

EFFECTS OF PROPRIOCEPTION AND STRENGTH TRAINING ON INJURY PREVENTION IN ADOLESCENT AND YOUNG ADULT FEMALE DANCERS

Carla Murgia

Exercise Science, Kean University

Biomechanics & Kinesiology; email: docmurg@aol.com, web: www.kean.edu

INTRODUCTION

The positive effects of strength and proprioceptive training in the rehabilitative process of the injured athlete are well documented in the literature [1,2,3]. It has been suggested that deficits in neuromuscular pathways associated with injuries have a detrimental effect on joint position sense, protective and defensive mechanisms of the injured joint, balance, and delay of return to activity [4,5]. As a result, progressive strength and proprioception training have been incorporated early into the rehabilitation protocol of injured athletes to restore joint stability and a quicker return to functional performance activity levels [6,7]. The purpose of this study was to examine the effects of strength and proprioception conditioning in the prevention of injuries in female dancers.

METHODS

One hundred subjects were randomly selected from professional dance studio advanced classes. Female subjects, aged 13 to 21 years of age, were cross trained in dance forms. Subjects were randomly assigned to four treatment groups: strength and proprioceptive conditioning (group 1); strength conditioning and relaxed static stretching (group 2); proprioceptive conditioning and relaxed static stretching (group 3); and static stretching (group 4). Progressive strength protocols for the knee and ankle included use of Thera-Band (silver strength) resisted motion and specialized weight training of the inferior extremity. Proprioception protocol consisted of a regimen commonly used in ankle and knee injury rehabilitation regimens. Stretch protocol incorporated the use of relaxed focused static stretch positioning. Positions were held for 30 seconds. All groups trained in front of a mirrored wall 3 times per week for 10 weeks. Pre and post-tests were compared for ankle and knee stability, kinesthesia, and postural sway. Pre and post treatment surveys were used to determine occurrence and severity of knee and ankle joint injury. Ankle stability was assessed using the anterior draw and tilt tests. Knee stability was assessed using varus-valgus, Lachman, and a-p drawer tests. Active and passive joint position sense for the knee and ankle were evaluated using isokinetic instrumentation. Postural sway was measured by identifying center of mass using a 3D automatic digitizing video system and a force platform. Subjects were required to maintain a flat-foot and demi-pointe one-foot stance for 30 seconds on the platform. Postural sway was determined by measuring the amount of center of gravity excursion in the frontal and sagittal planes. Quantity of sway in each plane was summed to determine total center of gravity excursion. A one-way ANOVA with repeated measures was used to analyze the data. Scheffe' post hoc tests were used to analyze the nature of the differences when significance was found.

RESULTS AND DISCUSSION

Groups that participated in any combination of strength and/proprioceptive conditioning (groups 1, 2 & 3) had significantly ($p < .01$) greater ankle and knee joint stability and less postural sway than the controls (group 4). When combination protocol (group 1) and the two combination relaxation protocols (groups 2 & 3) were compared for joint stability and postural sway, positive effects were found, although not significant. Joint position sense scores significantly increased ($p < .01$) in the two proprioception training groups (1, 3). In addition, dancers who participated in any combination of strength and proprioceptive training sustained fewer leg injuries of lesser severity ($p < .05$) and when injured, returned to full activity sooner than the controls. Anecdotally, surveys administered at the end of the study revealed that general complaints of discomfort about the knee and ankle joints decreased in number and severity ($p < .01$).

CONCLUSIONS

The results indicate that stronger muscles in proper strength ratios and educated sensory receptors produce stable joints that are more proficient in the identification of joint position and correction of sudden abnormal positions. The lack of significance between "treatment" regimens 1 and 2 or 3 does not necessarily indicate that all three treatment groups are equally effective. It may reflect the restorative effect of relaxed focused stretching. Dancers do not usually take the time to rest. They work through fatigue and minor injuries despite symptoms of pain and paresthesia, which result in poor movement mechanics, as evidenced by "harder" landings from jumps and leaps, "sagging ankles" in releve' and foot pronation in turn-out. The results of this study clearly demonstrate the positive effects of strength and proprioceptive conditioning when included in training cycle of the dancer. Inclusion of these components is recommended for enhancement of the quality of the performance life of the dancer.

REFERENCES

1. Baltaci G & Kohl H. *Phys Ther Rev*; 8, 2003.
2. Hassan B et al. *Ann of the Rheum Dis*; 61(5):422, 2002.
3. Kaminski T et al. *J Athl Training*; 36(2):S93, 2001.
4. Matsusaka N et al. *Am J Sport Med*; 29(1):25, 2001.
5. Bouer V & Yvews G. *Neurosci Lett*; 289:143, 2000.
6. Hiller C, Refshauge K, & Beard D. *Am J Sport Med*; 32(1):216, 2004.
7. Benton J, et al. *J Athl Training*; 36(2): S-87, 2001.
8. Willems T et al., *J of Athl Training*; 37(4): 487