

Occupational Hand and Thumb Injuries: A current review of the prevalence and proposed prevention strategies for physical therapists and similar healthcare professionals.

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Abstract

Hand injury is the second most common work-related musculoskeletal injury among physical therapists (PTs) and other manual therapy professionals such as osteopaths, physiotherapists, chiropractors, acupuncturists and massage therapists. However, the nature and extent of this problem have not been fully explored yet. Therefore, the objective of this study was to review the existing literature published on the prevalence, risk factors, consequences, and prevention of hand injuries among PTs and similar healthcare professionals. The lifetime prevalence of hand injuries was about 15–46%, and the annual prevalence was reported as 5-30%. Thumb injuries were found to be the most prevalent of all injuries, accounting more than 50% of all hand-related problems. The most significant risk factors for job-related hand injuries were performing manual therapy techniques, repetitive workloads, treating many patients per day, continued work while injured or hurt, weakness of the thumb muscles, thumb hypermobility, and instability at the thumb joints. PTs' reported modifying treatment technique, taking time off on sick leave, seeking intervention, shifting the specialty area, and decreasing patient contact hours as the major consequences of these injuries. We recommend that PTs should develop specific preventive strategies and put more emphasis on the use of aids and equipment to reduce the risk of an unwarranted injury.

1 Introduction

Occupational injuries affect professionals from almost every industry. Workers in the healthcare and social-assistance industry sectors, however, are injured more often than any other sectors, accounting 5.2 cases per 100 full-time workers^[1]. These injuries can severely damage various bodily parts such as hand, the head, eyes, neck, shoulder, spine, foot, to name a few. A full review of all the body parts affected by occupational injuries is beyond the

scope of this paper. The focus of this review is occupational hand injuries among healthcare workers as a result of using professional manipulation and similar techniques on patients.

Work-related hand and finger injuries are the most frequent bodily trauma that professionals from various industries sustain at work^[2-4]. These injuries can be disabling and have an enormous impact on the overall quality of life, as they often lead to serious social and economic consequences for not just workers but also their families^[5, 6]. In prior studies, it has been reported that these injuries lead to work restriction, prolonged sick time, changing of work settings, and even a career shift^[7-10].

Hand injuries are common among healthcare workers involved in direct patient handling activities. In general, nursing assistants, physical therapists (PTs), and similar healthcare professionals are more prone to these injuries^[11, 12]. According to the Bureau of Labour Statistics^[1], nursing professionals are at highest risk of work-related nonfatal musculoskeletal injuries. PTs, on the other hand, are at moderately high risk of nonfatal musculoskeletal disorders, hand injuries being one of the significant health problems^[2, 7]. PTs and their assistants are more susceptible to these injuries due to their physically demanding job duties and labour-intensive tasks. The practice involves prolonged constrained postures, patient transfers and lifting, repetitive tasks, application of high velocity forces, and bending/twisting postures during certain manoeuvres^[12, 13].

Existing studies on PTs have indicated the job tasks that might lead to hand injuries. Some organisations are already addressing this issue with institutional policies and programs as well as industry education. These policies and programs provide health care workers with specific guidelines to move patients and clients in a way that does not cause strain or injury. However, because the severity and extent of these injuries among PTs are not fully explored yet, the best practice guidelines provided therein are not up to the mark yet. Therefore, the aim of this paper is twofold. The first purpose is to review the literature relating to the prevalence, risk factors, and consequences of hand injuries among PTs and similar healthcare professionals. The second purpose is to describe preventive strategies that could be used by PTs to reduce the risks of developing hand injuries.

2 Prevalence

The prevalence of hand injuries among PTs and similar healthcare providers varies between studies [see Table 1]. In general, the estimated lifetime prevalence of wrist and hand injuries is approximately 15–46%^[12, 14-17], and the 12-month prevalence is reported to be between 5% and 30%^[12, 14, 18-22]. The differences from study to study, however, could be due to the considerable variations in the designs and methodologies of these studies. The variations also exist in the way occupational hand injury is defined in these papers. For example, some studies considered thumb injury as a part of hand injury, while others described them separately. Hence, some authors have found hand injury as the second most common work-related injury^[7, 9, 16, 18], whereas others reported it as less frequent than low back, neck, shoulder, and/or upper back injuries^[12, 19, 22, 23].

Table 1. Prevalence of Hand Injuries among PTs and Similar Professionals

Study	Population	Subjects (n)	Body Part	Prevalence (%)
Holm and Rose[24]	Chiropractors	1000	Wrist/hand/finger	42.9 (lifetime)
Cromie et al.[19]	PTs	536	Thumb	33.6 (1-year)
			Wrist/hand	21.8 (1-year)
Bork et al.[18]	PTs	928	Wrist/hand	29.6 (1-year)
Holder et al.[7]	PTs and PTAs	623	Wrist and hand	23 (PTs) (2-year) 15 (PTAs) (2-year)
Rugelj[15]	PTs	133	Wrist/hand	15 (lifetime)
Salik and Ozcan[16]	PTs	120	Wrist/hand	18 (lifetime)
Glover et al.[12]	PTs, PTAs, and PT students	2,688	Thumb	23 (lifetime) 17.8 (1-year)
			Wrist/hand	17 (lifetime) 12.5 (1-year)

Campo et al.[9]	PTs	882	Wrist and hand	5.3 (1-year)
Adegoke et al.[20]	PTs	126	Thumb	11.1 (1-year)
			Wrist/hand	20.6 (1-year)
Alrowayeh et al.[22]	PTs	212	Wrist/hand	11 (1-year)
Rozenfeld et al.[17]	PTs	112	Wrist and thumbs	46.2 (lifetime)
Darragh et al.[21]	OTs and PTs	3297	Hand	21 (OTs) (1-year) 20 (PTs) (1-year)
West and Gardner[14]	PTs	217	Hand	25 (lifetime) 14 (1-year)
Wajon and Ada[29]	PTs	155	Thumb	83 (1-year)
McMahon et al.[30]	PTs	961	Thumb	65 (lifetime)
Jenkins and Myezwa[31]	PTs	395	Thumb	65.3 (lifetime)

Note. PTs = Physical therapists; PTAs = Physical therapy assistants; OTs = Occupational therapists.

The prevalence of hand injuries is high among chiropractors. A survey conducted by Holm and Rose^[24] reported that wrist/hand/finger injury was one of the three most serious injuries sustained by doctors of chiropractic in their overall career. In fact, the authors found injuries to the hand, wrist, and fingers (42.9%) to have the highest prevalence, followed by shoulder (25.8%), and low back (24.6%). Similar findings were reported by two other earlier studies on work-related injuries of chiropractors^[25, 26], although Homack^[26] did not actually combine the wrist, hand, and finger percentages in his study. In a more recent study by Ndetan et al.^[27], it was reported that hand/wrist injuries were the second most prevalent musculoskeletal injuries among chiropractic students, preceded by neck/shoulder.

3.1 Thumb

The thumb has special functions (e.g. opposition, reposition, palmar abduction, and radial abduction) and accounts for up to 50% of overall hand use^[28]. It is also the most frequently injured part of the hand, accounting more than half of all hand-related injuries among PTs^[14].

This is not surprising given the fact that many manual therapy techniques utilise this digit more often than other digits. In addition, studies on PTs that described thumb and hand injuries separately reported higher incidence of injuries to the thumb than wrist/hand. Cromie et al.^[19] found that the annual prevalence of injuries to the thumb and wrist/hand were 33.6% and 21.8%, respectively. In a later study, Glover et al.^[12] also described similar findings. The authors reported that the lifetime prevalence of thumb injuries was 23% whereas the prevalence of wrist/hand injuries was 17%.

The prevalence of thumb injuries in PTs and similar professionals varies widely from study to study [see Table 1]. Direct comparison of the findings of these studies is extremely challenging. This is because of the variations in the study designs and methodologies and the differences in the definition of thumb injury. For example, while Glover et al.^[12] conducted their survey on a randomly selected sample, the survey sampling of Rozenfeld et al.^[17] was non-random. In general, the lifetime prevalence of thumb injuries is around 23-65%^[12, 30, 31], and the 12-month prevalence ranges between 11% and 83%^[12, 17, 19, 20, 29].

3 Risk Factors

PTs and similar healthcare professionals perform a wide variety of work-related activities, and many of these job tasks lead to occupational hand injuries. Table 3 illustrates some of the potential job-related factors that contribute to the development of wrist/hand/thumb injury. Other risk factors that are frequently described in the literature include age, gender, body mass index (BMI), and the type of clinical setting.

4.1 Work-related Activities

The job risk factors that contribute to the development of wrist/hand injuries in PTs and similar professionals include a variety of work activities [see Box 1.]. Of these, performing manual therapy techniques, treating a large number of patients per day, and repetition of the same work over and over have been found to be the three most significant job-related risk factors^[7, 12-14, 17-19, 32]. Rozenfeld et al.^[17] reported that 85% PTs identified repetition of same the task as the most significant risk factor that contributed to their injuries. Campo et al.^[19] found that manual techniques that frequently increased the risk for wrist and hand problems among PTs were joint mobilisation, soft tissue work, and passive range of motion. Of the 3

techniques, however, soft tissue work was identified as the most hazardous risk factor of all. The odds for developing hand/wrist injuries in PTs who routinely performed soft tissue techniques were 13.61 times higher than those who did not perform these techniques.

Box 1. Job Risk Factors Contributing to Wrist/Hand/Thumb Injury

<ul style="list-style-type: none"> • Performing the same task over and over • Performing manual therapy techniques • Treating an excessive number of patients per day • Not enough rest breaks during the day • Increasing thumb use • Continuing to work while injured or hurt 	<ul style="list-style-type: none"> • Working in the same position for long periods • Working in awkward or cramped conditions • Lifting or transferring patients • Working at or near physical limits • Reaching or working away from the body • Inadequate training to prevent injury
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Significant job-related risk factors associated with thumb problems include manual and manipulative techniques, trigger point therapy, massage therapy, repetitive workload, treating many patients per day, thumb hypermobility, and an inability to stabilise the thumb joints while performing physiotherapy^[14, 19, 30, 33-35]. In the literature, however, performing manual therapy techniques have been identified as a significant risk factor for the development thumb injuries among PTs. In a study of Irish PTs, it was found that 56% of the participants developed thumb pain as a result of manual orthopaedic work^[33]. Similar findings were reported by Bork et al^[18], Cromie et al.^[19], McMahon et al.^[30], Caragianis^[34] and Reglar and James^[36]. All these studies suggested manual orthopaedic techniques, mobilisation/manipulation, and massage as the leading risk factors for thumb problems. Snodgrass et al.^[35] reported that 100% of the participating PTs attributed their thumb injuries to manual techniques, particularly posterior to anterior spinal mobilisation and soft tissue massage. In addition, Wajon and Ada^[29] found that 83% of PTs who performed spinal manipulative therapy, unilateral and central posteroanterior glides in particular, sustained a thumb problem.

Thumb hypermobility, weakness of the thumb flexors/extensors/abductors, and instability at the thumb joints have been reported as potential risk factors for thumb pain/discomfort among PTs. Snodgrass et al.^[35] found that PTs in the thumb pain group had increased mobility at the thumb carpometacarpal joint compared to those in the non-pain group. The

authors also stated that the weakness of the thumb muscles, instability at the thumb joints, and hand-position during application of manual techniques have a correlation with thumb problems of PTs. In a later study, similar findings were reported by Australian physiotherapists^[30]. Wajon et al.^[37] suggested that thumb alignment while performing posteroanterior pressures has an association with job-related thumb pain. Wajon and their colleagues also reported that PTs who were less likely to report thumb pain were the ones able to keep their metacarpophalangeal (MP) and interphalangeal (IP) joints in extension. Furthermore, in a recent study, it was found that massage therapists with thumb pain had a significantly decreased extensor and flexor muscle strength than those without thumb pain and control subjects, respectively^[38]. Taken together, it can be said that there may be a correlation between thumb pain and application of manual techniques. However, such correlation may not indicate causation. This is because the incidences of job-related thumb pain mentioned above were often associated with a decreased strength and stability of the thumb.

4.2 Age

The age of PTs may have an effect on the prevalence of hand injuries. It has been reported in a number of studies that younger PTs are more prone to wrist/hand/thumb problems than older PTs^[12, 14, 16, 19, 22]. In an earlier study, Holder et al.^[7] also reported similar findings. The authors found that PTs and PTAs of 21- to -30 year age group had a higher prevalence of work-related musculoskeletal problems. In contrast, some studies have also reported that they found no statistical correlation between age and increasing prevalence of wrist/hand/thumb pain^[9, 29, 30].

4.3 Gender

The effect of gender as a potential risk factor for wrist/hand/thumb injuries of PTs has been controversial. While some studies found a higher prevalence of wrist/hand injuries among female PTs than their male colleagues^[12, 18, 22, 23], other studies did not find any significant association between the prevalence of wrist/hand problems and the gender of PTs^[16, 17, 21]. In PTs with thumb problems, however, Glover et al.^[12] reported that the prevalence of injuries was similar between male and female. In contrast, two studies reported a significantly higher incidence of thumb injuries among male PTs^[19, 30]. The authors of these studies argued that

this might be due to fact that male PTs often perform more manual therapy techniques than did female PTs. Nevertheless, some studies also found no correlation between gender and thumb pain/discomfort^[17, 29, 34, 35].

4.4 BMI

Because having a low BMI is disadvantageous for handling and treating large patients, it has been thought to be a contributing factor for hand injuries of PTs. Snodgrass et al.^[35] found that a low BMI of PTs was associated with an increased prevalence of thumb injury. Two later studies have also reported similar findings^[17, 22]. However, evidence to support this claim is still limited, as no other study has so far reported BMI as a potential risk factor for hand/wrist injuries among PTs.

4.5 Work Settings

PTs and similar healthcare professionals practice in a wide range of clinical settings, and the physical workloads differ depending on the area of specialty^[39]. Hence, the prevalence of hand/wrist problems among PTs varies across various work settings. In general, outpatient therapists are reported to be more prone to hand/wrist/thumb problems than those working in other settings. In a study on PTs and PTAs, it was found that 38% of PTs working in nursing homes and 32% of PTs in outpatient clinics sustained a wrist/hand injury; in contrast, only 13% of PTs in hospitals and 0% in home-based care had a similar problem^[7]. It has also been reported that PTs working in outpatient settings, especially private practitioners, had a higher prevalence of wrist/thumb injuries than others^[9, 12, 16, 19, 30, 36]. Another major area of specialty that is often associated with hand/wrist problems is rehabilitation hospital/clinic^[16, 22].

4 Consequences of Injury

The most common consequence of hand/thumb injury among PTs has been “modifying treatment techniques.” Studies reported the percentages of technique changes to be about 42-91%^[12, 14, 19, 33, 34]. Another major consequence of hand injuries in PTs is “taking time off on sick leave.” However, the rates of sick leave due to injury vary widely from study to study, and the responses range from 1.6% to 27%^[7, 9, 12, 14, 22]. The variations in findings can be

attributed to the methodological differences between studies, dissimilarities in study population, varying clinical settings, and/or different geographic locations.

In addition, many PTs stated that they chose to seek medical treatment, minimise patient contact hours, increase use of mechanical aids, modify work schedule, alter their specialty area, change the type of patients treated, and take more rest breaks as a result of hand/wrist injury^[12, 16, 34]. For example, West and Gardner^[14] found that 91% of the hand-injured PTs changed their techniques, 55% used splints, braces, or other orthoses, and 45% sought treatment by medical doctors. Caragianis^[34] reported that 42.5% of the affected therapists altered their work hours or techniques due to injury, and nearly 66% undertook treatment. In relation to thumb pain/discomfort, Wajon and Ada^[29] found that 74% of the therapists modified their physiotherapy techniques to alleviate symptoms, 29% used splints or taping, and 25% decreased their patient contact hours. In an earlier study, Reglar and James^[36] also reported similar findings. Furthermore, McMahon et al.^[30] documented that 19% of the respondents altered their work settings because of thumb injury.

The number of PTs leaving the physiotherapy or similar professions as a result of wrist/hand injury is extremely low. Cromie et al.^[19] found that only 3.2% PTs left the profession due to work-related musculoskeletal injury. This trend has been reflected in earlier and later studies. In a study done on Australian PTs, it was reported that out of 117 respondents, only 3 left the profession and 1 retired early because of health reasons^[14]. Another study noted that only 1% of the PTs took early retirement or left the profession because of an occupational injury^[12]. Two more studies also indicated similar findings. In one study, it was found that 4% of the respondents made a career change due to thumb problems^[30], and the other study reported that out of 882 PTs, only 1 (0.1%) physiotherapist with a wrist/hand problem left the profession^[9]. Except for these two papers, however, none of the above studies directly linked hand injuries with leaving the profession; the estimations were primarily based on musculoskeletal injuries. Therefore, the actual consequence of wrist/hand problems in relation to career change among PTs is still unknown.

5 Prevention Strategies

A number of studies have suggested preventive strategies for PTs and similar health professionals to cope with the work-related wrist/hand/thumb injuries^[7, 13, 16, 17, 21, 34, 40, 41]. None of these papers, however, demonstrated a statistical association between the strategies and injury prevalence.

Based on the implications described in the literature^[16, 17, 19, 40, 42], we suggest that hand-injured PTs could adopt the following four types of preventive strategies to avoid re-injury.

- a) *Outsourcing strategies* were first proposed by Cromie et al.^[19]. The authors suggested that PTs could shift all or part of their physical workload to another person as self-protective behaviours. For example, they can obtain help in lifting/transferring patients by using PTAs.
- b) *Workplace strategies* include minimal lift and/or no manual lift approach, ergonomic design of the work-station, use of aids and equipment (e.g. mechanical lift devices, height-adjustable plinths or beds, thumb splints, and mobilisation wedges), frequent training or workshops on proper patient handling, and more rest breaks in the work schedule.
- c) *Personal strategies* include use of proper body mechanics, modifying practice technique, performing warm-up exercises and muscle relaxation techniques, strengthening thumb muscles, using the ulnar border of the hand, reinforcing hands/thumbs with splints or tape, avoiding stressful positions, changing position while providing the therapy, taking regular rest breaks, avoiding excessive workload, and reducing the patient contact hours.
- d) *Reactive strategies* are preventive measures developed by PTs as a result of injury or perceived risk of injury. These strategies involve performing alternative activities that help avoid aggravating factors. For example, using the pain-free thumb instead of the affected thumb to protect the latter from overuse, or substituting some physiotherapy technique with electrotherapy.

Additionally, since manual soft tissue work is reported as the most substantial risk factor for hand/wrist injuries among PTs^[9], we encourage the use of instrument-assisted soft tissue mobilisation (IASTM) to decrease exacerbation of hand pain/discomfort. IASTM is an advanced soft tissue treatment technique to efficiently detect and treat soft tissue pathologies of muscle, ligament, tendon, and fascia. It provides therapists with a mechanical advantage, allowing deeper penetration, increased vibration sense, rapid localisation, and more effective

treatment^[43-46]. The therapy is also known to decrease imposed stress of manual therapies on PTs' hands^[44, 47, 48]. However, although IASTM tools may provide some degree of protection to the hand, the safety and efficacy of them have not been studied in depth. Therefore, more studies need to be conducted to establish IASTM as a potential alternative to manual soft tissue mobilisation.

6 Conclusion

In this study, we have presented descriptive data on the work-related hand injuries of PTs and similar healthcare professionals. Most of the studies we reviewed, however, were focused primarily on PTs, although we also covered a few papers on other practices. We found that the annual and lifetime prevalence of wrist/hand/thumb injuries among PTs is high, and the most significant work-related risk factor that contributed for developing an injury was performing manual therapy techniques, particularly soft tissue work. We believe PTs should develop specific preventive strategies and take appropriate safety measures to reduce the risk of an undue injury. We also encourage the use of aids and equipment such as mechanical lifts, splints, and IASTM to minimise the imposed stress of manual techniques on PTs' hands. However, further research is needed to evaluate the potential benefits of using these devices.

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