

EFFECT OF VIBRATION APPLICATION INTO DYNAMIC LEG PRESS EXERCISE WITH EXTRA LOAD: MULTI-BODY DYNAMIC ANALYSIS

Young Kuen Cho¹⁻², Jinyoung Min³, Dohyung Lim¹⁻², and Han Sung Kim¹⁻²

¹ Department of Biomedical Engineering, Yonsei University, Wonju, Korea

² Institute of Medical Engineering, Yonsei University, Wonju, Korea

³ TS Meditech Co., Ltd

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INTRODUCTION: Many studies have emphasized the importance of resistive exercise in maintaining a healthy human body, particularly in prevention of weakening of physical strength (Kostka, 2002). Recently, some of studies advocated that an application of vibration as a supplementary means in regular training was effective in encouraging physical strength (Annino et al., 2007). Aim of the current study was, therefore, to identify if an application of vibration in a resistive exercise is effective in encouraging physical strength as that in a regular training.

METHOD: A 3-dimensional virtual lower limb model for a healthy male (21-year-old, 177.8cm, 77kg) was generated by using BRG.LifeMOD (Biomechanics Research Group, Inc., USA) and a virtual leg-press model for a commercial product (POWER GYM, Korea) by using Pro/Engineer Wildfire (Parametric Technology Corp., USA) was generated and synchronized with the virtual lower limb model. Dynamic leg press exercises on a slide machine 1) with 70 kg extra load, 2) without the extra load and 3) on a footboard with vibration (amplitude: 10mm displacement, frequency: 20Hz) induced by using MSC.ADAMS (MSC Software Corp., USA) as well as on a slide machine with 70 kg extra load were analyzed.

RESULTS: The current study defined 12 muscles on lower extremity to analyze. Normally, rectus femoris, vastus lateralis, and vastus medialis generated high muscle strengths among the muscle strengths from all defined lower extremity exercises.

Table 1 Maximum muscle strengths for main lower-extremity muscles generated by the excersises defined in the current study (Unit: N)

| | Rectus Femoris | Vastus Lateralis | Vastus Medialis |
|-------------------------------|----------------|------------------|-----------------|
| Without Extra Load | 3381.84 | 3685.22 | 2243.78 |
| With Extra Load | 6306.30 | 6601.21 | 4910.29 |
| With Extra Load and Vibration | 5858.93 | 6144.60 | 4466.77 |

DISCUSSIONS AND CONCLUSIONS: The results indicated that the application of the vibration on the dynamic leg press exercise may not be greatly effective in encouraging physical strength, compared with the dynamic leg press exercise with extra load. It was, however, thought that the application of the vibration may be helpful to elderly individuals because the reduced maximum muscle strength appeared by the effect of the vibration may avoid a muscular spasm, which can be driven from a high muscle strength sometimes produced during the leg press exercise with extra load.

REFERENCES: 1) Kostka T. (2002), *Polski merkuriusz lekarski : organ Polskiego Towarzystwa Lekarskiego*, 13(78), 520-523.

2) Annino et al. (2007), *Journal of strength and conditioning research*, 21(4), 1072-10726.

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