This systematic review of literature examines and synthesizes research findings related to interventions for people with work-related elbow injuries, particularly epicondylitis. It was carried out as part of the Evidence-Based Literature Review Project of the American Occupational Therapy Association. The 11 articles included in this review suggest multiple approaches to intervention but do not provide sufficient evidence to determine which methods or approaches are best practice. Research has provided little evidence to support the use of commonly prescribed interventions for epicondylitis, the most frequently reported work-related elbow injury. Collectively, the evidence to support the use of splinting, exercise, or physical agent modalities is weak and provides little guidance for approaching management of elbow injuries. The implications for education and research are discussed, as is the application of the evidence to clinical practice in occupational therapy.


Focused Clinical Question

What occupational therapy interventions are effective in the rehabilitation of people with work-related injuries or clinical conditions of the elbow?

Objectives of the Evidence-Based Literature Review

The objectives of this literature review were (1) to identify, evaluate, and synthesize the research literature on interventions for work-related elbow conditions of relevance to occupational therapy and (2) to interpret and apply the research literature to occupational therapy.

Statement of Problem and Background

A systematic review of literature regarding work-related musculoskeletal disorders was completed as part of the Evidence-Based Literature Review Project of the American Occupational Therapy Association (AOTA). This topic was selected because workers’ compensation costs associated with work-related injuries have posed major health and economic problems. According to the U.S. Department of Health and Human Services (2006), emergency departments treat nearly 11,000 injured workers every day. Work-related injuries and deaths cost the economy an estimated $155 billion annually.

According to the U.S. Bureau of Labor Statistics (2008), in 2007 the incidence of elbow injuries involving days away from work was 2 per 10,000 full-time workers. The most common form of cumulative trauma at the elbow is epicondylitis. Although little agreement is found on the cause of epicondylitis, clients often present to their primary care physicians with pain (particularly on resisted motion of the wrist) and tenderness over the epicondyle of the humerus. Initially, the physician may treat the symptoms conservatively with rest, ice, and
nonsteroidal anti-inflammatory drugs. Symptoms associated with epicondylitis often persist, becoming chronic and negatively affecting the person’s ability to participate in meaningful occupations. When symptoms persist, the client may be referred to occupational therapy for treatment. The occupational therapist works with the client to determine the course of rehabilitation. The plan of care may include a variety of procedures and methods that will assist the client to return to his or her desired activities.

Occupational therapy practitioners use a variety of interventions that may relieve symptoms and facilitate the client’s safe return to work. Interventions may include range-of-motion (ROM) exercises, stretching and strengthening exercises, bracing or splinting, forearm strapping distal to the epicondyle, ergonomic adjustments to work areas, and pain management using therapeutic heat and cold. In some cases, when occupational therapists are properly trained, physical agent modalities such as ultrasound or iontophoresis may be used. Because the symptoms associated with epicondylitis affect the client’s occupations in different ways, the most effective intervention to meet the client’s needs is often difficult to determine. An evidence-based treatment approach allows the occupational therapist to ensure that the client is receiving the best care possible so that he or she is able to return to work and other desirable occupations. It is imperative that the therapist review available literature to determine the most reliable and effective course of intervention to allow the client to return to participation in valued tasks of daily life.

Method for Conducting the Evidence-Based Review

The portion of the evidence-based literature review reported in this article addresses interventions for work-related elbow injuries and conditions. Detailed information about the methodology followed for the entire workers’ compensation evidence-based literature review can be found in the article “Methodology for the Systematic Reviews on Occupational Therapy for People With Work-Related Injuries and Illnesses” (Arbesman, Lieberman, & Thomas, 2011) in this issue. The results of this aspect of the review are reported as they relate specifically to the elbow. Supplemental Table 1 (available online at www.ajot.ajotpress.net [navigate to this article, and click on “supplemental materials”]) summarizes the articles reviewed and includes information about the objectives, design, procedures, findings, and limitations of the review studies.

Results

Eleven studies were identified through extensive search. Ten studies were determined to be Level I (systematic reviews, meta-analysis, or randomized controlled trials [RCTs]). One study was a Level II study involving two nonrandomized groups. Seven of the studies focused specifically on lateral epicondylitis (LE), and an additional study included both medial epicondylitis and LE. Of the remaining two studies, one was specific to extensor carpi radialis tendonitis, and the other was a study of cubital tunnel release and medial epicondylectomy. Because most of the studies addressed issues related to inflammation of the epicondyles, this review specifically addresses management of epicondylitis.

This review indicates little consensus on the management of epicondylitis. None of the studies identified provided indications of long-term beneficial effects of any of the commonly prescribed interventions for epicondylitis (i.e., splinting, exercise, modalities). Because most of the studies focused on LE, the results are presented in terms of evidence to support interventions for LE, unless otherwise indicated.

Splinting

Conflicting evidence regarding the effectiveness of splinting and orthotics was found in the identified literature. One Level I systematic review cited positive, but not conclusive, support for the effectiveness of splinting for LE (Borkholder, Hill, & Fess, 2004), whereas a Level II cohort study suggested that the use of splints does not necessarily lead to better outcomes and may have adverse effects in treating epicondylitis (Derebery, Devenport, Giang, & Fogarty, 2005). One RCT suggested that the simple elbow band worn under the lateral epicondyle is as effective as the more elaborately designed Thämert splints (van de Streek, van der Schans, de Greef, & Postema, 2004).

Exercise

According to one Level I systematic review, exercise has often been included in studies as a cointervention; thus, results cannot be attributed to exercise alone (Bisset, Paungmali, Vicenzino, & Beller, 2005). Only one study included in the Bisset et al. (2005) review suggested that exercise may diminish pain associated with LE but does not improve grip strength. A single study cited in the Trudel et al. (2004) Level I systematic review indicated that a combination of strengthening and stretching resulted in a statistically significant increase in grip strength. Moreover, Trudel et al. suggested that progressive strengthening

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and stretching programs reduced pain. Smidt et al. (2003), however, concluded from their systematic review that insufficient evidence exists to determine the effect of exercise combined with mobilization techniques. A RCT study by Martinez-Silvestrini et al. (2005) noted that improvement from eccentric strengthening for wrist extensors in patients with LE was not statistically different from that achieved with a conservative program (stretching) or a concentric strengthening program. A single RCT study provided some evidence supporting early intervention as significantly more likely to achieve full active extension and return to work (Warwick & Seradge, 1995).

**Modalities**

The evidence for the use of modalities for the treatment of LE is insufficient. Contradictory results, insufficient power, and the lower number of studies per intervention contributed to this conclusion. The use of modalities in the identified studies included ultrasound, ionization with diclofenac, deep transverse friction massage, and low-level laser therapy.

**Ultrasound.** Two Level I systematic reviews addressed the use of ultrasound for the treatment of LE. Smidt et al. (2003) compared the use of ultrasound with placebo ultrasound and found no statistically or clinically significant differences in favor of using ultrasound to treat LE. The second study, by Bisset et al. (2005), provided some evidence to support short-term benefits (≤3 mo) for use of ultrasound and ionization but no evidence of long-term effects. Bisset et al. suggested that the use of ultrasound, alone or in combination with other treatments, may provide short-term decrease in pain; however, whether the perceived temporary relief of symptoms outweighs the cost of treatment is unclear.

**Ionization.** Only one Level I systematic review addressed the use of ionization for relief of pain associated with LE. Although the findings were not based on the strongest evidence, Trudel et al. (2004) concluded that ionization with diclofenac may significantly reduce pain when used as part of the conservative management approach for LE.

**Deep Tendon Friction Massage.** Deep tendon friction massage has shown little evidence of clinically important benefits. Although Brosseau et al.’s (2002) Level I systematic review suggested that deep transverse friction massage combined with other physiotherapy modalities may reduce tendonitis symptoms, the evidence was weak.

**Laser.** Little evidence supports the use of low-level laser therapy as a treatment for LE, as noted in a Level I systematic review by Trudel et al. (2004) and in a Level I systematic review by Stasinopoulos and Johnson (2005). Bisset et al. (2005) also concluded that the literature contained no evidence of short- or long-term effects of laser treatment.

**Discussion and Implications for Practice, Education, and Research**

Research providing evidence to support management of elbow disorders and conditions is limited. After an exhaustive search, only 11 articles were found that met the criteria for inclusion in this evidence-based review. All but 2 of the studies focused on epicondylitis; thus, the conclusions drawn from this review may not apply to other disorders or conditions of the elbow.

Most of the studies identified for this review focused only on preparatory methods to minimize symptoms associated with elbow injuries and disorders. Preparatory modalities represent a minor component of a comprehensive occupation-based intervention plan to address the client’s return to activities of daily living, instrumental activities of daily living, work, education, and leisure activities. Evidence to support or negate the inclusion of preparatory methods in occupational therapy intervention for the elbow is limited. Although many methods and approaches to conservative therapeutic management of LE exist, the evidence to support a single method or approach is inconsistent. Ionization with diclofenac is likely an effective method for reducing pain (Trudel et al., 2004). Ultrasound may decrease pain for some patients, but the evidence to support ultrasound’s efficacy is weak (Bisset et al., 2005; Smidt et al., 2003). The literature does not support deep transverse friction massage and the use of low-level laser therapy as effective treatments for LE (Brosseau et al., 2002; Trudel et al., 2004).

Evidence regarding splinting has suggested that although it may provide some benefit in treating epicondylitis (Borkholder et al., 2004), it may also have adverse effects (Derebery et al., 2005). This conflicting evidence provides weak support for use of splinting and orthotics in the treatment of epicondylitis. Contributing to this issue may be that existing studies evaluating the effectiveness of splinting vary greatly in their timelines for measurement and different comparison groups (Bisset et al., 2005). Moreover, the types of splints vary significantly, making it difficult to assess the impact of splinting on the course of treatment of elbow disorders or conditions (Borkholder et al., 2004). Although Derebery et al. (2005) found that patients with splints had higher rates of limited work duty, they also concluded that the patients they studied had more medical visits, longer treatment duration, and higher total medical expenses than those workers who did not receive splints.
Several studies have supported exercise to maintain ROM and strength (Bisset et al., 2005; Martinez-Silvestrini et al., 2005; Strujs et al., 2002; Trudel et al., 2004; Warwick & Seradge, 1995). In combination, these studies seem to support exercise as an effective method for reducing pain (Trudel et al., 2004) as well as use of progressive strengthening and stretching programs (Martinez-Silvestrini et al., 2005; Trudel et al., 2004). Warwick and Seradge (1995) provided evidence that early initiation of active exercise facilitated faster recovery and obtaining full ROM. Smidt et al. (2003) provided an alternate perspective suggesting that the best evidence synthesis of the studies included in their review provided insufficient evidence for exercises and mobilization techniques because of low power, poor validity, and large heterogeneity regarding interventions and outcomes. Supervision of exercise programs varied so that noncompliance or poor exercise technique may have affected the conclusions drawn (Martinez-Silvestrini et al., 2005). Clearly, considerable debate regarding the role of exercise in the treatment of epicondylitis still exists.

**Implications for Practice**

This review provides some guidance for practitioners who work with elbow injuries or conditions, but the literature is so limited that one must question the best approach to treatment of symptoms and the resulting functional limitations. Clinical decisions on whether to use modalities, splinting, or exercise have been based on individual needs as they relate primarily to managing the symptoms. Most of the literature examined did not indicate a direct link between any of the approaches and improving function outcomes. Practitioners may need to place more emphasis on documenting the outcomes of methods such as modalities, splinting, and exercises as they relate specifically to outcomes such as work performance or speed of recovery of function.

**Implications for Education**

This review provided the context for addressing management of work-related elbow injuries but did not specifically support particular protocols or approaches that should be included in occupational therapy curricula. Current educational standards defined by the Accreditation Council for Occupational Therapy Education include specific requirements for the most commonly prescribed approaches of modalities, splinting, and exercise. Splinting and exercise are historically more rooted in occupational therapy curricula than in other health profession curricula because their use is more directly related to maintaining positioning, strength, and ROM, which ultimately influence functional outcomes. The use of physical agent modalities has more recently been included in occupational therapy curricula and is often presented in a general way as preparatory methods to ultimately facilitate function. The effectiveness of specific modalities may not be elucidated for specific diagnoses, such as work-related elbow disorders, because diagnosis-specific research that provides the evidence to support the inclusion of these preparatory activities in specific treatment protocols is limited. More important, the literature to date has not addressed the effects of modalities as they influence functional performance. Occupational therapy educators must then be diligent in how they present information specific to functional outcomes after use of preparatory methods.

**Implications for Reimbursement and Policy**

Reimbursement and policy decisions about work-related injuries often result as an attempt to balance the total medical expenses and duration of treatment with the client’s desired outcome related to participation in self-care, work, and leisure activities. Although the evidence for many of the approaches included in this review may be considered weak, some evidence does support their use. The lack of strong evidence should not be the basis for denying services that could alleviate symptoms and promote function or for disallowing reimbursement for service provision.

**Implications for Research**

The results of this evidence-based literature review provide directions for future research on interventions for work-related elbow injuries. Specifically, the findings support the need for occupational therapy practitioners to collect and analyze data related to all aspects of occupational therapy interventions, particularly as interventions affect functional outcomes. In other words, the profession of occupational therapy should investigate the effectiveness of occupational therapy interventions with regard not only to how they affect intervention costs but also to how they affect people’s participation in the self-care, work, and leisure activities they value.

Researchers should consider both qualitative and quantitative methods for analyzing how the most frequently prescribed interventions (modalities, splinting, and exercise) address symptom relief and ultimately contribute to improvements in functional performance. Ideas for future research efforts are as follows:

- Investigating whether the functional outcomes from the use of modalities to relieve symptoms of elbow injuries warrant their inclusion in occupational therapy treatment protocols.
• Designing and implementing functional outcome studies to measure the effectiveness of occupational therapy interventions for clients with work-related injuries
• Comparing and contrasting early intervention strategies for acute symptoms of elbow injuries with later traditional interventions to determine whether early intervention facilitates a quicker return to life activities and reduces overall medical expenses
• Designing and implementing intervention studies that directly relate the use of preparatory methods to functional outcomes
• Defining timelines for measurement and, perhaps, classifying splints to provide a stronger basis for evaluating effectiveness
• Comparing the use of pure exercise with participation in functional activities to determine whether the different approaches result in similar functional outcomes, time needed to return to work, or total medical costs.

Limitations
In general, several factors limited the studies selected on the basis of a systematic review of existing literature. Most of the studies focused on acute intervention with limited follow-up time. Heterogeneity of the studies limited pooling of data to provide stronger evidence. Many reviews included a small number of studies, thus affecting the strength of the evidence. The quality of the studies included in the existing systematic reviews varied. Although the quality of the included studies was satisfactory, they had methodological shortcomings that limited drawing of conclusions.

Conclusions
An evidence-based management approach to work-related injuries was not evident in the literature reviewed. Literature that met the inclusion criteria for this review was limited. The design and implementation of research studies varied greatly, making synthesis of the data difficult. This review of the literature found only weak evidence to inform and support the efficacy of occupational therapy interventions for the treatment of elbow injuries in clinical practice. Educational programs should focus not only on teaching the use of preparatory methods but also on relating those methods to potential impact on function. Future research efforts should be directed toward defining the parameters for outcomes research, perhaps using a national database that consistently records outcome data. ▲

References