EFFECTS OF EIGHT WEEKS PILATES TRAINING ON JUMP PERFORMANCE AND LIMITS OF STABILITY IN ELEMENTARY DANCERS

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INTRODUCTION: Dance is not only a performing art, but also a highly rigorous athletic sport that is one of the most physically and mentally demanding athletic sports in the world (Shah, 2008). Dancers are a unique group of athletes in that they execute physically challenging movements while making them look beautiful and artistic. This performance ability requires a high level of fine motor control, strength, flexibility, and core stability. Pilates is a kind of conditioning which was used to exercise the body flexibility, muscles strengthen, and body alignment. It is suggested that the Pilates is good for joint flexiblity and core strengthing, however, limited study was conducted to evaluate its benefits on jump and postural stability. Therefore, the purpose of this study was to evaluate the effects of eight weeks Pilates exercise training on jump performance and limits of stability (LOS) in elementary dancers.

METHOD: Twenty-six elementary dancers equally and randomly assigned to experimental group (EG, age: 10.9 yrs, height: 147.5 cm, weight: 37.9 kg, dance experience: 3.5 yrs) or control group (CG, age: 11.2 yrs, height: 146.1 cm, weight: 36.1 kg, dance experience: 4.2 ± 0.8 yrs). All subjects received the same dance lessons as routine elementary curriculum but the experimental group underwent an extra Pilates mat exercises for 40 minutes, three times a week, for 8 weeks. A instructor who had 2 years of experience in Pilates mat exercises initiated the exercises.

Jump performance was evaluated by bilateral countermovement jump (CMJ) and squat jump (SJ) for maximal height on AMTI force plate with Noraxon TeleMyo 2400T G2 at sampling rate of 1500 Hz. Hands remained on the hips for the entire movement to eliminate any influence of arm swing. Jump technique was demonstrated by one of the investigators, followed by two sub-maximal attempts by the participant. Three jumps for maximal height, separated by 3 minutes rest, and the jump with the greatest height was subsequently used for data analysis.

Limits of stability (LOS) was evaluated by the Biodex Balance System. Subjects were tested bilaterally at two levels of difficulty: 2 and 8. To control for the learning effect and fatigue, the order of the tests was randomly assigned. The subject was instructed to start moving the cursor which accurately move the display toward the flashing target at eight different directions. The LOS score was calculated for each direction according to the percentage

between the straight line distance to target and the number of samples. Therefore, more direct the path to the target and back to center, the higher score will be achieved.

All statistical procedures were performed by using SPSS Version for Windows 12 (Chicago, IL, USA). A mixed design, one-way ANCOVA was used to evaluate the difference between groups after training for each parameter. The statistic significance was set at $p < 0.05$.

RESULTS: The average CMJ jump heights in the EG and CG were 23±5 cm and 20±4 cm in pre-training, and changed to 23±4 cm and 19±4 cm after the eight-week period ($F = 10.66$, $p < 0.05$). The average SJ jump heights in the EG and CG were 20±5 cm and 18±3 cm in pre-training, and changed to 19±4 cm and 17±4 cm after the eight-week period ($F = 0.42$, $p > 0.05$). The overall LOS scores for the EG group at levels 2 and 8 pre- and post-training changed from 22.6±8.3% to 31.3±8.9% and from 44.6±5.2% to 56.1±4.7%, respectively. The overall LOS score for the CG at levels 2 and 8 in pre- and post-training changed from 26.3±10.5% to 27.3±11.2% and 43.3±4.3% to 56.3±5.2%, respectively. The results of the ANOVA for the overall and left direction LOS scores at level 2 (Figure 1) indicated a significant interaction between the trained/untrained groups × pre/post repeated measures with post-training scores higher than pre-training scores in the EG (F=11.06 & 4.5, $p < 0.05$).
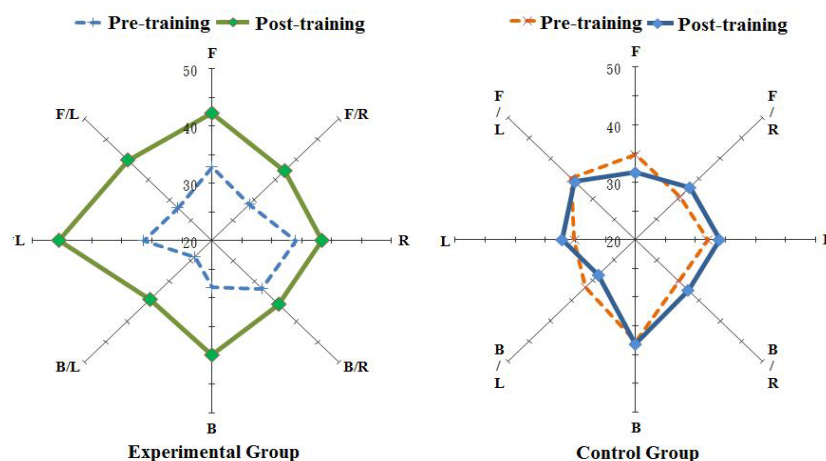

Figure 1. LOS scores in each direction between groups at level 2 before and after training.

DISCUSSION: This study demonstrated that young dancers who participate in 8 week Pilates training can improved the CMJ jump performance and total LOS performance. The CMJ is defined as a fast and powerful movement using an active eccentric contraction induces a powerful concentric contraction (stretch-shortening cycle, SSC). So it's a better indicator of neuromuscular coordination and control, were the SJ is a better indicator of explosive power. Previous study examining national-level gymnast using Pilates twice a week showed significant increases in jump height 16.2% (Hutchinson et al., 1998) which was in accordance with the finding of this study.

In addition. One recent study have indicated that Pilates training can enhances the control of trunk movement, and improves the jump neuromuscular coordination of movements, thus enhancing the overall jump performance (Lugo-Larcheveque et al., 2006). The improved LOS performance which demonstrated in this study and enhanced body movement which demonstrated in Lugo-Larcheveque et al., (2006) might suggest that Pilates training can strengthen the core muscles then improve the stability of the upper body and the lower extremity limb coordination.

CONCLUSION: This study demonstrated that eight weeks Pilates exercise can improve CMJ and total LOS performance in elementary dancers. Therefore, Pilates exercise is benefitial and should be implemented into elementary dance curriculum.

REFERENCES:

Hutchinson M, Tremain L, Ghristiansen J, & Beitzel J. (1998). Improving leaping ability in elite rhythmic gymnasts. *Medicine and Science in Sports and Exercise*,10, 1543-7.

Lugo-Larcheveque, N., Pescatello, L. S., Dugdale, T. W., Veltri, D. M., & Roberts, W.O. (2006). Management of lower extremity malalignment during running with neuromuscular retraining of the proximal stabilizers. *Current Sports Medicine Reports, 5*(3), 137-140.

Shah, S. (2008). Caring for the dancers: special considerations for the performer and troupe. *Current Sports Medicine Reports, 7*(3), 128-132.