

## RESEARCH PAPER

# Perceptions of using videogames in rehabilitation: a dual perspective of people with multiple sclerosis and physiotherapists

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### Abstract

**Purpose:** Our aim was to describe experiences of using Nintendo Wii Fit™ for balance exercise, from the perspectives of patients with multiple sclerosis (MS) and their physiotherapists (PT). **Methods:** Individual interviews with 15 patients with MS were conducted, recruited from a multi-centre study investigating the effects of balance exercising using Wii Fit. We also conducted a single focus group interview with nine PT involved in the study. The interviews were audio-recorded, transcribed, and analysed using content analysis. **Results:** Both patients and PT said that exercising with Wii Fit games was fun, and that it challenged the patients' physical and cognitive capacities. The competitive content in the games provided motivation to continue playing. Patients and PT reported improved body control and, more importantly, positive effects on balance and walking in daily life. The PT regarded Wii training as an effective alternative to other balance training, but some felt unsure in how to manage the video game. The patients regarded Wii training as a possible home training solution. **Conclusions:** Patients with MS and their PT considered Wii Fit exercises to be fun, challenging, and self-motivating. Exercising with Wii games can address balance impairments in MS, and can be performed at home as well as in rehabilitation settings.

### Keywords

Multiple sclerosis, physiotherapists, postural balance, qualitative research, videogames

### History

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### ► Implications for Rehabilitation

- Nintendo Wii Fit™ can be used as a fun and challenging way to perform balance exercises.
- The competitive content embedded in the games triggers continued playing and exercising.
- The positive effect on balance control can improve standing and walking in everyday activities.

### Introduction

In recent years, significant attention has been paid to the use of interactive video games as exercise tools in rehabilitation settings as well as in homes [1]. One home video game console on the market is the Nintendo (Kyoto, Japan) Wii Fit™, a system specifically designed to promote physical activity. The Wii Fit™ incorporates a console connected to a television, and a force platform (Wii balance board) placed on the floor. The balance board automatically provides personalized feedback on the gamer's movements when playing the games. Wii Fit™ has been used for rehabilitation in various populations and disorders in order to improve physical capacity. The focus has mainly been on improving balance, and thus reducing the risk of falls. These components are essential in physical therapy for older persons and

for persons with neurological disorders. In older people with balance deficits, small but clinically and statistically significant improvements in dynamic balance have been seen after 4–6 weeks of training with the Wii Fit [2–4]. In a study investigating home-based training on the Wii balance board for people with Parkinson's disease, improvements in static and dynamic balance were recorded [5]. However, another study found no additional benefit of adding Wii Fit™ training to conventional balance training for persons with Parkinson's disease [6]. In persons with acquired head injury, significant improvements in static balance were seen after a period of Wii Fit™ training, but no significant changes were seen compared with a control group receiving standard rehabilitation [7].

The most common neurological disorder in young adults is multiple sclerosis (MS) [8]. The wide range of symptoms associated with MS may cause gait and balance disorders even in the early stages of the disease [9]. Due to these balance disorders, accidental falls are common [10,11], and hence physiotherapy has focused on interventions for improving balance. Studies using Wii Fit balance exercises have shown promising results in improving static and dynamic balance [12–15]. In a multi-centre randomized controlled trial including

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84 persons with MS, we found significant improvements in dynamic balance in the intervention group (Wii Fit Plus balance exercises twice a week for 6 weeks) [12]. However, there were no significant differences compared to the untreated control group, though the effect sizes were larger in the intervention group. Improvements in static and dynamic balance have also been reported after 4 weeks of training on the Wii balance board 3 times a week [13], and after 12 weeks of daily training [14]. Plow et al. [15] examined the potential of Wii Fit to increase physical activity and health. Increased levels of physical activity were seen at the midway assessment at 7 weeks, but had declined by the final assessment at 14 weeks.

Clinical trials provide information on causal relations, but to more fully explore the experiences of an intervention, qualitative studies are needed [16]. Interviewing recipients about the effectiveness and feasibility of an intervention may give enhanced knowledge as to how the intervention can complement or replace usual care, and how it can be incorporated in clinical practice. Exploring the responses of health professionals as deliverers of a specific intervention might aid interpretation of trial results. To our knowledge, only a few studies have explored physiotherapy interventions with a dual perspective, covering the experiences of physiotherapy after stroke [17,18]. An advantage of using Wii Fit™ in rehabilitation is its novelty, and the possibility that it may attract people who might otherwise not have an interest for physiotherapy or exercises. The short-term effects seen in studies of Wii exercises are positive, but the recipients' and the deliverers' experiences of effectiveness and usability need to be explored. We are aware of five qualitative studies exploring experiences of Wii training, and four of them were limited to the perspective of the recipients. Laver et al. found that older people preferred traditional therapy programs over programs using Wii Fit™ [19], while Meldrum et al. [20] found that people with balance impairment due to neurological disorders preferred Wii Fit™ training to conventional treatment. Persons with stroke exercising with Wii Sports® found the training beneficial and challenging [21]. A study including persons with MS reported that a Wii Fit home exercise program helped the participants build confidence in their abilities, but the usability of the games was limited due to the participants' physical impairments [22]. In a small study, six physiotherapists (PT) working with children with acquired brain injuries were interviewed about their experiences of Wii as an intervention [23]. They reported that was a challenge to find appropriate ways to use Wii towards different client goals. To our knowledge, no study has yet taken into account the experiences of both persons with MS and PT of the use of Wii Fit™ exercises in rehabilitation.

The aim of this study was therefore to describe the experiences of using Nintendo Wii Fit for balance exercise, from the perspective of patients with MS and their PT.

## Methods

A qualitative research approach using content analysis [24,25] was chosen for this study, based on individual interviews with adult persons with MS and a focus group interview with PT. All participants gave written informed consent, and the study was approved by the Research Ethics Committee (2010/263).

## Participants

Eligible participants were patients with MS participating in a multi-centre study investigating the effects of Wii Fit™ balance exercises [12]. The inclusion criteria were subjectively perceived impaired balance function, but being able to walk 100 m without

Table 1. Characteristics of the patients with multiple sclerosis.

|    | Age | Gender | Type of MS;<br>years since<br>diagnosis | Assistive walking<br>device indoors/outdoors |
|----|-----|--------|---|--|
| 1  | 55  | Male   | SP; 16                                  | None/2 crutches                              |
| 2  | 64  | Female | SP; 17                                  | None/none                                    |
| 3  | 45  | Female | RR; 2                                   | None/1 crutch                                |
| 4  | 32  | Male   | RR; 1                                   | None/none                                    |
| 5  | 58  | Female | PP; 10                                  | None; 2 nordic poles                         |
| 6  | 73  | Male   | SP; 32                                  | Rolling walker/electric wheelchair           |
| 7  | 38  | Female | RR; 1                                   | None/none                                    |
| 8  | 45  | Female | RR; 13                                  | None/1 crutch                                |
| 9  | 60  | Male   | PP; 1                                   | 1 Crutch/2 crutches                          |
| 10 | 47  | Female | RR; 19                                  | None/none                                    |
| 11 | 33  | Male   | RR; 16                                  | none/none                                    |
| 12 | 60  | Male   | PP; 7                                   | None/1 crutch                                |
| 13 | 55  | Female | RR; 8                                   | 1 Crutch/2 nordic poles                      |
| 14 | 59  | Female | SP; 20                                  | 1 Crutch/rolling walker                      |
| 15 | 65  | Female | SP; 17                                  | None/none                                    |

RR, relapsing-remitting; PP, primary progressive; SP, secondary progressive.

resting (comparable to EDSS 1–6). The exclusion criteria were cognitive or linguistic problems with understanding instructions, on-going exacerbation of MS, and other disease interfering with either the intervention or the testing procedure. Patients with MS were recruited from three of the study sites, and thus comprised individuals living in three counties in central Sweden. A strategic sample of participants was chosen to capture experiences of men and women, younger and older persons, and those with varied length of time since onset of MS. Of the 36 eligible patients who completed the intervention at the three study test sites, 16 were given written information about the qualitative interview study. Fifteen patients with MS agreed to participate and signed a written consent form. Background characteristics of the participants are presented in Table 1. Median age was 55 years (interquartile range [IQR]: 45–60). Six patients were on sick leave, three were retired due to age, one was unemployed, and five were working full or part time. Median time since diagnosis was 13 years (IQR: 2–17).

The PT had been involved in the multi-centre study; in the recruitment process, providing the intervention or as data collectors [12]. Nine of the ten eligible PT agreed to participate. Their median age was 37 years (IQR: 31.5–52.5) and eight were women. They were all specialized in physical therapy for neurological disorders, and had worked in this field for median 10 years (IQR: 3.5–21.0). The PT represented six different hospitals or primary health care centres.

## Description of the Wii balance intervention

The intervention consisted of 12 individual sessions of 30 min of balance exercise twice a week, supervised by a physiotherapist [12]. Games were chosen from the Wii Fit™ Plus Balance Training or Training+. Games targeting balance were selected and ranked in order to standardize the progression of exercises by the two project leaders (A.F. and Y.N.). The first session started with the games which were judged to be easier to perform (Penguin Slide, Ski Slalom, Perfect 10, Football, and Table Tilt). The PT encouraged progression to more challenging games, but the patients with MS were allowed to choose the games that they enjoyed the most. However, progression is embedded in the games. When a player achieves a certain goal or score, new more advanced levels are unlocked. Performance was shown on the screen and also visualized by a happy or sad Mii figure.

Table 2. Categories and subcategories in the overall theme, *Exercising with Wii – it works*.

| Experiences from exercising using Wii   | Effects related to the intervention  | Perceptions of usability  |
|---|--|---|
| <ul style="list-style-type: none"> <li>• Self-motivating</li> <li>• Fun way to exercise</li> <li>• Negative feedback is distracting</li> <li>• Cognitively and physically demanding</li> <li>• Individually adjustable</li> </ul> | <ul style="list-style-type: none"> <li>• Improvements seen in everyday life</li> <li>• Improvements in balance control during the exercise sessions</li> <li>• Improvements found in game performance</li> </ul> | <ul style="list-style-type: none"> <li>• Insecurity in handling the game (PT)</li> <li>• Takes time to get started (PT)</li> <li>• User-friendly (patients with MS)</li> <li>• Possible solution for home exercises</li> <li>• Cost of the game can be a barrier</li> <li>• Complement to other training</li> <li>• Interactive videogames have their place in rehabilitation (PT)</li> </ul> |

The subcategories include statements by both patients with MS and physiotherapists (PT) unless otherwise noted.

### Data collection

Each patient with MS was interviewed within 2 weeks after the end of their own intervention period. The interviews were carried out as conversations based on an interview guide with individualized follow-up questions. The guide covered reflections on using Wii Fit for exercising, the usability of the game, the effects of the intervention, and on factors facilitating or creating barriers to exercising. The first author (A.F.) conducted all the interviews with the patients with MS. These interviews, lasting 15–45 min, were performed at a place of the participants' choice; nine preferred their homes and the other six a separate room at the local hospital.

The focus group interview with the PT lasted about 60 min, and was performed shortly before the end of the study period [26]. This interview was performed with the second author (Y.N.) as moderator and first author (A.F.) as observer, as we considered the second author less influenced by the interviews with the patients with MS. Introductory questions were asked, eliciting reflections on using Wii Fit as an exercise tool, the usability of the games, and the effects of the intervention. The PT were asked to reflect on their experiences with all patients participating in the intervention ( $n = 41$ ). All the interviews were audio-recorded and transcribed verbatim.

### Data analysis

Qualitative research based on data from interviews is contextual and value bound [27]. All authors took an active part in the whole analytical process. The analysis was performed in the following steps using content analysis [24,25]:

- (1) The transcribed interviews were read several times in their entirety to obtain an overall sense of the context.
- (2) The individual patient interviews were analysed separately from the focus group interview.
- (3) The analysis involved a systematic process of identifying and marking all units of meaning, defined as constellations of words or statements that related to the same central meaning.
- (4) Each unit of meaning was transformed by condensing and abstracting it to give a formulated meaning of the participants' experiences. Abstraction here refers to description and interpretation on a higher logical level. Coding was constructed through consensual agreement between three authors. Disagreements were resolved by referring back to the transcript to determine the context and the meaning.
- (5) The formulated meanings in the codes were placed in relation to each other and then organized into subcategories in accordance with different features based on similarities and differences in meaning.
- (6) The codes and subcategories in the individual interviews and the focus group interview were compared. Similarities and potential differences were considered and discussed.

- (7) Each subcategory was analysed, and preliminary categories were established. Constant comparisons were performed, resulting in the emergence of the final categories.
- (8) The final categories were compared within and between each other in order to grasp both the parts and the whole of the content. Finally, these categories were sorted and related to each other in an overall theme. Quotations were chosen to illustrate the subcategories.

### Results

The findings are described by one overall theme: *Exercising with Wii – it works*. Three categories emerged: experiences of exercising with Wii Fit, effects related to the intervention, and perceptions of usability (Table 2). Each category included 3–7 subcategories.

#### Experiences of exercising with Wii Fit

The patients with MS appreciated the competitive content in the chosen games, and all had found that the self-motivating aspect of these games was positive and emotionally rewarding. They said that playing Wii games was a very fun way of doing exercise, and time passed quickly during the training sessions. They became eager to beat their own personal record, which increased their motivation to play the game again.

Really fun – you're competing against yourself. (patient with MS 10)

The games provided immediate feedback in terms of scores achieved or time taken, and the patients appreciated how this allowed them to make comparisons with their earlier performance and set their own goals. Being able to advance to the next level in a game was also appreciated as a positive reinforcement.

I played Football every time. I'd get really hot-tempered, because... I just couldn't do it. Sometimes it went fine, and then suddenly I just couldn't get anywhere. I'd get so angry, like 'I'm gonna win, dammit!' It was so much fun! (patient with MS 13)

The PT also valued the competitive content in the games. They remarked that the patients with MS pushed themselves to play as many games or rounds as possible during a session, in order to beat their personal record. It was easy to motivate the participants to push their limits, and compliance with the training protocol was very good.

It was a really fun form of exercise. It seemed to me that many patients got really into it – they wanted to beat their own

record, they were totally invested in their exercise programme. (physiotherapist 26 years old)

When a player achieved low scores, a sad Mii figure was shown on the screen. Receiving obvious negative feedback was perceived as failure by a couple of the patients with less physical capacity. The PT remarked that the visual feedback was distracting and unnecessary; just seeing one's own score was enough feedback.

It seems kind of unnecessary if you want to develop a new game. There's no reason to respond that way – they know their results and it gives them a great deal of satisfaction if they score anywhere close. (physiotherapist 45 years old)

Some games required rapid reactions from the player, for example snowboard and slalom, and a couple of patients avoided these games. Overall, games that required very quick movements were considered less usable by both the patients and the PT. As a consequence, a couple of patients with MS found the choice of games too limited.

The exercises were regarded as demanding, both physically and cognitively, by both patients and PT. A couple of the games had an explicit cognitive part, such as counting, which had to be performed simultaneously with body movements. These games really challenged the ability to divide one's attention, and were appreciated by both the patients and the PT. A few patients remarked that they had to rest for a while after the training session. This was due not only to tiredness in the legs, but also to tiredness from having to concentrate while playing the games.

It seems to me that many patients find the time goes by quickly when they're doing this. You tell them they've only got 10 minutes left. 'Only what?' they say, 'But I've only just started!' But at the same time, they're pretty mentally exhausted, because they really have to concentrate during a session. (physiotherapist 37 years old)

Both the patients with MS and the PT appreciated the option to individually adjust the choice of games in the intervention. The PT could target the intervention to specific games, according to the individual needs of each patient. Several of the games challenged the persons' stability limits, with weight-shifting left/right in some games and forward/backward in others. Some of the patients needed supervision from the physiotherapist or having a sturdy chair or rolling walker nearby for support. The patients with MS appreciated being able to choose which games and how many different games they wanted to play in this intervention.

### **Effects related to the intervention**

Improvements in balance control were seen during the course of the intervention, but also in daily life. The PT had noticed improvement in endurance during the study period, such as no longer needing to sit down and rest during the sessions. Both the PT and the patients described situations where the improved balance made a difference in everyday life. Some of the patients reported being able to stand still for longer periods of time, while others felt safer during walking activities and could walk faster. One patient reported less dizziness. This was expressed during the interviews or to the PT during training sessions.

I actually have a few patients who have managed to stand for much longer periods. A woman who sings in a choir, who has now been able to stand for an entire choir practice, and a person who transmits radio as a hobby, who used to sit and

talk but can now stand for a full session. So that's great to see. And then there's a man who used to crawl to do his vacuuming, but now does it walking. (physiotherapist 37 years old)

Talking about moving your eyes horizontally, there's a very long corridor at my work. I've noticed that I can walk there more easily now. (patient with MS 11)

Playing the games meant exercising body control, and maintaining one's balance by means of hard work from the small muscles of the feet and legs. Many of the patients reported that the games had helped them become aware of their stability limits. Playing gave them a secure environment to challenge their balance and body control, and to increase their balance self-efficacy over time. Both PT and patients noticed that balance control and technique improved over the intervention period, reflected in successively higher game scores.

You found your muscles, learned to find your sense of balance. (patient with MS 1)

The tilt tables are good, because they demand a keener sense of balance, and the mushrooms [in the game] – I discovered something I hadn't thought about before, namely, that leaning forward is harder for me than leaning backward. (patient with MS 8)

A couple of patients reported that they had achieved better results in the games over time but found no improvement in physical capacity. They attributed this to improvements in technique.

You sort of just knew where to put your weight, this way or that way, on your left or your right side. (patient with MS 5)

A few patients reported initial muscle soreness and spasticity in the leg muscles, but also less muscle tension. These bodily symptoms resolved over the intervention period and did not hinder the training.

### **Perceptions of usability of the Wii Fit**

The complexity of the Wii Fit was discussed by the PT in relation to usability of the games. Some PT felt that starting up the Wii game was complex and time consuming, and that pushing all the buttons on the remote control before starting a game was a waste of valuable therapy time. A couple of the PT were not familiar with video games, and for them this was a new work task. They expressed insecurity over starting up and playing the video game, and realized that more practice beforehand might have made them more comfortable.

One difficulty perhaps is that as a physiotherapist I need to do more training myself, so I know how to increase the intensity and how you...what it feels like when it gets difficult. (physiotherapist 60 years old)

The patients felt that the Wii Fit seemed user-friendly, though it should be noted that in the intervention in the clinical trial, the games were started up by the PT. The patients said that they did not regard the technology as a barrier. "It was easy – you just step onto the platform and start exercising" (patient with MS 2). A few older participants said that they had been hesitant about video games before the study started, but that they changed their mind over time and found the exercises effective and challenging. The patients saw the use of the Wii Fit as a safe way to exercise. Many spoke about continuing to play with the Wii at home, as a fun way to do home exercises. They also said that having



a Wii game at home would provide an alternative during the winter when the weather could be a barrier to outdoor exercise. Having a game at home could also be a solution when time was scarce, making everyday life easier to manage. However, not everyone felt that they could afford to buy a Wii console, and so finances could be a hindrance to using this technical solution for home training.

Both PT and patient considered the Wii balance exercises to be a very enjoyable complement to the usual balance exercises. The PT noted that the Wii Fit allowed training of different important components of balance, such as body awareness, body image, and reaction time. However, it was also noted that this type of exercise mainly covered static balance, whereas good balance during walking activities is more important in everyday life.

This ends up being relatively static; you stand in the same place the whole time, which you rarely do in real life, where it's more about having to move from one place to another. (physiotherapist 39 years old)

Several PT expressed the opinion that the Wii games were suitable for both young and old patients, and for both novice players of video games and their more experienced counterparts. The patients considered this type of training to be gentle but effective, and something they could do even when they did not feel totally well. The Wii games also included a social aspect, in that playing video games was an activity you could do together with other people, children or friends.

But also that more people have connected this with doing something with their children or grandchildren – it's something they can all do together. (physiotherapist 60 years old)

The PT said that exercising using video games had its place in rehabilitation. Playing games could be used as an active type of entertainment for inpatients, via a game console in a ward day room, but could also be used for specific physiotherapy interventions. One physiotherapist (39 years) said: "I'm going to try this out with stroke (patients) – specifically those who are bad at putting stress to one side".

## Discussion

This is the first study presenting a dual perspective of using Wii Fit for persons with balance impairments. The dual perspective comes from the fact that the experiences of both recipients (persons with MS) and deliverers (PT) are presented. The Wii games were valued as fun and challenging, physically and cognitively, by both recipients and deliverers. The patients appreciated the competitive content embedded in the games. The effects of Wii training were seen as improvements in body control during the training sessions but also in daily life: being able to stand for a longer period and having better walking balance. Both PT and patients regarded the games as a usable solution for balance exercising, at home or in a rehabilitation setting. The usability of the games was somewhat limited, however, with some of the games being too difficult.

Evidence for exercising using Wii games to be an effective tool for balance training for patients with MS has been presented in earlier studies [12–15], as an alternative to conventional home-based balance training [14,15] or in rehabilitation clinics [12,13]. All patients in our study expressed the opinion that playing video games was a fun alternative to traditional balance training and the training time went quickly; this result is supported by Meldrum et al. [20]. Enjoying the training is a prerequisite for engagement

in physical activity [28]. However, the games were not perceived solely as fun, but also as a challenging and serious training tool. The patients said that they had to concentrate and that their leg muscles had to work hard to remain steady on the balance board. Improved body control during playing was reported by most participants, and noticeable improvements in balance, standing, and walking in daily activities were reported by both patients and PT. Some mentioned improved static balance, while others mentioned improvements in dynamic balance during walking. In most Wii games, dual attention tasks are in focus; the games combine prolonged standing and weight-shifting movements with the need to pay attention to the TV screen. Wii training provides a fun possibility for exercising standing balance, a capacity that is needed in daily life (e.g. when waiting in a queue).

Deutsch et al. [29] have presented a game analysis of the Wii Fit for stroke rehabilitation that can guide the choice of games in neurological rehabilitation. All of the games chosen for the current intervention targeted balance and coordination impairment. The games rely on maintaining balance control within stability limits, and require combinations of movements at the appropriate time and speed. For targeting other functions, such as endurance, the games need to be played at higher levels allowing longer blocks of exercise. Fatigue is a common MS symptom that affects endurance, and is often a barrier for engagement in physical activity [30]. Although endurance was not targeted in the present study, both patients and PT reported fewer sitting-down breaks during the sessions over time. The patients also reported requiring less rest after the training over time. Wii Fit provides low-intensity training which could be suitable for persons with MS. When changing games, there will automatically be a small break that may be beneficial for this patient group, by making it possible for them to push themselves a little more knowing that a rest is soon to come.

The self-motivating content in the Wii games, being able to compare one's results with earlier performance as well as the visual feed-back from a Mii figure, was seen as both positive and negative. Plow et al. [22] and Levac et al. [23] reported that the feedback reminded participants of their impairments. When negative feedback is delivered in the shape of a sad Mii figure, awareness of one's physical limitations can be reinforced. The PT in our study all said that this feedback did not motivate the participants, but instead made them even more aware of their limitations. On the other hand, getting direct feedback in the form of seeing one's individual results in terms of points or seconds was considered beneficial, often prompting a new round of playing.

Apart from the feedback, there are other usability issues with Wii training. People with more impairment may have difficulty with games that require fast reaction times, thus limiting the number of possible games. This issue was brought up in the present study as well as a previous study by Plow et al. [22], who explored the usability of the Nintendo Wii Fit with semi-structured interviews (30 participants completing pre-training interviews and 22 of them post-training interviews). For persons with good physical capacity, on the other hand, the games may be too easy to perform, as reported by a few participants in our study. Another usability issue reported by Plow et al. [22] was that the balance board was small, and so participants were worried about falling. This was not mentioned by any of our participants, possibly because in our intervention the participants were allowed to have a walker in front of them. The support provided by the walker allowed patients with more severe balance impairments to perform the Wii training.

Studies exploring perceptions of an intervention usually only include the patients, not the therapists providing the intervention. In our study, the perceptions of the patients with MS and the PT

were similar overall, though some specific technical issues were addressed only by the PT. Feeling insecure about using new technology was mentioned. Similar finding was reported by Levac and Miller [23], that using video games in rehabilitation required personal commitment to orient oneself and become familiar with the games. The PT could see the possibility of integrating video games into the rehabilitation of other patients, and potential benefits for patients with hemiparesis after stroke were mentioned. The Wii Fit games were suggested not only as a tool to promote physical activity for people in general, but also specifically as fun activity for inpatients in hospital wards. Several other studies have suggested the use of Wii Fit games as an enjoyable physical activity with the goal of promoting health [4,5,15,20]. However, support may be needed to get started. The PT in the present study provided social support, but the patients also saw them as experts on rehabilitation. Encouragement from leaders with knowledge and expertise is important for completion of a program [31]. The patients in the present study also said that the competence of the PT helped them feel safe, and let them dare to push their stability limits further. Wii games or other interactive video games are often suggested as a home-based training solution. Before starting up playing Wii games as a physiotherapeutic home exercise, assessment of balance by a physiotherapist may be needed in order to provide the necessary safety precautions. Follow-up may be needed to maintain the intensity level and assist in choosing suitable games to address specific dysfunctions. Taken together, Wii Fit is a challenging exercise tool but to increase the clinical application therapists may provide a walker nearby for safety, start with the less challenging games, and encourage patients to only compare scores with his/her previous individual scores.

The trustworthiness of the data was considered in terms of credibility, dependability, and transferability [25]. Aspects of credibility included the choice of participants and performance of the interviews. Individual interviews with patients with MS and a focus group interview with the PT were considered the most appropriate methods for data collection for investigating dual perspectives. Overall, the results can be regarded as transferable to other MS patients with balance impairments. It may be considered a limitation that the participants in our study were specifically interested in trying new ways of training and had chosen to participate in an exercise intervention, but many of them had no regular contact with a physiotherapist and, more importantly, the majority had no previous experience of video games. The participants were thus new to this way of performing balance exercises, and could compare and discuss the advantages and disadvantages. In the focus group interview, the PT could have been affected by the fact that the interview was performed with the two authors as moderator and observer, who has also been in charge of the multi-centre intervention study. With group interviews there is a risk that the answers will be affected by the responses from the other participants and the moderators. However, the PT were encouraged to discuss both the pros and the cons of the Wii Fit. Stability in data over time was achieved using an interview guide, and ensuring that the individual interviews were performed shortly after finishing the intervention. To ensure dependability of the data, an additional researcher (K.B.) who had not been directly involved in the larger study participated in the analysis. The results of the present study are considered transferable to persons with MS of similar disability level, and to PT with various experience of video games. Further studies that include patients unsuited to physical activity are needed to investigate if video games can be a tool for motivating a more active lifestyle.

## Conclusion

The findings in this qualitative study provide further evidence that Wii Fit training is a fun and challenging way of exercising that can address common balance impairments in MS. The competitive aspect of the games provides feedback on achieved scores which was appreciated by many, but the negative visual feedback was considered unnecessary. Improvements in daily life as well as during the training sessions were expressed by both the persons with MS and the PT. These findings suggest that training with Wii Fit may be a feasible option for balance training that can be performed at home or in a rehabilitation clinic.

## Declaration of interest

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