Assistive Technology and Hand Osteoarthritis

Matt Brewer, OTS

Cox College

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Assistive technology (AT) is any item, piece of equipment, or product system, whether acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities (Goodrich & Garza, 2015). AT can be devices that are used to prevent unnecessary stress on healthy joints (Pelc, 2003). Assistive technology includes a wide range of products, from low-tech devices such as splints to technologically complex equipment (Kjeken, Darre, Smedslund, Hagen, & Nossum, 2011).

Assistive technology can be used by individuals to fully participate in life and to complete activities of daily living. Activities of daily living (ADLs) include eating, bathing, dressing, and toileting. People with osteoarthritis may find themselves in situations where they are unable to do these simple tasks due to their hands not functioning properly as a result of weakness, disease, or deformity. In a study completed by Kjeken et al. (2011), limitations in ADLs were the major determinant of reduced health-related quality of life in patients with hand osteoarthritis. Assistive devices can help aid the person in completing these tasks so that they can continue to function independently. Adaptive equipment and techniques can be recommended to reduce the amount of force or stress to the joints through larger handles, tools that encourage joint alignment and tools that promote leverage (Beasley, 2012).

Splints can be used for support or to substitute for limited strength and range of motion (ROM) (Pelc, 2003). The goals of wearing a splint often include attempts to decrease pain, minimize deformities, decrease inflammation, decrease stress to the joints, provide support for increased function, and assist with joint stability (Beasley, 2012). Joint protection is imperative to decrease joint stress and damage through altered work methods. It is also vital to educate patients on proper joint alignment and the use of adaptive equipment.

**Osteoarthritis**

Osteoarthritis is a progressive loss of articular cartilage and reactive changes at joint margins and in subchondral bone (Joyner, 2015). It is a degenerative joint disease in which the smooth cartilage that covers the bone surfaces at the joints either is injured or wears over time (American Society for Surgery of the Hand, 2012). Causes can be idiopathic or secondary to effects like trauma, illnesses, or arthropies (Joyner, 2015). Osteoarthritis is most common in adults over the age of 40 and is the leading cause of disability in people over the age of 65 affecting over 60 million people (Joyner, 2015). Signs and symptoms of osteoarthritis include: joint bone enlargement, decreased range of motion of the affected joints, weakness of the muscles around the joint, changes in the joint alignment, local pain in the joint area, and crepitation late in the disease (Joyner, 2015).

**Hand Osteoarthritis**

Arthritis is inflammation of the joints and can affect any joint in the body, including the 29 bones of the wrist, hand, and fingers (American Society for Surgery of the Hand, 2012). Hand osteoarthritis is highly prevalent, affecting 55-70% of the adult population over 55 years of age (Bukhave & Huniche, 2014). The most common forms of arthritis in the hand are osteoarthritis, post-traumatic arthritis, and rheumatoid arthritis (American Society for Surgery of the Hand, 2012). Causes of hand arthritis in the hand include: injury, infection, gout, psoriasis, and other conditions.

There are three common locations in the hand for arthritis to occur: at the base of the thumb, where the wrist and thumb come together (also known as the carpometacarpal [CMC]), at the joint closest to the fingertip (also known as the distal interphalangeal [DIP] joint), and at the middle joint of the finger (also known as the proximal interphalangeal [PIP] joint) (American Society for Surgery of the Hand, 2012). Fifty percent of people with DIP involvement also have PIP joint involvement (Beasley, 2012). Osteoarthritis can cause joint enlargement and bone nodules at those joints (American Society for Surgery of the Hand, 2012). A nodule at the PIP is called a Bouchard’s node and a nodule at the DIP is called a Heberden’s node (American Society for Surgery of the Hand, 2012). Deformities, as a result, include a mallet finger deformity at the DIP joint and lateral deviation or boutonniere deformities at the PIP joint (Beasley, 2012).

The goal of treatment is to educate patients about the disease and its treatments, to control pain and improve function, and to alter the disease process and its consequences (Kjeken, et al., 2013). There are several different treatment recommendations to try and achieve this goal including: rest of the joints with sleeves or splints; heat; joint protection exercises and activity; anti-inflammatory medications or steroid injections; and surgery (American Society for Surgery of the Hand, 2012). Therapy to maintain or regain joint motion and muscle strength is a good treatment option (Joyner, 2015). Muscle strengthening exercises tend to improve the pain, however, exercise must be maintained as the benefits tend to be lost after six months if stopped. There is evidence to support hand exercises in osteoarthritis for increasing grip strength, improving function, improving ROM, and pain reduction (Beasley, 2012). Exercise programs that use active ROM as opposed to pinch strengthening were found to be more effective (Beasley, 2012) All forms of hand arthritis can cause stiffness, swelling pain, and deformity (American Society of Surgery for the Hand, 2012). As a result, weakness of grip and pinch can make it hard to do simple tasks like opening jars or turning a key. Activity problems relating to the opening and closing of containers and packaging, the peeling of vegetables and fruits, and the gripping and holding of small objects, as well as the lifting of heavy objects, have been reported as frequently occurring for people with hand osteoarthritis (Bukhave & Huniche, 2014).

**Assistive Technology Devices in Hand Osteoarthritis**

There are numerous types of assistive devices that are used for people who have difficulties using their hands, a few of these include: lever arms, ice tongs, grip wrenches, and fruit and vegetable slicers (Pelc, 2003). These assistive devices have a huge impact on people allowing people with arthritis to live a more independent lifestyle and ultimately improve their everyday functioning.

In a study conducted by Bukhave, Cour, & Huniche (2014), self-invented strategies and environmental support are among the main features of how the participants managed difficulties and challenges that were due to their arthritis. In another study conducted by Bukhave and Huniche (2014), nearly all the participants had experienced a struggle to keep on working. The participants reported little knowledge about assistive devices and their availability, but were arranged to have assistive tools for cooking, eating, grooming, dressing, etc. As a result, participants who had been able to take up lost activities because of the implementation of devices or a well-designed environment, reported great satisfaction. The study also noted limitations for people who were unable to resolve their activity problems or had a lack of social support. Without assistive devices, people tend to look to partners or friends to help with the things that they cannot do themselves, such as buttoning their shirt. The use of assistive devices, activity modifications, and activity pacing were the three most often used strategies to support performance of daily activities noted in one study (Kjeken, et al, 2013). The use of assistive technology was well tolerated and significantly improved activity performance and satisfaction with performance in patients with hand osteoarthritis.

**Conclusion**

The World Health Organization (WHO, 1986) defines the term health promotion as “the process of enabling people to increase control over, and to improve, their health.” Occupational therapy is concerned with helping an individual return to meaningful occupations. The Occupational Therapy Practice Framework-3 states that, “Occupations are central to a client’s identity and sense of competence and have particular meaning and value to that client” (American Occupational Therapy Association, 2014, s5). Research shows that the ability to perform valued life activities plays a substantial role in individual perceptions of health, and that loss of activities may have a negative effect in terms of reduced quality of life and an increased risk of developing depressive symptoms (Kjeken et al., 2013). This shows an increasing importance for occupational therapists to continue to focus attention into supporting people in maintaining valued activities. Osteoarthritis can be very debilitating and when it attacks the joints in a person’s hands, it can affect everything a person would normally be able to do. When one stops to think about life, without the use of one’s hands, the world becomes a lot more difficult to function in. Assistive devices allow people with hand osteoarthritis to continue doing their normal activities. Simple changes and devices can make what was once an unpretentious activity to again be a self-effacing activity.

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