The Principles of the Use of Exercise in Musculoskeletal Disorders
1

Introduction

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Historical perspectives

In many countries physiotherapy or physical therapy is the one of the largest health care professions after medicine and nursing. One of the major modalities of treatment at a physiotherapist’s disposal is exercise. Examining the history of the profession demonstrates that exercise is a fundamental component of treatment. Indeed many would argue that exercise is the most important treatment available to physiotherapists. The use of exercise in both the prevention and treatment of disease and disorders pre-dates the formation of the physiotherapy profession. This chapter examines the history of exercise and its role in disease management.

History of exercise

The use of exercise to promote health was recognised in China in approximately 2500 BC, when Hua T'o, a Chinese surgeon, promoted exercise based on the movement of animals (MacAuley, 1994). The ancient Greeks encouraged physical wellbeing and the greatest exponent of exercise was Galen. In his work, De Sanitate Tuenda dealt with the beneficial effects of exercise. In explaining how exercise worked, the amount of exercise and the types of exercise, he used numerous case studies to illustrate his ideas (Bakewell, 1997). What is clear is that not only was the importance of exercise recognised by the Greeks, but also the need for a prescription, encompassing not only the type of exercise, but also the dose or amount necessary for wellbeing. Galen believed that exercise in a moderate form was beneficial but that excess was dangerous as it worked by balancing the effects of eating and drinking, and therefore it was important to avoid excess of either.

In the seventeenth century, the Italian mathematician Giovanni Borelli (1608–1679) first described the body as a machine and used mathematics to describe the functioning of the body. This was the first attempt to apply scientific principles to human movement and Borelli would be regarded as the father of biomechanics. As the body was described as a machine with moving parts, it could be concluded that it needed movement for optimum effectiveness (Bakewell, 1997). In 1740, a French doctor, Nicolas Andry (1658–1742) wrote a book entitled L’Orthopedie, in which he described the need for
correct posture to prevent and treat deformities of the spine and also the need for active exercise rather than passive movement.

The idea that exercise was beneficial for the human body was hampered in the eighteenth century by a number of renowned British physicians including John Hunter (1728–1793), who promoted rest for the treatment of ‘disablements’ (Buckwalter, 1995). One of the greatest exponents of the use of rest was the Liverpool physician Hugh Owen Thomas (1834–1878), who is regarded as the father of British orthopaedics and during his career invented the Thomas splint for a fractured femur. He advocated that healing was enhanced by rest and that early mobilisation only caused adhesions. It is interesting that this philosophy is contrary to modern-day treatments for musculoskeletal disorders.

Contrary views to this pervading opinion were put forward by Julius Wolff (1836–1902) and Just Lucas-Championniere (1843–1913). Wolff proposed Wolff’s Law: that mechanical stress altered bone and that bone was laid down at sites of stress and reabsorbed at sites where there was little stress. Lucas-Championniere, a French physician, argued that rest was detrimental to the musculoskeletal system and that fractures (especially those near joints) were best treated by early mobilisation and by massage. Although Wolff and Lucas-Championniere’s theories have been subsequently proved to be correct, it was not until the mid 1950s that early exercise and mobilisation in the treatment of fractures started to become accepted.

**Exercise and physiotherapy**

The major changes in the use of exercise came about in the twentieth century, with an increase in knowledge and with the formation of the physiotherapy profession. The origins of the physiotherapy profession can be traced back to 1894 as the Society of Trained Masseuses, which became a legal and professional organisation in 1900 as the Incorporated Society of Trained Masseuses. In 1920, exercise was incorporated as part of the profession when the Incorporated Society of Trained Masseuses amalgamated with the Institute of Massage and Remedial Gymnastics. In 1944 the society was renamed the Chartered Society of Physiotherapists. Treatment at this time primarily consisted of exercise, electrotherapy and massage. Gymnasiums were a common sight in physiotherapy schools and exercise was a major component of the physiotherapy curriculum, which required students to undertake physical education classes.

Physiotherapists at this time, however, were not autonomous professionals as they had their treatments prescribed by doctors. In 1977, physiotherapists gained professional autonomy, therefore allowing them to treat patients as they felt appropriate. The fact that up to 1977 physiotherapists were unable to carry out treatment as they thought appropriate was not conducive to either innovation or to research. Despite physiotherapists using exercise on a daily basis, most of the advances in exercise therapy came from the fields of exercise physiology, biomechanics and medicine. This research led to a greater understanding of how the body works and how exercise can benefit all the major systems in the body.

The changes in 1977 and the movement of physiotherapy education into universities provided an opportunity for increased innovation and research in exercise therapy. Furthermore, in 1986 the Remedial Gymnasts Board was disbanded and remedial gymnasts became members of the physiotherapy profession. It is therefore surprising that interest in exercise as a treatment appeared to decrease in the 1990s. The reasons for this are unclear but are probably multifaceted, spanning changes in undergraduate curricula, increased specialisation and new technology. In recent years there has been a renewed interest in exercise and its beneficial effects not only among physiotherapists but also in health care in general.

**The benefits of exercise**

Exercise has beneficial effects on the cardiovascular system and the musculoskeletal system and indeed other body systems, but it is in the cardiovascular and musculoskeletal systems that the effects are most obvious. Aerobic exercise leads to a decreased demand on the heart at any particular workload with decreased blood pressure and decreased heart rate, increased stroke volume and consequently at
a given heart rate, an increased cardiac output. Muscles become more efficient in extracting oxygen from the circulating blood through an increase in the number and size of mitochondria. In bone, there is an increase in the density of weight-bearing bones and therefore is recommended for the prevention of osteoporosis in at-risk groups, e.g. post-menopausal women. Exercise also has beneficial effects on the density of bone in non-weight-bearing bones. Upper limb athletes, e.g. tennis players, have greater bone density in their dominant arm compared with their non-dominant arm (Kontulainen et al., 1999).

Strength training in itself will not necessarily lead to the changes in blood pressure, heart rate and stroke volume as seen with aerobic exercise. At the level of muscle there will be an increase in the size of fast twitch muscle fibres, which accounts for the hypertrophy of muscles and also neuromuscular adaptations, leading to a more efficient muscle contraction. Strength training increases the strength of ligaments and tendons and can lead to increased bone density. The increase in bone density seen in resistance training is greater compared with the changes seen in aerobic training. Cumulatively exercise has effects throughout the body.

Exercise is an active treatment which needs the co-operation and assent of the individual to be treated. Exercise programmes and exercise prescriptions therefore rely on the participation of the individual, and will not be successful if an individual is not compliant with their prescription. The lack of compliance or adherence to exercise programmes is one of the greatest reasons for poor results. Individuals often want a ‘quick fix’, i.e. a painkiller or a manipulation, so exercise may not be popular with many patients. It is therefore important that physiotherapists explain and educate people about their condition and their exercise programme in order to achieve high levels of adherence.

This chapter reviewed how the use of exercise has developed over the centuries. The following chapter examines the practical application of exercise in the management of musculoskeletal disorders.

References


