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Video Games can Improve Performance in Sports – An Empirical Study with Wii™ Sports Bowling

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Abstract. According to studies from the medical domain it can be assumed that the training of sensomotor abilities by the use of video game consoles positively affects performance in real life situations. With this in mind we investigated the assumption that – at least for bowling novices – training of bowling games with the Nintendo Wii can have positive effects on their performance on a real bowling alley. So we conducted an empirical study with students from the University of Bamberg. One group of participants took part in a video game training session while the other group received no special training. After that participants of both groups played on the bowling alley. Results showed a significant positive effect of console training on the mean scores in bowling.

1 Introduction

By this time video and computer games have become a part of modern western culture. As Privewaterhouse Coopers announced the sales of video games industry exceeded the sales of the music industry in Germany in 2007 for the very first time. For this reason the diverse discussions about the inuences of video games on consumers' psychological, social and motor abilities are highly relevant (Kershner, 1995; Griffths, 2007). This study addresses itself to the last aspect, the coordinative and motor abilities.

Several other studies exist concerning this topic. Some years ago there already seemed to be evidence that video gamers were better trained in concentrating on several tasks at a time (Satyen & Ohtsuka, 2002). The reason

[0] The reported empirical study was realised as practice part of a course Human Computer Interaction in the winter term 2007/2008. The authors are students who participated in this course.

therefore can be found in the demands of games to perceive several different objects on screen and transform the perception into the right motor commands. Even more concrete results are delivered by Rosenberg, Landsittel, and Averch (2005) who could show that the ability to control a video game correlates with the ability to solve laporoscoptic tasks. In other words, test persons that achieved better results in video games in the mean also acted more successfully in real life tasks which demanded a good eye-hand-coordination. In a further study (James C. Rosser et al., 2007) it was revealed that surgeons that spent their time regularly on video games made about one third mistakes less in laparoscopic surgeries (procedures with the help of very small cameras) in average.

So there must be a connection between motor abilities in a game and in reality. But there remains one question unanswered: Is the consume of video games the reason of a better eye-hand-coordination or is there another reason for the correlation? In other words, the question is whether specific training at a video game console is really appropriate for improving motor abilities. Within this study the question is substantiated by training on a Wii console of the manufacturer Nintendo.

The video game console Wii from Nintendo is part of a new generation of interactive gaming. In contrast to common consoles like the Sony Playstation the Wii is not created for absolutely realistic graphics and games but is specialized on what Nintendo likes to call “Gameaction" (Nintendo, 2008). Bundled with the Wii Nintendo released “Wii Sports" which consists of the games baseball, bowling, boxing, golf and tennis. It won the Game Developers Award for innovation and game design in 2007. The most important innovation of the Wii is its new kind of controller, the Wii Remote. It is a wireless controller that reacts to players' movements. According to the manufacturer this allows an absolutely intuitive and natural kind of gaming (Nintendo, 2008). The remote contains an acceleration sensor that recognizes movements and rotations of the controller and sends them to the console via bluetooth. With this it is possible to rotate the bowling ball or to make a serve in tennis or a weak put in golf.

According to H. Müller, B. Schumacher, K. Blischke and R. Daugs (1990, p.37) the training of techniques in top-class sport aims at error minimization which means a reduction of target-performance discrepancy. This demands an analysis of the athlete's movements who receives a feedback on how to improve his technique further. One very apt way of analysis is to employ video systems which enable professional coaches and athlete to view specific phases of the athlete's movements. As already explained, the Wii Remote contains a set of sensors to recognize movements in three dimensions. By doing so real movements like in tennis or bowling can be adapted. Through enabling the transfer of a player's movements (at least partially) into the game it might be possible of the console taking the part of a coach in some simple manner. Although the player's technique isn't analysed in a professional way he still receives some kind of feedback through the graphics on screen (e. g., a throw on the bowling alley). Especially novices should have a very high potential of improvements in their technique so that training on a Wii could improve their movements and timing in sports. This might show that virtual training with the right input device could achieve real life advancements.

So we conducted an empirical study in which the Wii Sports bowling simulation was evaluated. We wanted to test the assumption that a benefit of training would

be measurable with inexperienced test persons. This benefit should become visible by better bowling scores of the Wii trained subjects in comparison to a control group. The following part of this work will introduce the empirical study. The dependent and independent variable and the procedure of the study and also the sample are explained. After that the results are presented and discussed. A prospect on possible further studies completes this work.

2 Empirical Study

2.1 Sample

The study was carried out in Dezember 2007 at the Otto-Friedrich-University and at the bowling alley MainFranken Bowling in Bamberg. Altogether the group of participants consisted of 32 university students (25 male, 7 female), predominantly from the social and economical programs. The students were assigned to one of two groups: a group of 15 persons who received training with the help of the game console, and a second group of 17 persons who would start at the bowling alley without specific training.

2.2 Material

The Nintendo-Wii was chosen to provide the platform for the bowling training one of the groups was to receive. The possibility to adapt the game to right/ left-handed subjects increased the usage of the software for this study. By employing an introductory questionnaire demographic data was collected from the test persons as well as information concerning previous knowledge or self-assessment concerning sports in general and bowling in particular. Key questions on the questionnaire were:

- bowling expertise (frequency of play, scores),
- self-assesment (rating as novice or expert on a 5-step scale),
- experience in other ball sports, and
- experience with Wii and other game consoles.

After the study was finished, a final questionnaire was handed to the test persons in order to gather information about:

- self-assessment on the performance in the bowling game (as above, same, below the subject's usual level),
- rating of the fun the subject experienced while playing bowling, and
- self-assessment on the effects of the training on the subject's performance in the real game (only for members of the training-group) on a 5-step scale from negative over no effect to positive.

2.3 Design and Variables

The participants were assigned to two groups, the training-group (15 persons) and the non-training-group (17 persons). In order to have a sufficient number of test persons available, group membership was not determined randomly. Instead participants were able to choose whether they would like to receive treatment before playing at the bowling alley.

The bowling scores from the participants at the bowling alley were the main dependent variable. For the training group, the scores from the training sessions with the game console were recorded separately.

2.4 Procedure

The study was carried out in two phases - training and the testing. All the participants receiving training filled out the questionnaires before the session was started. For the training itself the test persons were split up in groups of three or four, playing two games of ten frames after the control had been explained and some practice shots were taken. At the end of each session, the scores of the players were written down on their questionnaires. To ensure the participants' anonymity, the questionnaires do not contain the subjects' names.

The lag between training and testing on the bowling alley was 1-2 days. When the testing started, the subjects were allowed some practice shots without pins, giving everyone as much time as 15 minutes to have as many shots as they felt necessary to take. Again the test persons were split up into groups of four to eight players per lane. The only distinct feature which had to be taken into account building the groups was whether the participant had received training beforehand. The persons which had not been in the training sessions filled out the introductory questionnaire before the actual game began. Finally, after the testing on the bowling alley had been finished, all the participants filled out the concluding questionnaire.

3 Results

The scores of the training group differ positively from those of the non-training group. As expected, the recipients of video game training performed considerably better then the not-trained test persons. This becomes evident contrasting the average score of the training-group with $\bar{x} = 105.41$ (sd = 25.88) with the nontraining-group where $\bar{x} = 85.47$ (sd = 18.35). The significance of this difference becomes evident by performing a t-test with $T = -2.48$, df = 30; $p = 0.017$.

After the evaluation of the questionnaires, there is no evidence for potentially biased group consistency concerning the level of expertise. It seems that both inexperienced and experienced (in our case expert) participants were affected by the training received (see Figure 1).

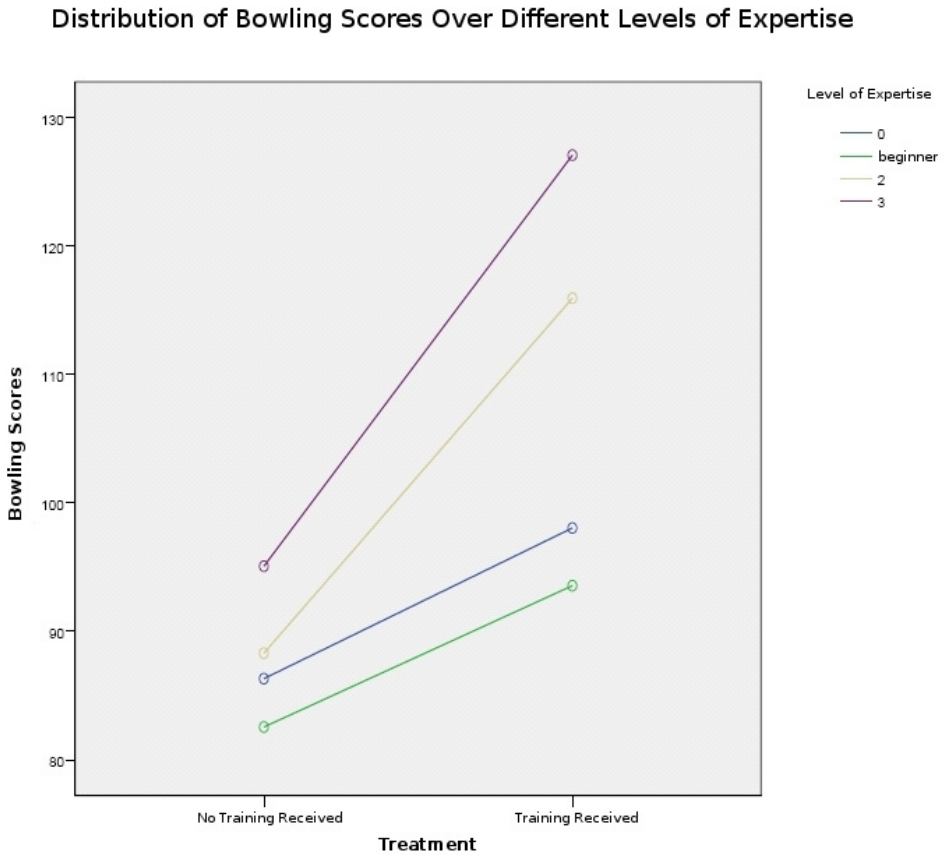

Fig. 1. Bowling-Scores

4 Discussion

The results of this study are quite straight-forward. From previous studies we already knew that training with video games can affect strategic thinking processes. This studies' aim was to take it one step further focussing on the aspect of sensomotor coordination. The fact that the Wii allows for the player to use a style of control which enables them to carry out a motion much like in the real bowling game put us in the position to employ it as a means of coordinative training. Since the groups' average scores differ considerably, the study provides evidence that the training on the video console had had a substantial inuence on the performance on the bowling alley for this sample.

In order to confirm these results, the next step would be to enlarge the scenario by introducing an initial game of bowling before the actual training takes place. This way the increase in performance can be detected more reliably since a number of games on different days could balance out good or bad days of the test persons. The training sessions could be more intense and goal-oriented in order to tailor the treatment to the participants' needs.

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