Videogames in therapy: a therapist's perspective

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ABSTRACT

This paper describes a user and task analysis that was conducted in order to examine the role of therapists in the use of video games in therapy. The results show that video games were used often, but improvements could be made to make them more effective for the therapist. From these results recommendations for video game design were derived. Recommendations include that a therapeutic video game should be easy to startup and configure, should allow the therapist to support a patient during play, and should support the therapist in tracking a patient's performance.

Categories and Subject Descriptors

J.3.3 [Computer Applications]: Life and Medical Sciences --- Health

General Terms

Design, Human Factors

Keywords

Video games, therapy, user centered design, requirements, rehabilitation

1. INTRODUCTION

The power of video games lies not only in their capacity to entertain people. As the recent interest in serious games shows, many areas can benefit from the captivating character of video games. One of those areas which has received some attention of video game researchers is that of therapeutic sessions. Video games can help to motivate patients, develop skills and serve as a distractor in pain management. Video games have been used in physiotherapy, occupational therapy, and psychotherapy [8][3].

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When considering the use of video games in therapy, a distinction can be made between games specifically made for therapeutic purposes and games made for the general public but that are used in therapy as well. An example of the last category, dating back almost two decades, is the use of the Super Mario Bros and Zelda games in addition to the regular psychotherapy program to assess and assist various abilities of children, such as problem solving strategies and means of dealing with success and failure [6].

The introduction of low cost commercially available video gaming hardware that allows input by physical movement, such as the Nintendo Wii, has further increased the interest in the use of video games for the general public for therapeutic purposes. One case study showed positive outcomes for the use of the Nintendo Wii console and the Wii Sports game in the rehabilitation of an adolescent with cerebral palsy [5]. The Wii Balance board controller and the Wii Fit game were the subject of another study concerning physical training [9].

On the other hand, the low cost of commercially available gaming consoles and controllers that allow physical control also make it an attractive option using this hardware to design video games specifically for use in therapy. The Nintendo Wii Remote controller has been used as an input device for music and sound generation system in music therapy for children with behavioral disorders [1] and for people with Parkinson's disease and children with autism or Asperger's syndrome [10]. Other studies went further and modified a Wii Remote controller to control a game used in the rehabilitation of wrist flexion and extension [4]. Custom made games for other consoles such as the Microsoft XBOX and Sony Playstation 3 have been used in the rehabilitation of post-stroke patients [13] and children with hemiplegia [11].

The focus of these studies examining the design of games specifically for use in therapy is usually on the technical implementation and the effects of these games on the wellbeing of the patients. Little is known about the requirements for these games, especially regarding the therapists who play an important role in using these games in therapeutic sessions. In this paper, we will report the results of a user analysis study leading to requirements of therapeutic video games, with a focus on the use by therapists.

2. RELATED WORK

2.1 Therapeutic video game requirements

It is clear that video games that are designed specifically for use in therapy have different requirements than regular video games. There is a difference in user characteristics, i.e. the patient as a player and the therapist as a secondary user, compared to players of regular video games. These users also have different objectives, e.g. physical rehabilitation instead of entertainment. Finally, the context differs as a therapist's room is different from a living room.

Guidelines and strategies for designing psychotherapeutic games targeted at children and adolescents have been compiled on the basis of a review of computer gaming literature [7]. Aspects of a game that were thought to make a psychotherapeutic game effective, such as an appropriate game genre, reinforcement and motivation strategies, challenge and degree of realism, were discussed. They also addressed how aspects of the player such as gender, cultural background, and developmental, emotional and physical states should be considered during the design.

While Goh, Ang and Tan [7] focused on the game and player aspects that should be considered, Burdea [3] discussed challenges that should be overcome for the adaptation of what they called virtual reality augmented rehabilitation. Evidence of effectiveness, costs, therapist's attitude, and interface shortcomings that impair natural interaction were summed up as important challenges. Evidence for effectiveness is the scope of a number of studies [5][11], while costs can be reduced significantly by using the low cost commercially available hardware that has been developed. When it comes to the therapist's attitude, Burdea [3] argues that it is a common misconception that virtual rehabilitation could replace the therapist. Instead, Burdea concludes, it should be seen as a tool allowing the therapist to be more effective and helpful for the patients. However, what is required from a video game or virtual rehabilitation application to allow a therapist to be more effective is not discussed.

2.2 The therapist as a user

Though very useful, the strategies and guidelines referred to above do not concern the needs of the therapist as a user. This is odd considering that the therapist will be using the game at least as often as an individual patient. The therapist may use the game with multiple patients on one day, while a typical patient only has two to three therapy sessions a week in which the game can be played. The importance of the therapist in discovering the needs for a virtual rehabilitation system has been recognized, but the details of what these needs are specifically are not known [12].

In order to better understand this role of the therapist as a user and the requirements for video games in a therapeutic context, specifically for therapists, we performed a user and task analysis to examine the context of therapeutic sessions and the needs of the therapists.

3. METHOD

To reach an understanding of the context in which therapy sessions take place, the characteristics of the therapists and patients, and the tasks the therapists perform, we conducted a contextual inquiry. This is a method in which one or more researchers observe a number of representative users from the target population while performing their regular tasks. The person

being observed is asked to explain what they are doing. The researcher can also interrupt to ask for further explanations. This way a master-apprentice type relationship is formed between the researcher and the person being observed [2].

The contextual inquiry was conducted by two researchers who performed most of the observations together. The observations were conducted in four different institutions: two schools for special education, one clinic for Multiple Sclerosis (MS) patients, and one centre that organizes leisure activities for people with mental and physical impairments. This diverse range of institutions was chosen to examine the similarities and differences in different patient populations (varying in impairments as well as in age), diverse forms of therapy, and a different approach in using video games in therapy.

In addition to their regular classes, children in the schools for special education receive various kinds of therapy including occupational and physical therapy. Physical therapy focuses on restoring and maintaining physical movement, while the occupational therapy concerns the general self care of people, and also includes cognitive exercises. The majority of children in these schools had Cerebral Palsy (CP), a disorder that affects motor control while secondary symptoms include mental and sensory impairments. The children in these schools are between the ages of 7 and 21. Typical patterns of physical impairment include spasticity of limbs on one side of the body (hemiplegia) or of all limbs (quadriplegia), or uncontrolled movement of all limbs in dyskinetic CP. The physical problems these patients encounter can range, depending on the extent of their impairment, from walking with a typical spastic pattern to being unable to sit unsupported, and from having trouble with precise hand movements to being unable to hold anything in their hands. Patients with CP often also suffer from cognitive problems and can have visual impairments as well.

Multiple Sclerosis (MS) is a disease that affects the communication between nerve cells, which can result in a large number of physical and cognitive impairments, depending on the location in the brain where the nerve cells are affected. Typical physical symptoms of MS are muscle weakness and spasticity. These symptoms gradually get worse over time, while episodes in which symptoms worsen temporally can occur. In addition, about half of the patients with MS also suffer in varying degrees from cognitive problems such as reduced memory and attention capabilities.

All patients in the clinic we visited were adults and come to the clinic once or twice a week to visit different therapists including occupational and physical therapists. Sometimes patients stay in the clinic for a few weeks when more extensive treatments are necessary.

The people that visited the centre that organized leisure activities had no specific profile, although there were quite a few patients with an autistic disorder.

We performed two rounds of observations. In each round we visited all the institutions for two days. In total we observed the 7 occupational therapists and 11 physical therapists in the schools for special education and the clinic for MS patients. In the centre that organized leisure activities, we followed two persons that guided the activities. Between the two rounds of observations we structured all collected data, and determined focus points for the second round of observations. These focus points included

communication between therapist and patient as well as among therapists, and the way in which therapists track a patient's progress.

In addition to the contextual inquiry, we organized workshops at the institutions in which we tried out several video games with patients under the guidance of both physical and occupational therapists. We brought a Nintendo Wii with the Balance Board controller and several games, and the Sony Playstation 2 with the Eye Toy camera and games. While the researchers took a passive role during the contextual inquiry and tried to disturb the regular schedule of a therapy session as little as possible, the workshops allowed a more active role of the researchers and more interaction with the therapists. These workshops allowed us to obtain a lot of additional feedback from the therapists as we could ask them what they liked and did not like about the different games, what they thought made these games suitable for use in therapy, or why they would not be suitable, etc. We stimulated the therapists to generate ideas about how they would improve the games.

4. RESULTS

In this section, we will present the results from our user and task analysis. We will first explain what a typical therapy session looks like, based on the different observations. We will then use this as a starting point for presenting and discussing the requirements for the use of video games by therapists.

4.1 A typical therapy session

Although we observed therapy sessions with both occupational therapists and physical therapists, and in different institutes, the general structure of a therapy session was very similar. A typical therapy session lasts 30 minutes and starts with the patient arriving at the therapist's room. Depending on their mental and physical capabilities, patients may arrive by themselves or the therapist may have to go look for them. In the schools for special education we saw that the therapists usually had to go the classroom to get a child for therapy. As these schools are fairly large and the children move slowly due to their physical impairment, this can take up quite some valuable therapy time already.

When the patient has arrived at the therapy room, the therapist helps the patient at the computer. This can include transferring the patient from a wheelchair into a chair at the computer, adjusting the height of the chair, desk and computer screen, and providing aids such as a footstool to assure that the patient is seated in the right position. During these preparations the therapist chats with the patient about how they are feeling, what they did in the last therapy session and so on.

After the therapist has helped the patient at the computer, the therapist first has to configure the game for the patient. When the patient is playing the video game, the therapist supports the patient both mentally and physically. Mental support is provided by giving instructions, encouraging the patient, and helping the patient with problem solving required in the game. Physical support may be necessary to assure that the patient stays seated in the right position and uses the controls of the computer in the right way. During the game the therapist might adjust the level at which the game is played to one that is suitable for the patient at that moment.

At the end of the therapy session, the therapist helps the patient leave. This can include transferring a patient back to the

wheelchair and returning the patient to the classroom, or helping the patient to their next therapy session.

We saw that video games were used quite often during therapy sessions, with more games being used in occupational therapy than in the physical therapy. These games ranged from very simple action-reaction games, designed for use in therapy with very young patients and patients with severe mental impairments, to regular flash games on the internet and games on the Nintendo Wii. The therapists we spoke were enthusiastic about the use of video games. They saw them as an excellent way to motivate patients, and also as an important way to provide the patients with a more varied therapy program.

4.2 Implications for game design

Considering all preparations and support for the patient which are included in the 30 minutes a therapy session lasts, it is not uncommon that only half of a session is actually spent on therapy. Therefore, the time that is left should be used in the most optimal way possible. All therapists we spoke thought this was a very important issue. Although we saw that this problem is also present in therapy sessions when materials other than video games are used, preparations usually took more time when video games were used. Furthermore, even if preparation time would not be longer when video games are being used, every extra minute that can be spent on actual therapy would be very welcome. This has a number of implications for the design of games for use in therapy.

4.2.1 *Configuring and starting the game*

Before the patient can start playing the video game, the therapist first has to select an appropriate difficulty level, sometimes connect and calibrate a specific controller. Although therapists found setting up the appropriate difficulty levels and correct calibration of a controller very important, they agreed strongly that time spent on these activities should be kept at a minimum and the process should be as straightforward as possible.

A second issue at the startup of a video game was the appearance of cut scenes and on-screen instructions. Therapists found these very frustrating, especially when there was no possibility to skip forward and they could do nothing but wait. This issue, for instance, was very clear when we tried out the Nintendo Wii Fit game in the workshops. A large number of onscreen instructions and warnings were presented before the patient finally could start playing the game.

When designing a game for use in therapy, the number of settings the therapist has to adjust for each patient should be kept to minimum. Settings which are the same every time a patient plays should be stored in a profile and automatically retrieved the next time a patient plays the game. Settings which have to be adjusted for each session, such as the calibration of controllers, should be very straightforward and take very little time. In addition, cut scenes and on-screen instructions should also be kept to a minimum, and it should be possible to skip forward at any time.

4.2.2 *Supporting a patient during game play*

Although difficulty levels typically have been configured before the start of the game, adjustments might still be needed during game play. We saw that in addition to large differences in abilities between patients in the same institutions, depending on the circumstances, the abilities of a particular patient can also differ a lot between therapy sessions. Having to exit the game play,

reconfigure the game and then start over was perceived as very frustrating by the therapists.

During game play, the therapist is continuously supporting the patient. Sometimes patients can play without the help of the therapist, but most of the time the therapist is needed. The therapist checks the seating position of the patient, tries to motivate and encourage the patient. Furthermore, the therapist helps the patient by providing extra instructions on how to play the game, asks questions to assess the patient's understanding of the game, and sometimes tries to provide a link between the game play situation and real life situations. For some of these activities the therapist paused the game, if the game allowed this.

We observed that therapy sessions were frequently interrupted. Therapists often had to answer phone calls or questions from other therapists or patients stopping by their room. This meant that the game either had to be stopped or the patient had to try to continue without the support of the therapist. Therapists found that by letting the patient continue on their own they could not assure the quality of the exercise, and therefore they usually paused the game, if the game allowed this, or stopped the game altogether to start over after the interruption.

Sometimes a game also had to be paused or stopped when the therapist and patient had a conversation during game play. As most patients visit the same therapist for years, a good relationship is established between a therapist and most patients. Therapists often know much about the private lives of patients as well. As a result, the conversations therapists have with their patients can touch upon personal issues. Therapists commented they saw these conversations as part of their job as well, and situations from the private lives of patients could also help them understand variations in performance of patients during therapy. However, with patients with mental impairments or speech difficulties these conversations could take up a lot of time.

Finally, it also happened that someone came by to get a patient because they had an appointment at the doctor, or it was time for a periodical test. Therapists, as well as patients themselves, were often not aware of these changes in the regular therapy schedule, and were forced to end the therapy session half way.

When designing a video game for use in therapy, the game should be very flexible during game play. Difficulty levels should be configurable at any moment without having to start the game over. The therapist should be able to very easily pause and continue the game again at any moment and end the game easily when a therapy session is cut short.

4.2.3 Reporting on a patient's progress

One important task of a therapist is to track the progress of a patient's performance over time. However, we observed that therapists spent very little or no time at all on reporting about the patients' performance during and after a therapy session. They commented that they simply had very little time for this, and when they did this it usually happened in their spare time at the end of their workday or during their lunch break. The time spent with the patient should not be used for administrative tasks. Despite the little time they spend on reporting, the therapists valued a good overview of the patients' performance. Such an overview would be especially important for writing the mandatory periodical reports on a patient's progress over time.

Games that were used in therapy mostly did not support therapists in their reporting task. Some games provided performance data after playing. However, this data was usually not stored, making it hard for therapists to compare performance of a patient between sessions and over a longer period of time. Furthermore, the data presented was not always useful. Some games presented raw data such as movement patterns that were essentially meaningless to the therapists. The therapists had no way to objectively assess or compare the patterns.

To optimally support the reporting task of a therapist, a game should automatically log meaningful performance data, and it should be possible for a therapist to view an overview of a patient's performance over multiple therapy sessions. This is also supported by Jung et al. [12], who used a human centered design process closely involving physical therapists for creating a virtual reality enhanced stroke rehabilitation system. One of the key features of their system was an option for both therapists and patients to view the patient's performance data on-line.

5. CONCLUSION

In general, it was observed that in the patient population we observed, the work of a therapist involves many more tasks than only providing the right kind of exercise for a patient. A therapist has to help the patient arrive, provide mental and physical support to patients and track their performance. In addition, time pressure is usually high and it is not uncommon for a therapy session to be interrupted or cut short. As a result, the time that is spent on actual therapy is often limited. Therapists perceive this as a big problem, and try their best to maximize this time, which requires a lot of flexibility.

When video games are used in therapy with similar patient populations, they should be flexible and support the tasks of a therapist. Video games should not burden the therapists with extra tasks that further limit the time that can be spent on actual therapy. On the contrary, video games should allow the therapist to be more effective by supporting the tasks they perform and taking over tasks that can be automated, such as tracking a patient's performance.

However, especially for the patient population we observed, video games should not be seen as a replacement of a therapist, despite some concerns about this in the literature [3]. The presence of therapist will always be necessary for these patients to ensure they play the game in the correct seating position and to provide mental support during game play. The necessity of the presence of a real human coach was also perceived as the most important observation in a study examining the use of the Wii Fit game for physical training purposes, especially for senior participants [9].

In conclusion, focusing our user and task analysis on the role of therapists in the use of video games for therapeutic sessions generated a number of interesting observations leading to new requirements for these games. Addressing these requirements in the design of games for therapy should be beneficial for the effectiveness of therapy. The next logical step in a user centered design process is evaluating the implementation of these requirements to help further refine them.

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