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STUDENTS' CORNER

Strength and Aerobic Exercise for the Treatment of Osteoarthritis Symptoms

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Abstract

Background: Arthritis is a prevalent joint disease characterized by joint inflammation. Osteoarthritis is the most common form of arthritis which causes progressive cartilage breakdown at the ends of bones and may affect surrounding ligaments, menisci and muscles. Osteoarthritis puts individuals at an increased risk of developing comorbid conditions. The use of exercise is growing as a low-risk treatment for symptoms of osteoarthritis. **Purpose:** The purpose of this narrative review is to examine how strength and aerobic exercise interventions can be used for the management of osteoarthritis symptoms. **Methodology:** A literature search was conducted utilizing PubMed, Medline, Google Scholar, and UBC Library. Selected literature included quasi-experimental studies, randomized-controlled trials, systematic reviews, narrative reviews, and exercise guidelines. **Results:** The literature indicates that strength exercise is beneficial to symptom management and physical function among individuals with osteoarthritis. Research specific to quadriceps strengthening showed significant improvements in physical performance, walking self-efficacy, and pain. While aerobic exercise plays a vital role in overall well-being, it also is shown to be as effective as strength exercise for symptom management and physical function. **Conclusion:** Evidence suggests that strength and aerobic exercise can enhance the quality of life among individuals with osteoarthritis. Greater dissemination of evidence is needed to increase awareness of strength and aerobic exercise as a valuable treatment option for osteoarthritis. Further research is required to determine optimal exercise parameters prescribed for individuals with osteoarthritis. **Health & Fitness Journal of Canada 2020;13(2):46-50.**

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Keywords: Physical Activity, Quadricep Strengthening, Exercise Prescription, Randomized-Controlled Trial, Systematic Review, Medications

Introduction

Arthritis is a disease characterized by joint inflammation that can affect one or multiple joints (Barbour, Helmick, Boring, & Brady, 2017). The most common form of arthritis is osteoarthritis, which is characterized by progressive cartilage breakdown on the ends of bones resulting in joint immobility and may result in

damage to surrounding ligaments, menisci, and muscles. (Barbour et al; 2017; Chilibeck, Vatanparast, Cornish, Abeysekara, & Charlesworth, 2011). Furthermore, research has shown that individuals living with osteoarthritis are more likely to develop comorbid conditions, such as cardiovascular disease, diabetes, and obesity (Hall, Stubbs, Mamas,

Myint, & Smith, 2016; Robbins & Kulesa). Osteoarthritis is the leading cause of disability in the United States, affecting 46 million adults and is projected to affect 78.4 million adults by 2020 (Barbour et al., 2017; Robbins & Kulesa, 2012). Medical costs for osteoarthritis related hospitalizations, joint replacements, and rheumatologist appointments were \$128 billion in 2003 (Robbins & Kulesa, 2012).

Medical treatments currently being used to treat inflammation associated with osteoarthritis include nonsteroidal anti-inflammatory drugs and corticosteroids, both of which have been shown to cause negative side effects (Chilibeck et al., 2011). However, exercise has proven to be a low-risk treatment option that can reduce pain, improve physical function, and reduce symptoms associated with osteoarthritis (Chilibeck et al., 2011; Fransen, McConnel, & Bell, 2003). When considering the prevalence of osteoarthritis and the associated burden of health care costs, it is clear that further research should be conducted to determine how different types of exercise intervention can help manage the disease. The objective of this narrative review is to examine how strength and aerobic exercise can be used to manage osteoarthritis and its associated symptoms.

Methods

A comprehensive literature search was conducted utilizing databases including PubMed, Medline, Google Scholar, and UBC Library. Keyword searches included “physical activity”, “quadricep strengthening”, “exercise prescription”, “randomized-controlled trial”, “systematic review”, “medications”. Literature that was included in this narrative review ranged from 1990 to 2017 and consisted of quasi-experimental studies, randomized-

controlled trials, systematic reviews, narrative reviews, and exercise guidelines.

Results

Strength Exercise

Strength exercise serves an important role in managing osteoarthritis. Studies have compared isotonic, isometric, and isokinetic exercise for factors including pain and physical function in individuals with osteoarthritis. Isotonic or isokinetic exercises yield better results than isometric exercises (Huang, Lin, Yang, & Lee, 2003; Rosa et al., 2012; Salli, Sahin, Baskent, & Ugurlu, 2010). However, isometric exercises are valuable during periods of increased joint inflammation. The reduced joint range of motion in isometric exercises may allow for adherence to exercise without exacerbation of joint symptoms (AGS, 2001; Semble, Loeser & Wise, 1990). Free weights, exercise machines, and resistance bands are all appropriate modalities for individuals with osteoarthritis (AGS, 2001; Gaught & Carneiro, 2015).

Lange, Vanwanseele, & Singh (2008) conducted a systematic review examining how strength exercises could be used for treatment of osteoarthritis of the knee and found that resistance training improved muscle strength as well as self-reported measures of pain and physical functionality. Furthermore, this systematic review confirmed that resistance training had provided significant improvements in physical performance, walking self-efficacy, and a reduction in physical disability (Lange et al., 2008). These findings are corroborated by two additional systematic reviews, which revealed that quadricep strengthening exercises could be effectively used to reduce rates of disability in addition to improving measures of quality of life and

physical function among individuals with knee osteoarthritis (Fransen et al., 2015; Roddy, Zhang, & Doherty, 2004).

Aerobic Exercise

Aerobic exercise is important for enhancing quality of life by improving capacity for activities of daily living and cardiovascular health (Ettinger et al., 1997; Gaught & Carneiro, 2015; Warburton & Bredin, 2016). One systematic review found no significant differences between various muscle strengthening programs and aerobic exercise programs for factors of pain and physical function, with groups reporting significant improvements in both factors (Fransen et al., 2015). A high weekly volume of whole-body aerobic exercise may induce osteoarthritis symptoms through overuse of joints (AGS, 2001). However, aerobic exercise intensity does not seem to pose any significant risk in exacerbating symptoms of osteoarthritis (Brosseau, MacLeay, Welch, Tugwell, & Wells, 2003). Walking, cycling, swimming, tai chi, and dancing are shown to be viable aerobic exercise modalities which are sensitive to osteoarthritis symptomatology (AGS, 2001; Gaught & Carneiro, 2015; Nguyen, Lefèvre-Colau, Poiraudau, & Rannou, 2016; Ni et al., 2010).

Discussion

Current research on osteoarthritis symptom management and physical function in affected individuals largely focuses on knee osteoarthritis, with growing research in hip osteoarthritis, and less on other commonly affected joints such as hands, wrists, and feet (Bennell & Hinman, 2011; Fransen et al., 2015; Hinman, Heywood, & Day, 2007; Huang et al., 2003; Rosa et al., 2012; Salli et al., 2010). Research from affected knee joints are being applied to treat other less

commonly affected joints in the body, which merits additional investigation regarding how exercise can be used to specifically treat less commonly affected joints (Nguyen et al., 2016).

This narrative review compiled considerable evidence to support the use of strength and aerobic exercise for improvement of symptom management and physical function among individuals with osteoarthritis. It also examined how various modalities of strength and aerobic exercise can be implemented into exercise prescription for individuals living with osteoarthritis. However, minimal research has explored how to use exercise as treatment for osteoarthritis in a progressive and effective manner. Future research should be conducted to examine specific exercise parameters for exercise prescription, such as frequency, intensity, and type of exercise that will yield optimal results which are specific to these modalities.

Other common forms of symptom management include nonsteroidal anti-inflammatory drugs and corticosteroids (Chilibeck et al., 2011). The potential negative side effects of these medications constitute the use of exercise as a low-risk alternative (Chilibeck et al., 2011). Unfortunately, research has also expressed that exercise is seldom prescribed for osteoarthritis due to uncertainties of its effectiveness by physical therapists (Holden, Nicholls, Young, Hay, & Foster, 2009). In one study, an alarmingly low amount of osteoarthritis patients - only 44% of the sample - were provided exercise therapy for osteoarthritis (Ganz et al., 2006). This indicates a need for greater dissemination of evidence derived from a growing body of research on the effectiveness of exercise as a means for

managing osteoarthritis symptoms and enhancing physical function.

Conclusion

Evidence suggests that exercises that strengthening the muscles surrounding an osteoarthritic joint can reduce pain and disability measures in addition to improving physical function and overall quality of life (Fransen et al., 2015; Lange et al., 2008; Roddy et al., 2004). Aerobic exercise has proven to be a low-risk modality of improving quality of life without directly exacerbating existing symptoms (Brosseau et al., 2003). Further research should be conducted to determine the optimal frequency, intensity, and type of exercise prescription that can be used to manage osteoarthritis. Lastly, exercise has been shown to be an underutilized mode of treating osteoarthritis symptoms considering its effectiveness and warrants the need for greater dissemination of evidence to health care professionals (Ganz et al., 2006; Holden et al., 2009).

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Authors' Qualifications

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