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EXERCISE PHYSIOLOGY STUDY

Effects of Pilates exercise on general health of hemodialysis patients

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Summary Pilates is a type of exercise which has recently drawn exercise and health experts' attention. They have noticed that it can improve hemodialysis patients' general health. A clinical trial study was performed. Fifty hemodialysis patients were randomly assigned to intervention and control groups. A demographic information questionnaire and a general health questionnaire (GHQ-28) were completed by the two groups at the beginning of the study. Then, modified Pilates exercises were carried out in the intervention group three times a week over a period of eight weeks. At the end of the study, the GHQ-28 questionnaire was completed by the two groups. In the intervention group, the difference between the mean scores of general health before (45.24 ± 9.9) and after (31.2 ± 6.9) the intervention was significant ($p \leq 0.002$). After the intervention, the difference between the mean scores of the control (1.6 ± 1.3) and intervention (14 ± 0.78) groups was also significant ($p \leq 0.001$).

Introduction

Chronic renal failure (CRF) is a major international health problem (Williams and Manias, 2008). Patients undergo health challenges that lead them to change their daily lifestyles including adjusting their diets, using medications, and experiencing frequent hemodialysis (Abraham et al., 2012). Although hemodialysis is the most common treatment for these patients, it results in several adverse

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complications, such as food and fluid restrictions, pain in fistula, multiple hospitalizations, and financial burdens (Akin et al., 2014). Multiple complications, such as sleep disturbance, depression, anxiety, and social isolation contribute to patients' reduced physical functioning, decreased quality of life, and poor general health (Aucella et al., 2015; Cohen et al., 2007; Gerogianni and Babatsikou, 2013; Hmwe et al., 2015; Parvan et al., 2013; Wang et al., 2012). Therefore, nursing and therapeutic interventions are required to deal with patients' mental and physical complications and disabilities (Johnson and Dwyer, 2008).

The World Health Organization (WHO) defined general health as an individual's physical, mental, social, and moral well-being (WHO, 2008). Maintenance of regular activities or improvement of physical exercise can enhance the general health of hemodialysis patients (Rhee and Kalantar-Zadeh, 2014). Besides medical interventions, complementary and alternative medicine suggests new therapeutic options with the goal of improving general health, reducing symptoms, and decreasing negative consequences and costs of conventional treatments (Birdee et al., 2013). Complementary and alternative medicine is a set of unconventional medical and healthcare interventions. These interventions include the use of biologically-based products such as dietary supplements, and mind-body exercises like yoga, deep breathing, and meditation (Duncan et al., 2007; Nowack et al., 2009).

Regular exercise improves mental function, reduces anxiety and depression, and improves temperament and happiness partly due to an increase in growth, cortisol, and serotonin hormones released in the body (Eyigor et al., 2010; Krogh et al., 2010). Cupist et al. (2011) reported that regular physical exercise plays a pivotal role in patients' rehabilitation and the improvement of aspects of their physical health, such as cardiovascular, metabolic, and nutritional conditions (Cupisti et al., 2011). Maniam et al. (2014) revealed that physical exercise helps hemodialysis patients to improve their physical and mental conditions. Although exercise is widely recommended for hemodialysis patients, the physical demands of exercise, along with multiple complications of the disease and treatments, hinder patients to incorporate exercise programs into their conventional treatments (Jung and Park, 2011). Therefore, sports and rehabilitation experts have frequently suggested Pilates exercises to overcome patients' problems related to exercise programs (Caldwell et al., 2009; Dunleavy, 2010; Rodrigues et al., 2010).

Pilates exercises, introduced by Joseph Pilates, are sets of activities that positively affect strength, posture, and flexibility of the body. Mostly exercises have effects on the physical aspects of patients' health (Neumark-Sztainer et al., 2011; Guimarães et al., 2012; Mallin and Murphy, 2013). However, Pilates exercises are combinations of physical and mental training through which individuals can balance their mind-body interactions and ultimately enhance their general health status (Guimarães et al., 2012). Pilates exercises are based on six principles including centering, concentration, precision, control, flow, and breath (Caldwell et al., 2009), and combinations of different static postures including supine, sitting, and quadruped, without movements such as jumping and leaping. Therefore, a modified Pilates exercise can be a choice for chronically ill patients because it minimizes the inherent risks of muscular and joint injuries that movements in other exercises can pose (Emery et al., 2010; Boguszewski et al., 2012; Tunar et al., 2012; Wells et al., 2013). The main goal in Pilates exercises is strength and flexibility improvement. In other words, using a mind-body exercise approach and focusing on muscle control, posture, and breathing can improve an individual's core stability, strength, and flexibility (Patti et al., 2016).

Literature review

Different studies showed positive effects of Pilates exercises on dimensions of general health and quality of life using different designs of exercise and populations. They included Pilates exercises 3 sessions per week during eight weeks in older men (Pourvaghar et al., 2014), two times a week over a three-week period in older and adult women (Cruz-Ferreira et al., 2011; Rodrigues et al., 2010), two times a week for three months among middle aged men and women (Garcia-Soidan et al., 2014), three times a week over an eight-week period in women with breast cancer (Eyigor et al., 2010), 3 sessions per week over eight weeks among women with type 2 diabetes mellitus (Torabian et al., 2013), and 2 times a week for six months in patients with idiopathic arthritis (Mendonca et al., 2013). Furthermore, Jang and Kim (2009) and Liu and colleagues (2015) found that aerobic exercises improved the general health and reduced depression in hemodialysis patients.

On the contrary, Segal et al. (2004) found that Pilates exercise an hour a week over six months had no effect on the physical and general health of healthy adult participants (Segal et al., 2004). Likewise, Kuo et al. (2009) showed that two 20-minute Pilates sessions per week for 10 weeks had no effect on older adults' physical health (Kuo et al., 2009). Parsons et al. (2006) and Jung and Park (2011) conducted clinical trials using aerobic and resistance exercises in hemodialysis patients. They found that 30-minute intradialytic trainings three times a week over 8-weeks (Parsons et al., 2006) and 10 time for 2 weeks (Pinto et al., 2015) had no effect on the respiratory muscle strength of chronic renal patients.

The high prevalence of CRF and growing population of hemodialysis patients with multiple complications urge nurses to provide innovative strategies including mind-body interventions for patients (Gerogianni and Babatsikou, 2013). Evidence demonstrated the effects of Pilates exercise in several populations (Eyigor et al., 2010; Garcia-Soidan et al., 2014; Cruz-Ferreira et al., 2011). However, to the authors' knowledge, this is the first study that explored the effects of a modified Pilates exercise on hemodialysis patients. There is a gap in knowledge about complementary and alternative treatments, particularly among patients with renal diseases (Duncan et al., 2007; Nowack et al., 2009).

Due to the contradictory results of previous studies with different designs, further research is required to first, verify the effectiveness of Pilates exercise and second, introduce an effective design of this exercise for hemodialysis patients. Eyigor et al. (2010) emphasized that ongoing research is required to verify the effectiveness of