively when asked if they would play with the game console as an inpatient in the future. Two patients rated this question with "maybe," one patient was undecided, and two patients said they would not play these kinds of games in the near future. Older patients reported that they preferred the less physically straining and less complex games. In general, games with realistic movements and in which at least two people could interact were preferred (see Table 2).

The application of the game console in the inpatient setting was responded to positively by the patients, with the authors receiving the following comments: "Very good," "Healthy people can also participate and have fun at the same time," and "This is great for people of all ages, even those who are older." Some critical statements were mentioned, as well: "This might be better for patients hospitalized for longer periods," "Some of the patients surely had fun with it, but it was a strange experience for me," and "This could be an alternative, but the kind of games should be discussed with the patients before playing in terms of what is individually reasonable."

From the interviews, it can be derived that although the physical strain of playing the games was moderate, it still was unfamiliar because the patients had little or no physical activity. For example, some participants commented, "I feel a bit flabby, because I am not used to this kind of action," and "After a couple of games,

I had to take a shower because I was sweating. I realized I hadn't had any physical activity in a long time." In general, the games were evaluated positively by the patients. In particular, aspects of fun, being active, distraction, and the interactional demand of the games were rated as very important.

Physical Activity as a Game

The playful nature of physical activity in game form was experienced by the patients as comfortable, varied, and relaxing. However, one patient evaluated herself as too old for this kind of action, saying, "If I were 10 years younger, I would have had more fun with it."

Relaxation and Decrease of Negative Emotions

Playing virtual physical activity games decreased strain-related distressing symptoms and led to subjective internal loss of control experiences, which can be seen in the following patient statements: "I feel much better now," and "Yes, I was more relaxed and more confident, my mood improved and every action seemed to happen automatically. I felt less tense." All patients described the game situations as "comfortable and relaxing," frequently as "distractive and actively fun." The strong cancer- and treatment-related emotional tension could be derived from the following statement: "I was somehow chirpy, because the games were sometimes my buffer when I had just come back from radiation treatment." The games usually resulted in positive emotions (e.g., eased, activated, relaxed). By playing a motion-activated video game, the patients' ability to cope with their illness was improved temporarily, as was shown in the following statements: "Much, much better. I was totally relaxed, less tensed, everything went back to normal," and "I felt like I was getting back to normal, because I felt that I can handle these demands. This helped very much." The authors interpreted those statements as confirmation of the well-known mood-enhancing effect of physical activity ("feeling better phenomenon") (Schwenkmezger, 2001).

Table 2. Participant Game Preferences According to Age and Gender

Age (Years)	Male	Female
40–49	Golf, bowling, baseball, tennis, boxing, skiing	Golf, bowling, tennis
50–59	Golf, bowling, tennis	–
60–69	Golf, bowling, tennis	Bowling
70 or older	Golf, bowling	–
N = 7		

Distraction While Playing

Playing with the game console resulted in the experience of forgetting the hospital surroundings and what it was like to be an oncology inpatient for the majority of individuals. In addition, the experience of losing awareness of time and being fully absorbed in the actual action was described by one participant, saying, "This felt like just some few minutes; I don't know how long we played. When I went back to my room, I wondered how much time had passed. Time was passing very quickly while I played." For all patients, playing with the Nintendo Wii enabled distraction from the daily clinical routine and environment.

Positive Self-Experience and Interaction

Some of the patients also focused on the interactional nature of the games as well as on the competition factor, as shown in the following comments: "That I could beat you, " "Yes, I thought, 'Look, kid. Look at what this old man can do!'" and "communication and interaction with the opponent." The statement, "I can say that I was not thrown on the scrap heap" showed an increased functional self-efficacy and self-awareness leading to a more global positive evaluation of own abilities and so to increased coping resources. In addition, based on the realistic appearance through video projection, the games were helpful in bringing patients back into positive reminiscences about their own past physical activity (e.g., "This reminded me of the time when I used to bowl.").

The use of the motion-activated game console in a hospital environment was accepted positively. Overall, patients felt comfortable with the equipment and being physically active using Nintendo Wii. Most of the patients felt positively stimulated and decided to use this kind of equipment in the future in the case of a possible longer hospital treatment. Playing games through the game console resulted in patients experiencing a loss of time sensation, a distraction from daily clinical routine, and an elevated mood state.

Discussion

This study showed that a motion-activated game console in the treatment of patients with cancer in a hospital setting can result in distraction from daily hospital routines and can increase the patients' motivation to be physically active. However, the training necessary to use the game console might be an unaccustomed experience for some patients within the acute care setting.

All participants confirmed that this kind of physical activity was pleasant and resulted in positive mood states. Although participants reported good handling of the technical device and only a few had problems

with the game (software), three patients refused trial involvement because of handling difficulties with the Nunchuk and remote control. Thus, acceptance of the game console might be influenced by age and routine in using a computer or game console.

Participants predominantly felt stimulated by using the motion-activated game console during inpatient hospital stays. In addition, the majority lost their sense of time, felt distracted from the hospital environment, and experienced an improvement in their state of health.

Some participants' statements can be interpreted with regard to the cognitive-transactional stress theory by Lazarus (1991) and reflections from cognitive-behavioral theory as well as current findings from flow research. Lazarus (1991) assumed that stress results from the subjective appraisal of a challenge as rather menacing and, thus, as exceeding a person's capabilities.

The playing sessions were described as pleasant, relaxing, distracting, and fun and, therefore, could encourage improvement of physical activity using a motion-activated game console. From the psychological perspective, this process could be described as an effective emotion-centered coping strategy because of the patients' situation. If patients successfully down-regulate themselves, the next step of developing problem-oriented coping could be addressed. That result confirms the findings of Kato et al.'s (2008) study, which showed a developing functional coping process in patients by using a game console in the hospital regardless of age.

From a behavioral psychology standpoint, patients certainly experienced positive responses to their behavior. That could be seen as a positive reinforcement and could enhance adherence to physical activity. In addition, the interaction and competition with a real opponent seemed to be important for some patients. Patients experience social support in the context of stress theory because of the playful and competitive physical activity with other patients. That process could strengthen patients and increase their self-awareness of personal capabilities and decrease stress levels, which might help them to develop a commitment to this kind of therapy.

Some results can be interpreted with regard to recent flow research. According to Csikszentmihalyi (1975), flow occurs if a situation results in a subjectively reflected challenge-skill match. If patients got into a state of flow, they were fully absorbed in their activity and lost their awareness of time and place. All patients reported having had no sense of time during the playing sessions and having been completely focused on the game. Such experiences usually are perceived as very positive and motivating. Therefore, the games also could be used as a positive reinforcement.

The fact that five out of seven participants would use a motion-activated game console during longer hospital stays again can be explained by the MoVo (motivation and volition) process model (Fuchs, 2006). The use of a game console particularly incentivizes patients to physical activity. In virtual reality, most patients are able to master challenges (e.g., motor) accompanied by functional intention development, which can act as positive reinforcement for additional sports activities and give patients the opportunity to be physically active with a very low probability of being hurt or injured compared to a real physical activity setting. Therefore, the authors postulate that patients might be able to transfer their acquired skills to other situations in their everyday lives. Noticeable effects also exist in terms of the self-efficacy and the distraction hypothesis (Bandura, 1997; Schwenkmezger, 2001). Almost all patients reported an increase of positive mood during playing sessions. Patients may feel better as a result of playing with the motion-activated game console, which enabled individual and subjective control experiences. All patients stated that they had been distracted from hospital routine by playing sessions and were able to forget for a short time that they had cancer.

Playing with the motion-activated game console established a strong relation to participants' sports backgrounds because of the realistic representation of exercises. That intensifies the feeling of joy and fun, as those memories are not in any way connected with the hospital. No disease-, age- or gender-related effects were observed, which might be related to small sample size. Therefore, larger trials with representative samples are needed to address these issues.

Gender-specific differences regarding applicability and acceptance in participants were not observed; however, only two women participated in this trial. Future trials should assess intervention effects with a more balanced population.

Several methodologic aspects of the study deserve more discussion. The semistructured interview guideline could be seen as a possible source of bias, as it set the direction of the questions for the participants. An unintended influence of the interviewer on the participants or desired responses cannot be ruled out completely, even considering that participants were encouraged to express their personal thoughts. Video recordings of the playing sequences could have a less distorting effect, as the situation could be analyzed parallel to the training and not in a retrospective man-

ner. However, the current study's approach enabled a reflected evaluation, which was less influenced by the emotional playing situation. It remains unclear whether the acquired effects of the Nintendo Wii on patient-report outcome are similar compared with standard physical activation. In addition, it remains unclear if and how competing against a real person influences the attitudes of participants. This study provides no results determining whether the acquired activating effect remained after discharge. Therefore, additional investigation should address these issues in larger clinical trials with control interventions.

Conclusions

This study showed that the application of a motion-activated game console within inpatient hospital settings is accepted by adult patients with cancer. The results indicate that those consoles increase patients' motivation to be physically active. Thus, during inpatient treatment, those consoles can be used in addition to conventional physical exercises. Patients also were distracted from daily hospital routine through the video game and described flow experiences.

Implications for Nursing Practice

The results of this study indicate that a motion-activated game console can be useful in motivating adult patients with cancer for physical activity during longer inpatient hospital stays. Nurses can use the Nintendo Wii for physical exercises, in addition to standard care, to maintain muscular strength and reduce cancer-related fatigue. The motivational effects might be particularly helpful for patients with cancer-related fatigue to overcome barriers and start with exercising.

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