

# Effects of mechanical horseback riding on the balance ability of the elderly

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**Abstract.** [Purpose] This study was conducted to evaluate the effect of mechanical horseback riding exercise on the balance ability of the elderly. [Subjects and Methods] Ten elderly patients were assigned to an experimental group, and they performed 15 min of horseback riding. Another 10 elderly patients were assigned to a control group, and they performed 15 min of one-leg standing exercise. Both exercises were repeated five times a week for a total of six weeks. The participants' balance ability was evaluated. [Results] The horseback-riding group showed significant differences between the pre-and post-test balance abilities as assessed by the Berg Balance Scale (BBS) and the Timed Up and Go (TUG) test. [Conclusion] Horseback riding effectively improves the balance ability of the elderly. Horseback riding should be considered as a therapeutic method for the physical therapy of the elderly.

**Key words:** Balance ability, Elderly, Mechanical horseback riding

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## INTRODUCTION

Among the elderly, falls are caused by decreased balance ability and stability resulting from decreased performance of exercise<sup>1)</sup>. Exercise designed to increase flexibility and response time can improve the balance of the elderly<sup>2)</sup>. Specifically, aerobic exercise, strength exercise, walking, postural adjustment, and repeated muscle coordination exercises can improve balance and prevent falls<sup>3)</sup>.

Many studies have been conducted to investigate methods for the improvement of balance ability to prevent falls. Recently, research efforts have given much attention to helping the elderly reduce pain and increase stability and muscle strength through ball exercises which have positive effects on health<sup>4)</sup>. The elderly are more likely to experience accidental falls as they age, and efforts to prevent such accidents are desperately needed. With an increasing elderly population, raising the quality of life of the elderly has become more important. Illness-based aging rather than simple aging is emerging as a social issue beyond the individual economic level. The number of exercises which have been proven to actually prevent falls by the elderly is low. This study investigated the effects of mechanical horseback riding, which is on interest and enjoyment among the elderly, and on its efficacy as an exercise for improving the balance ability of the elderly.

## SUBJECTS AND METHODS

### Subjects

The subjects were those being treated under the Elderly Welfare Act and those who were hospitalized in a nursing hospital in Gyeonggi Province. Prior to their participation in the study, a written informed consent accepted by the local ethics committee was obtained from all of the subjects. The subjects were able to understand the purpose and procedures of this study. They were free of musculoskeletal system problems, capable of independent walking, and had no vestibular sense problems, and sufficient cognitive ability.

The physical characteristics of the subjects were as follows. For the experimental group, the mean age was 70.1 years, the average height was 164.4 cm, and the average weight was 60.8 kg. Seven patients were male, and three were female. For the control group, the mean age was 71.2 years, the average height was 163.2 cm, and the average weight was 62.1 kg. Six patients were male, and four were female.

### Methods

Ten of the 20 subjects were randomly assigned to the one-leg standing exercise control group, and 10 to the mechanical horseback-riding experimental group. All subjects listened to detailed explanations about each posture, watched demonstrations, and practiced a few times before testing.

The control group performed the one-leg standing exercise. The subjects were asked to unfold their arms, stare in front, and raise their right and left feet alternately. The experimental group performed mechanical horseback riding using a Slim Rider (Shinwa Electronics, South Korea), which has speeds and courses from levels 1 to 15. Each course lasts 4 min, and it has a variety of programs. The horseback-riding

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machine was covered with a leather pad and mounted on supports at the approximate height of an average horse. The subjects sat on the horseback-riding machine as one would on a real horse, with a supervisor on standby. While sitting on the horseback-riding machine, the subjects maintained their balance throughout the session. The Berg Balance Scale (BBS) and the Timed Up and Go (TUG) test were used to evaluate the subjects' balance ability.

SPSS version 18.0 for Windows was used to statistically process data to examine the effects of six weeks of balance exercises, specifically one-leg standing exercise and horseback riding, on the elderly subjects' balance ability. The paired t-test was conducted to compare the effects on each group before and after exercise. A significance level of  $\alpha=0.05$  was used to test the statistical significance of differences.

## RESULTS

The elderly subjects performed one-leg standing exercise or horseback riding and the BBS and TUG test were used to assess their balance ability. The findings are as follows:

After the intervention, the experimental group showed a statistically significant increase in BBS from  $41.25\pm 2.46$  to  $46.50\pm 2.30$  ( $p<0.05$ ), but the control group showed no significant difference,  $42.56\pm 4.21$  and  $43.81\pm 3.85$  ( $p>0.05$ ). The experimental group showed a statistically significant improvement in the TUG time from  $11.28\pm 1.54$  s to  $8.36\pm 1.29$  s ( $p<0.05$ ), but the control group showed no significant improvement,  $11.41\pm 1.77$  s and  $10.32\pm 1.72$  s ( $p>0.05$ ).

## DISCUSSION

McGibbon et al. found that horseback riding could increase task performance skills by improving regulation of trunk movements, and even balance ability by eliciting better sensory information control, and reported that children who had difficulty with walking showed improvement in exercise functions and walked more easily after horseback riding<sup>5</sup>). Fleck reported that horseback riding could generate the same effects as walking exercise, as the pelvic exercise the rider has on horseback is similar to that while walking<sup>6</sup>). Kang and Song reported that indoor horse riding stimulated interest in children with cerebral palsy and was worth considering as a therapeutic method to enhance their functions<sup>7</sup>). According to our present results, the horseback riding group showed a reduction in the TUG time of 2.9 s and an increase in the BBS score of 5.2, consistent with the results of previous studies. Regular exercise for maintaining posture can affect the physical ability of the elderly. Even low-intensity exercise that considers the physical conditions of the elderly can effectively improve their balance ability.

It was reported that horseback riding led to improved

muscle strength and vestibular and visual stimuli with effects on sensory functions. It helped facilitate the stability and balance reactions of the spine as well as postural adjustment training of the patients. Horseback riding therapy improves trunk balance and postural adjustment through the repeated stimuli of the horse's movement that enhances the muscles around the pelvis, abdomen, and waist, which are used to maintain posture<sup>8</sup>). Horseback riding is an exercise that can enhance both static and dynamic balance. It can simultaneously strengthen the musculoskeletal and neurological factors that specifically improve balance. In terms of musculoskeletal factors, horseback riding may result in functional improvement and increased stability; in terms of the neurological factors, it may stimulate proprioception<sup>9</sup>). The experimental group showed great interest in the therapeutic methods and achieved a high participation level in the exercise, which seemed to improve their balance ability. Horseback riding resulted in significant improvements in the balance tests, and this improvement raises the possibility of its application at home programs. Future studies are needed to search for various methods of exercise programs and to accumulate scientific evidence and basic data for the establishment of horseback riding as a stability exercise for the elderly.

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## REFERENCES

- 1) Buchner DM, de Lateur BJ: The importance of skeletal muscle strength to physical function in older adults. *Ann Behav Med*, 1991, 13: 91–98.
- 2) Means KM, Rodell DE, O'Sullivan PS, et al.: Rehabilitation of elderly fallers: pilot study of a low to moderate intensity exercise program. *Arch Phys Med Rehabil*, 1996, 77: 1030–1036. [[Medline](#)] [[CrossRef](#)]
- 3) Rasmussen-Barr E, Nilsson-Wikmar L, Arvidsson I: Stabilizing training compared with manual treatment in sub-acute and chronic low-back pain. *Man Ther*, 2003, 8: 233–241. [[Medline](#)] [[CrossRef](#)]
- 4) Carpes FP, Reinehr FB, Mota CB: Effects of a program for trunk strength and stability on pain, low back and pelvis kinematics, and body balance: a pilot study. *J Bodyw Mov Ther*, 2008, 12: 22–30. [[Medline](#)] [[CrossRef](#)]
- 5) McGibbon NH, Andrade CK, Widener G, et al.: Effect of an equine-movement therapy program on gait, energy expenditure, and motor function in children with spastic cerebral palsy: a pilot study. *Dev Med Child Neurol*, 1998, 40: 754–762. [[Medline](#)] [[CrossRef](#)]
- 6) Fleck CA: Hippotherapy; mechanics of human walking and horseback riding. In: Engel BT, editor. *Rehabilitation with the aid of horse: A collection of studies*. Durango: Barbara Engel Therapy Services, 1992.
- 7) Kang KY, Song BH: The effects of horse riding simulations on the gross motor functions of children with cerebral palsy. *J Contents Assoc*, 2010, 10: 1–5.
- 8) Kim H, Her JG, Ko J: Effect of horseback riding simulation machine training on trunk balance and gait of chronic stroke patients. *J Phys Ther Sci*, 2014, 26: 29–32. [[Medline](#)] [[CrossRef](#)]
- 9) Kim HS, Lee CW, Lee IS: Comparison between the effects of horseback riding exercise and trunk stability exercise on the balance of normal adults. *J Phys Ther Sci*, 2014, 26: 1325–1327. [[Medline](#)] [[CrossRef](#)]