

## IMPACT OF WII-FIT TRAINING ON NEURO-MUSCULAR CONTROL

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**KEY WORDS:** rehabilitation, muscle training, co-contraction, synergy.

**INTRODUCTION:** In the past year, the interactive exercise video game Wii Fit (Nintendo, Tokyo, Japan) has achieved worldwide popularity. This system could be a potential asset for both training and physical therapy purposes; however, there is a lack of scientific validation to justify such applications. As a first step in ascertaining the advantages of the Wii Fit system, the present study is focused on the neuromuscular control changes that occur after 8 weeks of daily training.

**METHOD:** Two healthy subjects ( $25.5 \pm 2.1$  years,  $177.8 \pm 14.37$  cm,  $71.5 \pm 16.26$  kg) trained for 30 minutes a day for 8 consecutive weeks using standard Wii Fit strength training, aerobic, and yoga exercises. Before and after the training period, a series of tests were performed (gait, hop, isometric, and one leg stability) while collecting EMG data from the quadriceps (rectus femoris, vastus lateralis, vastus medialis), the hamstrings (biceps femoris and semitendinosus), and the gastrocnemii (lateralis and medialis). The EMG data was linear-enveloped and normalized by a maximum isometric voluntary contraction (MVIC). Similarly to Lloyd et al. (2005), the electromyographic activations were then summed by muscle group to calculate the co-contraction ratio (CCR), which is a value between 0 and 1 that indicates equalizing activation as it increases.

**RESULTS:** Only the right leg data is being reported in this paper. Table 1 displays the CCR for the antagonist coactivations of the hamstrings and quadriceps and also the synergistic activations of the knee flexor muscle groups. It is worth noting that during gait and hopping motions, the ratios are decreased after training, while during the stability tests they increased. Finally, no trend emerged for the isometric data.

**Table 1 Co-contraction Ratio Maximums (Ext 60 and Flex 60 refer to isometric extension and flexion at 60°)– values in italics are reciprocals**

		Ext 60	Flex 60	Gait	Hop	Stability
Ham/Quad Coactivation	Pre	0.21	0.41	0.17	0.20	0.06
	Post	0.46	0.47	0.02	0.06	0.88
Ham/Gast Synergy	Pre	0.34	0.47	0.02	0.08	0.04
	Post	0.47	0.28	0.01	0.08	0.35

**DISCUSSION:** After training, the CCR data for dynamic activity indicated more focused muscle control. During the stability tests, much higher CCR values were reported, indicating the muscles were doing a better job achieving an intra-articular equilibrium.

**CONCLUSION:** These preliminary results indicate a promising use of the Wii Fit system for training and physical therapy as on a small population they demonstrated neuromuscular control improvement during dynamic and static trials.

### REFERENCES:

Lloyd, D. G., Buchanan, T. S., and Besier, T. F. (2005). Neuromuscular Biomechanical Modeling to Understand Knee Ligament Loading. *Medicine & Science in Sports & Exercise*, 37, 1939-1947.