



Use of the Exergaming (Nintendo Wii™ system) in the Rehabilitation of Patients with Hemophilia

Janaina Bosso J. da Silva, Rafael Fagnani, Egritti de Oliveira Zacarias da Silva, Marcia Aparecida Picoloto Matta, Margareth Castro Ozelo

Hemophilia Unit "Cláudio L. P. Correa" – INCT do Sangue Hemocentro UNICAMP, University of Campinas – Campinas, SP, Brazil



Instituto Nacional de Ciência e Tecnologia do Sangue



UNICAMP

INTRODUCTION

The evaluation of musculoskeletal deficits in patients with hemophilia (PWH) emphasizes some disability that interferes in global health and functional capacity of these patients. These conditions affect the static and dynamic balance. Identify these deficits is important for the establishment of training programs that can improve the balance.

OBJECTIVE

The aim of this study is to analyze the influence of an exercise protocol through therapeutic modality "exergaming" (Nintendo Wii™ system) in controlling the balance of PWH.

METHODOLOGY

The exercise protocol included activities of balance, proprioception and postural correction. The activities were performed twice a week for 50 minutes during two months. The activities included several exercises programs, divided into two groups (table 1). The order of activities was the same for the patients, starting at the first session of the week with "Training A" and the next session with "Training B". Patients started the exercise protocol in the beginner intensity, progressing based on performance. Three scores were used to evaluate the baseline balance and musculoskeletal status and after two months of the exercise protocol, the Berg Balance scale, Tinetti Test score and the Functional Independence Score in Hemophilia (FISH).

RESULTS

Two patients with severe hemophilia A, with 8 years old and 12 years old were evaluated in this pilot study. The performances of the exercises are demonstrated in the figures 1 to 4. In each treatment session, the software automatically generated graphics performance with the score after exercise that was compared to previous sessions (figure 5). Balance and musculoskeletal status were assessed at the enrollment of the study and at the end of the two months exercise protocol, using the Berg Balance scale, Tinetti Test score and FISH. The two patients enrolled in this study demonstrated improvement of balance, gait and functional independence in the evaluation (table 2).

Table 1: Exercises programs.

Training A		Training B	
2x Balance Buble		2x Snowboard Slalom	
2x Penguin Slide		2x Segway Circuit (Figure 3)	
2x Tilt Table (Figure 1)		2x Wii Fit Half-Moon (Figure 4)	
3x Soccer Heading		3x Tightrope Walk	
3x Wii Fit Chair (Figure 2)		3x Wii Fit Palm-Tree	
3x Wii Fit Tree Pose		3x Wii Fit Standing Knee	

Table 2: Scale score of Berg, Tinetti Test and FISH (Functional Independence Score in Hemophilia).

Patient	Berg Balance scale		Tinetti (Gait)		Tinetti (Balance)		FISH	
	before	after	before	after	before	after	before	after
1	34	40	04	07	08	12	22	26
2	38	46	10	12	11	14	28	32

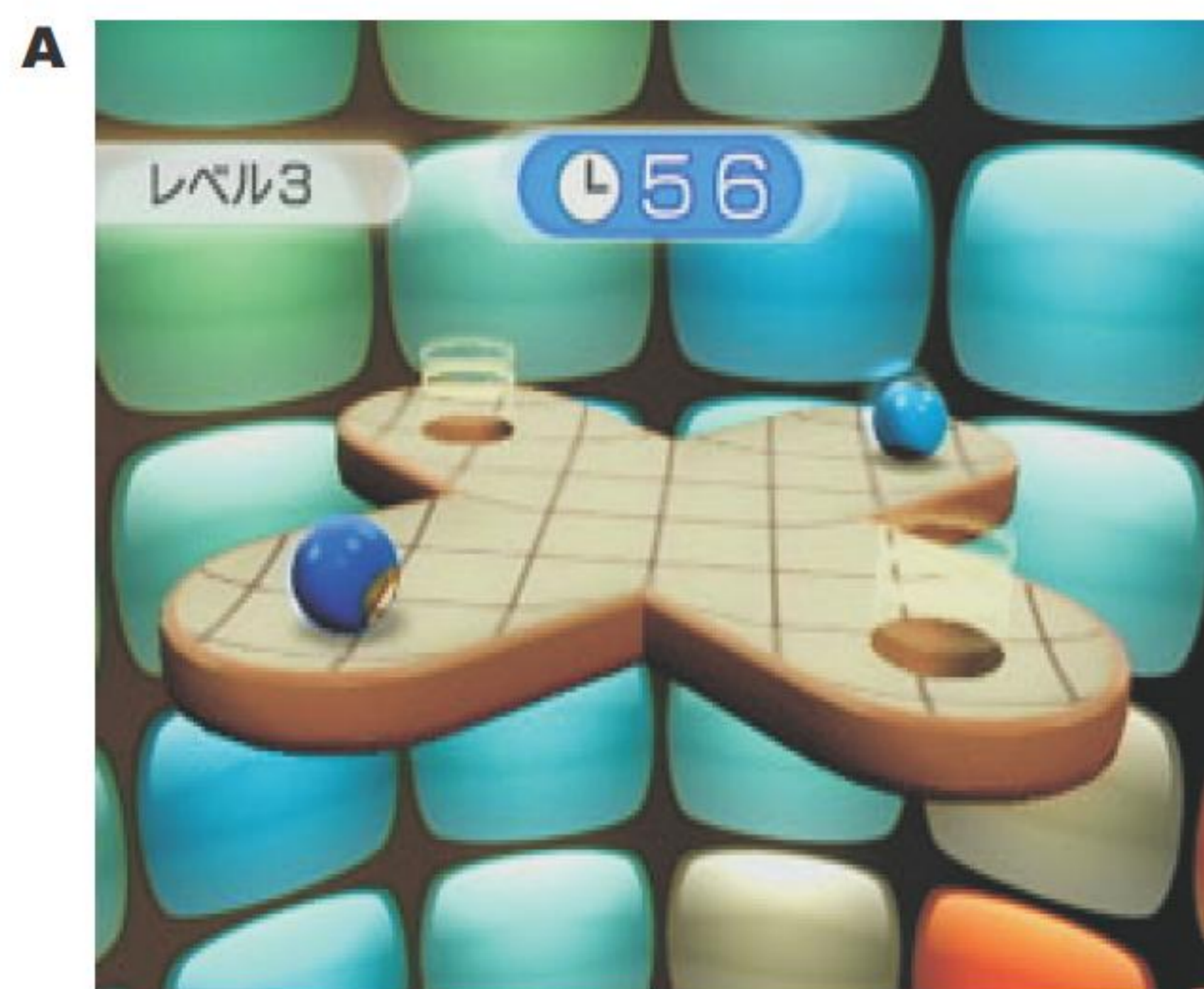


Figure 1. A. Wii Tilt Table. B. During Tilt Table, the patient is positioned in bipedal support on the platform. The activity consists of the motion of his gravity center in antero-posterior and lateral-lateral. The goal is fits the balls in the holes of the board. This game has 8 levels and the sequential format of the board changes at each level and the number of balls increases. If the patient drop a ball, the board automatically turns around 180 degrees and the remaining spheres are replaced.



Figure 2. A. Wii Fit Chair. B. In Wii Fit Chair, the patient should remain in bipedal support with the feet parallel on the platform. The position for exercise is shoulder flexion at 90° and elbows in extension. The training consists of performing a mini-squatting during 30 seconds. The patient should keep the center of gravity within the circle yellow.



Figure 3. A. Wii Segway Circuit. B. In this game the patient remained seated or standing with both feet on the platform, knees semi flexed, elbows extended with shoulder flexion 90°. The patient performs displacement of his gravity center to anteroposterior direction reproducing the movements of a scooter. In addition, we used the remote control simulating a wheel. The goal is to pop 13 balloons before the end of time. The difficulty levels are: beginner 240 seconds, advanced 210 seconds and extreme 180 seconds.



Figure 4. A. Wii Fit Half-Moon. B. During Wii Fit Half-Moon, the patient should stay in bipedal support with feet together on the platform. The position for exercise is shoulder flexion to 180° with the fingers interlaced above the head. Patient must perform a lateral inclination of the trunk while keeping the center of gravity within the circle yellow during 30 seconds. Each postural oscillation of the patient the cursor (red ball) moves on the screen.

CONCLUSION

Currently, features that use virtual reality have become prominent in the rehabilitation of patients allowing new experiences and promoting new sensations. The therapeutic modality "exergaming" of Nintendo Wii™ system, and probably other similar programs, are especially attractive for children and adolescents, and can help to stimulate proprioceptive and musculoskeletal capacity in PWH.



Figure 5. Center of balance. Each treatment session the software automatically generated performance graphics with the scores after exercise, and thus we can compare to previous sessions. This figure shows the oscillation present during an exercise in the feet (Left 46pts and right 40pts). These virtual graphics were used as visual feedback to the participants.

