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CASE REPORT

AN IN-DEPTH, LONGITUDINAL EXAMINATION OF THE DAILY PHYSICAL ACTIVITY OF A PATIENT WITH HEART FAILURE USING A NINTENDO WII AT HOME: A CASE REPORT

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Objective: To explore the influence of the Nintendo Wii on the daily physical activity of a patient with chronic heart failure at home.

Methods: A 74-year-old Swedish patient with heart failure had access to a Nintendo Wii at home for 12 weeks. Exercise motivation, exercise self-efficacy and exercise capacity were assessed before and after the intervention. Data on perceived physical effort, global well-being and expended energy were collected every day during the intervention.

Results: During the 12 weeks of access to the Nintendo Wii, daily physical activity increased by 200% on weekdays and 57% on weekends, compared with baseline. The patient’s exercise motivation and exercise self-efficacy increased during the study, whereas perceived physical effort and global well-being did not change. The patient had no difficulties in using the system and did not suffer any major harm.

Discussion: The results of this case study suggest that providing patients with heart failure access to a Nintendo Wii is a promising and safe intervention. The energy expended by the patient per day increased, as did exercise capacity. Playing the Nintendo Wii did not increase the perceived physical effort, but increased motivation to exercise and decreased barriers to exercising.

Key words: heart failure; exergame; virtual reality; physical activity & elderly.


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INTRODUCTION

The number of chronically ill patients in society is increasing, and a considerable proportion is patients with cardiac conditions. Heart failure (HF) is a chronic condition, often the end stage of different cardiac diseases. HF is a syndrome in which patients experience symptoms such as shortness of breath and tiredness. Due to the poor prognosis, high incidence (1) and costs in connection with HF (2), it is important to search for opportunities to improve outcomes. Several studies have shown that exercise is safe and beneficial (3–5) for HF patients, both home-based and hospital-based (6–8). However, it is known that it is difficult for HF patients to maintain and adhere to exercise recommendations long-term (9). Non-adherence with exercise has a negative effect on clinical outcomes and there are many factors that influence adherence to exercise (9, 10). Therefore, it is important to search for alternative approaches to motivate patients with HF. Exergaming (physically active video gaming) has been shown to be a possible way to increase physical activity in different age groups (11), and might be a promising solution to improve patients’ adherence. It is not known if exergames are applicable to patients with HF. The aim of this study was to introduce Nintendo Wii Sports to an older patient with HF at home and determine whether this influenced his daily physical activity, as well as to describe his experiences and assess the practical issues.

METHODS

Case history

We selected a patient with chronic HF (HF with preserved ejection fraction) who had mild symptoms. We chose a patient who worked full-time, as this is an extra barrier to becoming more physically active. The present study describes an intervention in a Swedish 74-year-old married man with no depressive symptoms. The patient was comfortable at rest, but ordinary physical activity resulted in mild to moderate symptoms of tiredness, palpitation, or dyspnoea (New York Heart Association Functional Class II). The patient had been diagnosed with HF approximately 1 year previously, with hypertension and overconsumption of alcohol as underlying aetiology. At the time of study inclusion, he had a left ventricular ejection fraction (LVEF) between 50% and 55%, established by echocardiography, and his heart was in sinus rhythm. On examination his pulse was 61 beats/min, blood pressure was 135/85 mmHg, and he had a body mass index of 31. The patient did not have further co-morbidity. He used standard HF medication, Angiotensin II receptor blockers and beta-blockers, but he did not use diuretics at the time of inclusion. His amount of physical activity, collected every day during the baseline measurement 1 week before the installation of the Nintendo Wii was 2881 kJ/day during the week and 1704 kJ/day during the weekend.

Nintendo Wii

The Nintendo Wii is an exergame platform with a wireless controller, the Wii Remote, which is connected to the computer via Bluetooth. The Nintendo Wii remote enables players to interact with the computer through movements. The game Nintendo Wii Sports (bowling, tennis, baseball, golf and boxing), was provided with the Nintendo Wii.
Results

Patient experiences

The patient experienced the perceived physical effort playing the Nintendo Wii as being between “light” and “very light”. During the 12 weeks of access to the Nintendo Wii, the patient experienced no shortness of breath and he felt no tiredness, as recorded in the diary. Global well-being remained stayed approximately the same during the 12-week follow-up period.

The patient reported high exercise self-efficacy and high motivation to exercise at baseline, which increased over the 12 weeks of access to the Nintendo Wii. Exercise self-efficacy increased from “confident” to “very confident”. The patient rated social and psychological motivation to exercise as “important” at baseline and as “enormously important” after 12 weeks of access to the Nintendo Wii. Physical motivation to exercise changed from “very important” to “enormously important”.

Due to myalgia in week 2 after the installation of the Nintendo Wii, the patient decided to play bowling with both hands instead of only using his right hand. As a result, he experienced myalgia in both arms in week 3. However, this did not stop him from playing every day that week as well. The patient experienced no myalgia for the rest of the study. Another possible negative effect was that the patient gained 5 kg in weight during the 12 weeks of access to the Nintendo Wii.

Practical issues

Playing the Nintendo Wii did not cause any major harm; no injuries occurred during the study period in this case study. The patient had no difficulties exergaming (Wii Bowling being the preferred option) and there was enough space around the television to be active with the Nintendo Wii, according to safety guidelines. The patient played exergames for approximately 45 min before going to work every morning, either alone or with his wife or grandchildren.

Table I. Outcome measurements

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline Measurements</th>
<th>12 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise capacity</td>
<td>6-min walking test (13)</td>
<td>585 m</td>
</tr>
<tr>
<td>Exercise self-efficacy</td>
<td>Exercise self-efficacy questionnaire (16)</td>
<td>Confident</td>
</tr>
<tr>
<td>Exercise motivation</td>
<td>Exercise motivation index (17)</td>
<td>Important</td>
</tr>
<tr>
<td></td>
<td>Social exercise motivation</td>
<td>Important</td>
</tr>
<tr>
<td></td>
<td>Psychological motivation</td>
<td>Important</td>
</tr>
<tr>
<td></td>
<td>Physical motivation</td>
<td>Very important</td>
</tr>
</tbody>
</table>
activity level (see number 3 in Fig. 1), but the day with the high amount of physical activity was due to walking outside for 45 min in addition to playing Wii for 45 min (see number 4 in Fig. 1). In week 11 and 12 the patient had the highest daily physical activity level during the intervention. In week 11 he expended 33% more energy (3819 kJ/day) compared with baseline and in week 12 he expended 57% more energy during the week (4522 kJ/day), compared with baseline (2881 kJ/day). At the weekend of week 11 he expended 121% more energy (3764 kJ/day) than at baseline and in week 12 he expended 200% more energy (5112 kJ/day) during the weekend compared with baseline (1704 kJ/day).

Exercise capacity (6MWT) improved compared with the baseline measurement. At baseline, the patient walked 585 m in 6 min and after 12 weeks’ access to the Nintendo Wii, the patient walked 627 m in 6 min.

**DISCUSSION**

This case study indicates that the Nintendo Wii is a promising exergame platform to help increase daily physical activity in patients with HF. In this patient, playing the Nintendo Wii did not cause major harm and did not increase the perceived physical effort. The patient did not experience shortness of breath or tiredness when playing the Nintendo Wii. Exercise self-efficacy increased from “confident” to “very confident”, which indicated that the patient was very confident exercising even when barriers occurred. This could be because the Nintendo Wii was installed at home and, according to the patient, made it easier (fewer barriers) to exercise than, for example, in a gym or at the rehabilitation department in the hospital. In particular, the social motivation to exercise increased during the intervention. One explanation is that the patient was playing the Nintendo Wii with his wife every morning and that his grandchildren also liked being active with the patient this way. The daily physical activity level increased during the intervention. His exercise capacity also improved over the 12 weeks: he could walk 42 m further during the 6MWT after 12 weeks’ access to the Nintendo Wii, compared with baseline, which is a clinically relevant difference (13). Our case study illustrates that installing the Nintendo Wii in a HF patient’s home increases the amount of energy expended each day, increases exercise capacity, does not increase perceived physical effort, increases motivation to exercise and decreases barriers to exercise.

The patient experienced myalgia during the intervention; thus, patients in such interventions should be informed that this is a possible occurrence. Myalgia could be a barrier to HF patients becoming more physically active.

In this case study the patient gained weight. The weight gain exceeded 2 kg in 1 week. As instructed, he called the HF nurses and attended a consultation. After the examination the nurses concluded that the weight gain was not due to fluid retention. A possible explanation could be the increase of muscle volume and/or maybe changed eating habits. Patients should always contact their HF specialist if they experience a weight gain, due to the possibility of oedema, which could indicate worsening of HF (1).

It is difficult to draw causal conclusions from a case study, and we cannot generalize our findings. Further research is...
needed into the use of the Nintendo Wii as a possible home intervention to increase daily physical activity in patients with HF. This study was conducted during the summer, and the patient was able to do gardening and take walks outside in addition to playing the Nintendo Wii. In Sweden, winter can be a barrier to physical activity outdoors. As the results of this case study were promising, we are conducting an intervention using the Nintendo Wii, in order to examine possible effects on daily physical activity in a larger group of patients with HF.

ACKNOWLEDGEMENTS

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