



EXERCISE PHYSIOLOGY

A novel balance exercise program for postural stability in older adults: A pilot study

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Summary Pilates-inspired exercise is increasing in popularity as a general and clinical exercise training technique. It is purported to improve postural awareness with a large focus on facilitating movement re-education, however, there is limited research to support this. This study examined the effectiveness of a novel Pilates-inspired exercise program specifically designed to improve balance in an upright position, referred to as postural stability, in older adults. Participants for this pilot study were eight community-dwelling men and women aged 66–71 years. The exercise regimen was undertaken twice weekly for 8 weeks and pre- and post-subject assessment included postural sway (static and dynamic), the timed get up and go test (TGUGT), sit-to-stand (timed one repetition and repetitions over 30 s) and a four stage balance test. Seven subjects completed the intervention. There was a significant improvement ($P < 0.05$) in some components of static and dynamic postural sway (8–27%) as well as the TGUGT (7%) following training. These results suggest that a balance training program of Pilates-inspired exercises over a short duration can be safely performed in well-functioning elders and may lead to improvements in postural stability. Future research may consider the variation of specific balance training techniques, primarily movement re-education compared to speed and/or reaction time, to improve postural stability and reduce falls risk.

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Introduction

An older adult's postural stability is considered important to perform common activities of daily living (ADL) such as walking, turning, and rising to a standing position. The maintenance of postural stability is multifactorial but normal age-related declines of the sensory and motor systems negatively impact postural stability making the performance of ADL tasks more challenging (Sherrington et al., 2004). Strong associations have been established between outcome measures of postural stability and improved strength, power and range of movement in respect to falls prevention exercise programs (Barnett et al., 2003; Nitz and Choy, 2004). Previous studies have shown that physical activity and exercise can reduce the incidence and risk of falls (Sherrington et al., 2004; Nitz and Choy, 2004; Barnett et al., 2003). However, research on exercise interventions for postural stability and falls management requires further investigation, specifically on the types of exercises that are more effective in maintaining postural stability (Sherrington et al., 2004).

Randomized-controlled trials that utilize structured exercise programs, particularly those with a balance focus, have had a positive effect on improving postural stability and/or reducing falls incidence and injuries (Lord et al., 1996; Barnett et al., 2003; Nitz and Choy, 2004). These balance training programs provide a specific exercise environment for task orientated and functional movement, challenging the body position in space by either changing the size or shape of the base of support. Such principles are similar in the teaching of Pilates-inspired techniques (Anderson and Spector, 2000; Lange et al., 2000).

The purpose of this pilot study was to examine an exercise intervention designed to improve balance in an upright position based on the principles of Pilates-inspired techniques that challenge and re-educate balance and functional movement by using resistance and changing the body's orientation to gravity (Anderson and Spector, 2000). Pilates-inspired techniques are commonly used in clinical practice, to improve postural awareness and facilitate movement re-education focus, but have limited research support.

Methods and procedures

Subjects

The participants were eight men and women aged 66–71 years with a body mass index (BMI) of

19–33 kg/m². A falls risk questionnaire identified the participants as they presented at a LifeCare Physiotherapy Clinic in Brisbane, Queensland and through the Australasian Centre for Ageing 50+ registry at The University of Queensland. The inclusion criteria required subjects to be 65 years or over, with no cardiovascular, neuromuscular or neurological contraindications to exercise. Subjects already involved in equivalent exercise classes were excluded from the study. All participants took at least one medication and four participants were on ACE inhibitors or calcium channel blockers, where dizziness is a possible side effect. Participant information letters and an adapted medical/health questionnaire (Evans, 1999), including the American College of Sports Medicine (ACSM) Par-Q recommendations (Franklin, 2000), were mailed to potential subjects. The study was approved by The University of Queensland Medical Ethics Committee and all subjects provided written informed consent. Where indicated, medical clearance was obtained by their physician.

Exercise intervention program

The program was conducted twice weekly, 1 h per session, for eight consecutive weeks. The session included a 10-min warm-up, 40-min conditioning phase and a 10-min cool-down period, consistent with previous study designs (Lord et al., 1996; Barnett et al., 2003). The design and supervision of all the small group training sessions was performed by the principal investigator, an Exercise Physiologist and a qualified Pilates Instructor through Isodynamic Fitness and Polestar Pilates[®] Education. The selected exercises and techniques were based on Pilates-inspired principles of disassociation, stabilization, mobilization and dynamic stabilization (Anderson and Spector, 2000). Twelve exercises were chosen to incorporate dimensions of balance, strength and coordination, performed in a closed kinetic chain environment (Table 1). The exercises were designed to work the full range of motion available to each subject in leg and arm flexion, extension, abduction, adduction and rotation, and trunk flexion and rotation for various positions of supine, seated and standing. All movements performed by the participants were slow, controlled and deliberate to increase coordination, sensory awareness and to facilitate transfer and retention to maximize the re-education process (Lange et al., 2000). All exercises were modified and/or progressed through changing the size and shape of the base of support (e.g. lying to sitting to

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