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Review Article

Allied Health Professionals and Work-Related Musculoskeletal Disorders: A Systematic Review

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A B S T R A C T

Work-related musculoskeletal injuries and disorders (WMSD) are a significant issue in the health care sector. Allied Health professionals (AHP) in this sector are exposed to physical and psychosocial factors associated with increased risk of developing a WMSD. Clarification of relevant hazard and risk factors for AHP is needed to improve understanding and inform WMSD risk management. A systematic analysis of the literature was undertaken to determine prevalence and risk factors for WMSD in AHP. Databases of Ovid MEDLINE, CINAHL (EBSCO), EMBASE and the Cochrane Database of Systematic Reviews were reviewed. This quality of articles was low. Outcome measures were varied, with prevalence rates of WMSD reported from 28% to 96% over a one-year time period. The lower back was the most commonly affected body part. Relevant factors identified with the development of WMSD included inexperience in the role and area of employment. Future research needs to focus on undertaking high quality prospective studies to determine the factors associated with WMSD development in AHP.

1. Introduction

Work-related musculoskeletal injuries and disorders (WMSDs) are a significant issue in the health care sector [1]. Within this sector, allied health professionals (AHPs) are important providers of services for individuals who are sick or injured, or have a disability. AHPs comprise occupational groups that have similar job roles, levels of job satisfaction, and issues concerning work life balance and staff retention [2–8]. The allied health professions include those of physiotherapists, occupational therapists, speech pathologists, prosthetists and orthotists, dieticians, sonographers, social workers, osteopaths, audiologists, radiologists, exercise physiologists, perfusionists, and, under some definitions, chiropractors [9]. AHPs undertake a variety of work activities and are exposed to a range of hazards and risks associated with a higher chance of WMSD development [10,11]. Despite the large body of evidence that supports the role of physical and psychosocial factors in the development of WMSDs [12], the literature on allied health has largely focused on the former [13–18]. To date, a comprehensive examination of the literature relating to this professional group has not been undertaken in relation to WMSDs, a gap this review aims to address. The health care literature provides a useful lens to examine the relationship between work environment and development of WMSDs in AHPs.

A substantial overlap exists between a range of work activities undertaken by health care workers, such as nurses and AHPs. Both roles involve physically demanding work and exposure to a range of psychosocial hazards [10,11,19,20] such as high workloads, time pressure, or limited job control. However, strategies designed to prevent WMSDs in the health care sector have largely focused on minimizing physical hazards and risks, such as lifting or transferring of patients [19,21]. This mismatch between potential WMSD causal factors and risk management strategies may, in part, explain the high numbers of WMSDs reported in the health care sector, despite extensive efforts to reduce their prevalence.

The multifactorial nature of WMSD development requires identification of a range of causal factors relevant to the population group, in this instance AHPs. This information can then be used to guide the development of effective strategies to reduce hazards and risks for WMSD. The current focus on physical aspects of work necessarily limits the development of a multifactorial prevention approach. In the first instance, improved understanding of what are the key issues is needed to inform prevention strategies.

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An additional factor, not restricted to the health care sector, is the over-reliance on compensation data to inform risk management strategies [22]. In health care, previous research [11,23,24] has reported that health care workers are reluctant to report injuries, and as such compensation data are likely to under-represent actual injury rates. Furthermore, the complex and cumulative nature of WMSD development means that attribution of causation is challenging, and compensation data do not capture this information accurately [22].

To improve the understanding of key issues for AHPs in relation to the development of WMSDs, a systematic review of the available literature is needed. This systematic review has two aims: first, to determine the prevalence of WMSDs, and second, to identify hazard and risk factors associated with the development of WMSDs.

2. Materials and methods

2.1. Quality assessment

The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) checklist and diagram (see Fig. 1) were used to conduct the systematic review to ensure complete, transparent, and unbiased reporting. Quality assessments were undertaken using one of the following tools, depending on the study design: the Critical Review Form for Quantitative Studies [25], the Critical Review Form for Qualitative Studies [26] from McMaster University, and, for systematic reviews, the Critical Appraisal Skills Programme [27]. These quality checklists were used to assess the risk of bias, research design, and rigor of the included studies.

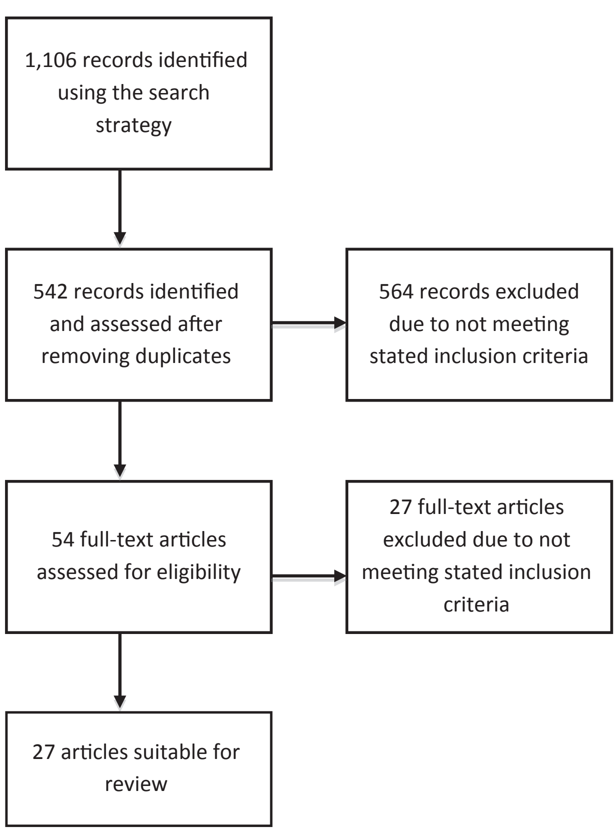

Fig. 1. Flow chart.

2.2. Data extraction

One reviewer (S.A.) assessed the title and abstract of each study to determine if it met the inclusion criteria. All excluded abstracts were then assessed by a second reviewer to ensure no accidental exclusion of relevant articles. Full papers were then reviewed and those that did not satisfy the inclusion criteria were excluded (Fig. 1).

The following characteristics of included studies were extracted and described: study design, occupation, location, sample detail, outcome measure, prevalence measure, risk factors identified, body area affected, and the consequence of injury for the individual.

2.3. Search strategy

Following the PRISMA guidelines, a search protocol was developed, identifying analysis and inclusion/exclusion criteria. A search of the literature was conducted in March 2016, using Ovid MEDLINE (1948–March 2016), CINAHL (EBSCO) (1937–March 2016), EMBASE (Ovid) (1947–March 2016), and the Cochrane Database of Systematic Reviews (1991–March 2016). Databases were searched from inception to March 2016, for articles in English language. Reference lists from identified papers were hand searched to ensure that all relevant papers were identified.

A search using Medical Subject Headings (MeSH) terms (exploded) and free text words was performed, including appropriate acronyms and synonyms, relevant truncations, and wildcard symbols, to ensure that all spellings and variations of root words were taken into account. The search terms used are listed in Table 1. Allied health titles were selected using definitions from the AHP Australia [9] (Table 1).

2.4. Inclusion criteria

For inclusion in the current review, studies required a focus on AHPs, to have reported WMSD prevalence rates or measured

Table 1
Key search terms and search strategy

Subject heading	(1) Exp. occupational health (2) Exp. occupational disease (3) Exp. occupational accident
Keywords	(4) Workplace or occupational injur* or occupational disease* or occupational health
Combine	(5) 1 or 2 or 3 or 4
Subject heading	(6) Exp. musculoskeletal disease (7) Exp. musculoskeletal injury
Keywords	(8) Musculoskeletal disease* or musculoskeletal disorder* or musculoskeletal injur* or MSI or MSD
Combine	(9) 6 or 7 or 8
Subject heading	(10) Exp. paramedical profession (11) Exp. physiotherapy (12) Exp. occupational therapy
Keywords	(13) “Allied health” or physiotherap* “physical therap*” or “occupational therap*” or podiatr* or “speech patholog*” or osteopath* or audiolog* or chiropractor* or dietic* or psychologist or “exercise physiology*” or prosthet* or orthot* or perfusionist* or “social worker*” or songograph* or “genetic counselor*” or “music therapist*”
Combine	(14) 10 or 11 or 12 or 13
Limit	(15) English language
Combine	(16) 5 and 9 and 14 and 15

Exp, exploded; MSD, musculoskeletal disorder; MSI, musculoskeletal injury.
* Truncation that allows a literature search to include multiple forms of a word including singular, plural and variable spellings.

Table 2
Study characteristics

Authors	Study design	Occupation	Place of study	Sample details	Outcome measure
Adegoke et al 2008 [32]	ORCSD	PT	Nigeria	$n = 126$, F = 46, M = 80	Survey based on Cromie et al [33] and West and Gardner [34]
Alnaser 2007 [35]	Systematic review	OT	NA		
Alrowayeh et al 2010 [36]	ORCSD	PT	State of Kuwait	$n = 212$, F = 99, M = 113	Self-designed three-part survey; Part 3 based on Kuorinka et al [37]
Bork et al 1996 [13]	ORCSD	PT	USA	$n = 928$, F = 483, M = 445	Self-designed survey aspects based on Kuorinka et al [37]
Campo et al 2008 [38]	Observational prospective cohort 1 y follow-up	PT	USA	$n = 881$, F = 627, M = 254	Self-designed survey based on Blair [63] and Kuorinka et al [37]
Campo et al 2009 [14]	ORCSD	OT	USA	$n = 881$, F = 627, M = 254	Self-designed survey based on Blair [63] and Kuorinka et al [37]
Cromie et al 2000 [33]	ORCSD	OT	Australia	$n = 536$, F = 418, M = 118	Self-designed survey WMSD aspect based on Kuorinka et al [37]
Cromie et al 2002 [39]	In-depth interviews	OT	Australia	$n = 18$, F = 15, M = 8	
Darragh et al 2009 [40]	ORCSD	OT & PT	Australia	$n = 1{,}158$, F = 997, M = 161 OT477 PT = 681	Self-reported injuries based on Holder and Clark [64], Campo et al [38] used to identify WMSD
Dyrkacz et al 2012 [41]	ORCSD	OT	Canada	$n = 600$, F = 571, M = 29	Self-designed
Glover et al 2005 [42]	ORCSD	OT	UK	$n = 2{,}688$, F = 2,150, M = 538	Based on Cromie et al [33], West and Gardner [34], and Kuorinka et al [37]
Grooten et al 2011 [43]	ORCSD	PT	Sweden	$n = 133$, all females	
Hill et al 2009 [44]	ORCSD	Sonographers	USA	$n = 26$, all females	Self-designed, four parts: (1) demographics; (2) based on Kuorinka et al [37]; (3) work habits; (4) job demand
Islam et al 2015 [45]	ORCSD	OT & PT	Bangladesh	$n = 101$, F = 47, M = 53	Self-designed, two parts: (1) sociodemographic details & (2) discomfort survey by Workplace Safety and Prevention Services
Kumar et al 2004 [46]	ORCSD	X-ray technologist	Italy	$n = 20$, F = 18, M = 2	Self-designed based on Kumar (unpublished survey)
Lorusso et al 2007 [47]	ORCSD	X-ray technologist	Italy	$n = 203$, F = 45, M = 158	Self-designed based on Kumar (unpublished survey), Kuorinka et al [37], and the Karasek [65] model of demand/control
Losa et al 2010 [48]	ORCSD	Podiatrists	Spain	$n = 421$, F = 274, M = 147	Self-designed, three parts:(1) based on Kuorinka et al [37]; (2) sociodemographic variables; (3) pain on the Borg CR-10 scale
Nordin et al 2011 [49]	ORCSD	PT	Malaysia	$n = 81$, F = 63, M = 18	Based on Kuorinka et al [37]
Passier and McPhail 2011 [50]	ORCSD	OT	Australia	$n = 46$ All female	Based on Cromie, Robertson [33]
Passier and McPhail 2011 [51]	Quality survey & focus groups	OT & PT	Australia	$n = 112$, F = 94, M = 18 OT = 46, PT = 66	Self-designed
Rozenfeld et al 2010 [16]	ORCSD	PT	Israel	$n = 112$, F = 82, M = 41	Based on Cromie et al [33]
Rugelj 2003 [52]	ORCSD	PT	Republic of Slovenia	$n = 133$, F = 127, M = 6	Self-designed
Salik and Ozcan 2004 [53]	ORCSD	PT	Turkey	$n = 120$, F = 92, M = 28	Based on Cromie et al [33]
Sharan and Ajeesh 2012 [17]	Systematic review	PT			
Sin Ho et al 2013 [54]	ORCSD	PT	Korea	$n = 157$, F = 74, M = 83	Based on Adegoke et al [32]
Vieira et al 2016 [18]	ORCSD	PT	USA	$n = 121$, F = 82, M = 39	Based on Cromie et al [33]
West and Gardner 2001 [34]	ORCSD	PT	Australia	$n = 217$, F = 178, M = 39	Self-designed

F, female; M, male; ORCSD, observational retrospective cross sectional design; OT, occupational therapy; PT, physiotherapy; WMSD, work-related musculoskeletal injury and disorder.

hazard and risk factors related to the development of WMSDs across all body sites. Only articles from peer-reviewed journals were included. Letters to the editor, guidelines, case reports, and editorials were excluded. Study designs included experimental, observational, and qualitative studies and systematic reviews. Gray literature was examined to inform the research but excluded from the systematic review.

Four articles were excluded from the current review, as they focused on specific joints such as the hand or upper limb and did not meet the inclusion criteria of WMSDs across all body sites [28–31].

3. Results

Twenty-seven articles (Table 2) met the inclusion criteria for the current study: 22 retrospective observational cross-sectional design articles, one prospective cohort studies with 1-year follow up, two reviews, and two qualitative articles. No relevant randomized control trials or meta-analysis papers were identified.

Two reviews [17,35] were examined using the Critical Appraisal Skills Programme tool [27], were found to lack rigor in research design, and did not report conclusive findings. Both reviews lacked a clear methodology and did not have well-documented search protocol or assessment of risk of bias. As such, evidence from these reviews was not included in the current review.

The majority of articles using cross-sectional surveys, appraised using the critical appraisal tool for quantitative research [25], were of high quality and addressed the issues of bias within the papers. However, as these papers were observational and retrospective, a risk of selection and recall bias [55] is possible within the research process.

A number of studies [16,33,34,42,50] examined both career and 1-year prevalence to address the risk of recall bias (Table 3). The similarity in the findings between the two prevalence measures and associated likelihood of recall bias is discussed further within the findings. Inclusion of whole cohort groups within all these studies goes some way to addressing the issues of bias in the selection of participants.

Cohorts within this review were state, region, and country based, and were most commonly restricted to the registered professional groups, for example, the Australian Physiotherapy Association [33]. These observational cohort studies scored poorly in the area of research rigor, primarily due to nonreporting of statistical significance. However, the outcome measure of prevalence rates is not impacted by statistical significance. All studies were observational, and as such evaluation of interventions was not relevant. Two qualitative articles were appraised for the review; one article used one-on-one interviews [39] and the other an open-ended survey with follow-up focus groups [51]. Both articles were assessed using the critical tool for qualitative research [26]; no significant methodological flaws were identified in the studies. Conclusions drawn from the findings of these two studies were limited due to the small sample sizes.

Sample sizes ranged from 18 [39] to 2,688 [42] (Table 2). Sixteen professions [9] were included in the initial literature search; however, only five professional groups were represented in the articles reviewed for this study. The breakdown of professional groups included was as follows: physiotherapists—18, occupational therapists—five, podiatrist—one, sonographer–one, and X-ray technologists—two. Research was conducted in a variety of geographical locations including Australia [33,34,39,40,50,51], the United Kingdom [42], the United States of America [13,14,18,38,44], Nigeria [32], the State of Kuwait [36], Malaysia [49], Sweden [43], Korea [54], Turkey [53], the Republic of Slovenia [52], Israel [16], Italy [46,47], Canada [41], Spain [48], and Bangladesh [45]. Gender differences within study populations reflected the professional group work populations of those specific countries. Four studies, undertaken in Nigeria, the State of Kuwait, Korea, and Bangladesh, had a higher ratio of males to females in their sample populations [32,36,45,54]; this reflects the underlying gender distribution of the target populations of those countries. For example, in Australia, females outnumber males in professions, such as physiotherapy (77% females vs. 33% males [56]), while in Nigeria, male physiotherapists outnumber females (37.7% females vs. 62.3% males [32].

3.1. Outcome measures

Studies in this review that employed a cross-sectional research design reported the use of a survey tool. However, clear description of survey content and the outcome measures used were not consistently reported across the studies in this review (Table 2). The standardized Nordic questionnaire was the most commonly used measure to identify body location and frequency of musculoskeletal symptoms [37]. Variation in survey content and limited detail on question content make comparisons of outcomes difficult between the included cross-sectional studies.

Six studies [16,18,32,42,50,53] included in this review utilized a survey tool developed by Cromie et al [33]. The Cromie et al [33] survey tool consists of two parts, the first developed by the authors and the second part is the standardized Nordic questionnaire [37]. Each of the six studies reported making modifications to the survey. However, reporting of the changes was not clear; thus, a comparison of results between the five studies is difficult.

3.2. Prevalence

Prevalence of WMSDs was reported using a range of different time periods. The two most common time periods were "career prevalence," defined as the number of WMSDs reported over the duration of a person's career and a "1-year prevalence," defined as the number of WMSDs that have occurred in the previous 12 months. Glover [57] suggests that 1-year prevalence may provide a more accurate representation of prevalence as recall bias of participants is reduced. One study [58] reported 4-week prevalence and was excluded from the current review as it did not meet the inclusion criteria.

Comparison of injury prevalence rates between professional groups was examined in two studies [40,45]. Darragh and colleagues [40] reported a small difference in WMSD injuries between occupational therapists and physiotherapists (45% and 47%, respectively), while Islam et al [45] reported higher rates of 92% and 97%, respectively. The small difference between the professional groups remains consistent across both studies. Darragh et al [40] propose that the variation between the rates arises from organizational differences rather than from the particular characteristics of specific jobs.

3.2.1. Career prevalence

Career prevalence was reported in 10 studies [16,33,34,41,42,47,49–52] (Table 3). Reported career prevalence ranged from 40% [34] to 91% [33]. Outcome measures used in these studies varied. Six of the studies [16,33,42,49,50] used the Nordic questionnaire [37] to collect data on WMSDs, while West and Gardner [34], Rugelj [52], and Dyrkacz et al [41] used self-designed tools. The studies that used self-designed tools recorded the three lowest WMSD career prevalence rates of 47.4% [52], 40% [34], and 55.7% [41], while the tools based on the Nordic questionnaire recorded prevalence rates ranging from 63% [50] to 91% [33]. No obvious correlations could be detected between increased WMSD

Table 3
Prevalence rates and reported area of injury

Authors	Career prevalence (%)	1 y prevalence (%)	Area of body affected (%)		
			Back	Arms	Legs
Adegoke et al 2008 [32]		91.3	Lower back 69.8% Neck 31.1% Upper back 14.3%	Shoulder 22.2% Forearm 5.6% Wrist & hand 20.6% Thumb 11.1%,	Hip & thigh 6.3% Knee 15.9% Ankle & foot 9.5%
Alrowayeh et al 2010 [36]		47.6	Lower back 32% Neck 21% Upper back 19%	Shoulder 13% Elbow 4%, Hand & wrist 11%	Hip & thigh 3% Knee 11% Ankle & foot 6%
Bork et al 1996 [13]		61	Lower back 45% Upper back 28.7% Neck 24.7%.	Wrist & hand 29.6%	
Campo et al 2008 [38]		28	Lower back 6.6% Neck 4.9% Upper back 2.4%	Shoulder 3.2% Elbow 1.4% Hand & wrist 5.3%	Hip & thigh 2.3% Knee 2.1% Ankle & foot 2.2%
Campo et al 2009 [14]		33	Lower back 15.7% Neck 10.2% Upper back 7.1%	Shoulder 7.3% Wrist & hand 13% Elbow 3.7%	Knee 4.3% Hip & thigh 3.1% Ankle 2.8%
Cromie et al 2000 [33]	91	82.8	Lower back 62.5% Neck 47.6% Upper back 41%	Shoulder 22.9% Elbow 13.2% Wrist & hand 21.8% Thumb 33.6%	Hip 7.3% Knee 11.2% Ankle 7.1%
Dyrkacz et al 2012 [41]	55.7		Neck, spine, & torso 41.8% Head & face 6.7%	Upper extremities 33.4%	Lower extremities 18.1%
Glover et al 2005 [42]	68	58			
Grooten et al 2011 [43]		53.5	Lower back 56.5% Neck 39.6%	Shoulder 43.4% Wrist & hand 58.5%	
Hill et al 2009 [44]		96	Lower back 69% Neck 50% Upper back 15%	Shoulder 73% Elbow 27% Wrist & hand 54%	Knee 23% Hip 19% Ankle & foot 8%
Islam et al 2015 [45]		95	Neck 65% Upper back 70% Lower back 83%	Shoulder 54% Elbow 18% Forearm 23% Wrist/hand 62%	Hip 20% Thigh 22% Knee 47% Lower leg 45% Ankles/Feet 42%
Lorusso et al 2007 [47]	67		Lower back 59.6% Shoulder 21.2% Neck 19.7%		
Losa et al 2010 [48]		56.53	Lower back 21.38% Upper back 13.06% Neck 13.54%	Shoulder 0.95% Wrist/hand 1.19%	Knee 3.09% Ankle/foot 3.33%
Nordin et al 2011 [49]	71.6		Lower back 51.7% Neck 46.5% Thoracic 44.8%		
Passier and McPhail 2011 [50]	80.4	63	Lower back 50% Neck 33% Shoulder 17%		
Rozenfeld et al 2010 [16]	80	83	Lower back 59.8% Neck 45.5% Upper back 41.1%	Wrist 35.7%	
Rugelj 2003 [52]	47.4		Lower back examined specifically, 73.7% lifetime prevalence		
Salik and Ozcan 2004 [53]		85	Lower back 26% Neck 12%	Wrist & hand 18% Shoulder 14%	
Sin Ho et al 2013 [54]		92.4	Lower back 53.5%	Shoulder 45.2%	
Vieira et al 2016 [18]		96	Neck 61% Upper back 35% Lower back 66%	Shoulder 42% Elbow 15% Wrist/hand/finger 36%	Hip/thigh pain 23% Knee 36% Ankle/foot 25%
West and Gardner 2001 [34]	40	55	Lower back 35% Neck 24%	Hand 25%	

prevalence and location, gender, or environmental factors [16,33,34,41,42].

3.2.2. *One-year prevalence*

Seventeen studies reported 1-year prevalence (see Table 3); variance in the results using this outcome measure was higher than in studies that used career prevalence as a measure. One-year prevalence is defined by Adegoke et al [32] as a WMSD that resulted in "…discomfort, injuries or pain due to their work and lasting more than 3 days in the last 12 months in any part of the body." One-year prevalence was reported to be between 28% [38] and 96% [18,44]. All studies, with the exception of those of Rugelj [52], Dyrkacz et al [41], West and Gardner [34], and Islam et al [45], based some or all of their survey tools on the Nordic WMSD survey [37].

Career prevalence rates for WMSDs were higher than 1-year prevalence rates in all studies that included both measures [16,33,34,42,50]. Four studies [16,33,42,50] used survey tools based on the works of Cromie and colleagues [15] and the Nordic WMSD survey tool [37], while West and Gardner [34] and used a self-designed survey. West and Gardner [34] report a 15% decrease between 1-year and career prevalence. Similar differences between the two measures were reported in other studies [33,34,50]. These other studies are in the opposite direction to that of West and Gardner [34], with career prevalence being higher than 1-year prevalence. Cromie et al [33] report a 1-year WMSD prevalence of 82.8% and a career WMSD prevalence of

Table 4
Career, one-year prevalence rates, and percentage of participants reporting pain in specific body areas

Authors	Risk factors identified	Consequence of WMSD (%)
Adegoke et al 2008 [32]	Gender, low BMI, inexperience	Change in working position 13% left the profession
Alrowayeh et al 2010 [36]	Gender effect in lower back, neck, and shoulders only	
Bork et al 1996 [13]	Gender, work setting, age of patient, specialty	2.9% of saw a physician 75% changed their work activities
Campo et al 2008 [38]	Job factors	13% saw a physician 7% lost work time 2% changed settings 0.5% left the profession
Campo et al 2009 [14]	Job factors	
Cromie et al 2000 [33]	Age, job factors	7.4% lodged workers' compensation claim 13.6% had taken sick leave 84.2% continued working with discomfort 61% sought treatment 42.2% had daily activities affected 17.7% changed their specialty of practice 3.2% left the profession
Darragh et al 2009 [40]	Amount of work, type of work	
Dyrkacz et al 2012 [41]	Job factors	67.1% reported injury 49.5% sought medical attention 92.5% continued to work after being injured
Glover et al 2005 [42]	Inexperience, age	61% sought informal treatment 39% saw a physician 16% reported their injury 10% completed a workplace incident form
Grooten et al 2011 [43]	Job factors	57.6% had pain interfering with work
Hill et al 2009 [44]	Abdominal girth	
Islam et al 2015 [45]	Age, gender	
Lorusso et al 2007 [47]	Age, length of employment	
Losa et al 2010 [48]	Marital status, age	
Nordin et al 2011 [49]	Gender, BMI	
Passier and McPhail 2011 [50]		63.2% of WMSDs were self-managed 10.5% saw a physician 27.6% saw a PT 6.5% reported injury 3% lodged in workers compensation claim 59% continued working 30% worked in modified work tasks 6.5% continued working with no pain or impact on work 19.7% took leave from work
Rozenfeld et al 2010 [16]	Job factors, inexperience 45% in the first 5 y	64.5% modified treatment 10.8% changed work settings
Rugelj 2003 [52]		18% visited a doctor 21% took sick leave
Salik and Ozcan 2004 [53]	Job factors	69% visited a doctor 46% reported injury
Sin Ho, Jin Gang 2013 [54]	Gender, Job factors, Inexperience	37.8% changed patient treatment 14.2% changed expertise area 52.2% were considering job transfer
Vieira et al 2016 [18]	Level of experience, less hours of direct patient care, type or work	
West and Gardner 2001 [34]	Inexperience 56% in the first 5 y, job factors	77% sought physio treatment 45% took prescribed medication 42% saw a physician 24% took time off on sick leave only 4% took time off on workers compensation 41% changed duties 39% changed work setting

BMI, body mass index; PT, physiotherapist; WMSD, work-related musculoskeletal injury and disorder.

91%, Glover et al [42] report a 10% increase from 1-year WMSD prevalence of 58% to career WMSD prevalence of 68%. Rozenfeld et al [16] report the smallest change from 80% to 83% between 1-year and career WMSD prevalence, while Passier and McPhail [50] report the largest difference of WMSD prevalence from 63% (1-year prevalence) to 80.4% (career prevalence). These relatively low differences may indicate under-reporting of WMSD career prevalence rates or that those with injuries and disorders are leaving the profession.

3.3. Area of injury

Reporting of WMSDs in specific body parts was undertaken in two ways: as a percentage of either the whole sample or those who had reported experiencing a WMSD (Table 3). For example, Adegoke et al [32] report a prevalence of lower back injuries of 69.8% in 126 participants, while Campo et al [38] reported that, of the 28% of people who reported a WMSD, 6.6% reported lower back as the affected area. Across all studies, the low back area was the most commonly reported area of injury. Nineteen studies (Table 4) reported lower back injury prevalence ranging from 6.6% to 83% [13,14,16,18,32–34,36,38,43–45,47–50,52–54].

Prevalence rates for injuries of the neck ranged from 4.9% [38] to 65% [45], shoulder from 0.95% [48] to 73% [44], and upper back from 2.4% [38] to 70% [45]. Other areas of the body with reported WMSDs included the wrist/hand, knee, hip/thigh, ankle/foot, and the thumb.

Areas of injury tended to be associated with specific job-related tasks of each occupational group. For example, sonographers reported the highest prevalence of shoulder injuries (73%) [44], while occupational therapists and physiotherapists performing manual therapy tasks reported pain and discomfort in the fingers and hands [13,16,34,41].

3.4. Risk factors for WMSD

Risk factors associated with WMSD development varied across the reviewed studies (Table 4). The role of gender as a risk factor for WMSD was mixed. Six studies [13,32,36,45,49,54] reported that females were associated with an increased WMSD risk in some body areas, and four studies [34,38,47,53] found no correlation. Females were generally overrepresented in sample populations, as described earlier. Age was found to be a risk factor in five studies [33,42,45,47,48] with younger AHPs at a higher risk of developing a WMSD.

Location of the workplace and type of work undertaken were also identified as risk factors for WMSD development [13,18,34,40]. Those working in acute care and outpatient rehabilitation were identified to be at a greater risk of WMSD development compared with those working in community-based settings and private practice [40].

Five studies [13,38,42,53,54] asked participants to identify factors that contributed to the development of their WMSDs. Factors identified by participants were predominately physical in nature and included working in awkward positions [54], working in the same position [53], bending or twisting, transferring patients [13,38], lifting [42], performing tasks monotonously [42], performing repetitive tasks [53], a high number of patients [54], and a lack of rest breaks [54].

Three studies [14,44,47] explored the relationship between psychosocial factors and WMSDs. Two of these studies [14,44] examined the relationship between WMSDs and job strain, and reported that low job control and high levels of stress increased the risk of WMSDs in males only. The same finding was not reported for the females included in the study.

3.5. Treatment of WMSDs

Thirteen articles explored the range of treatment options used by those with a WMSD [13,16,32–34,38,41–43,50,52–54] (Table 4). Analysis of these 13 articles found that more people reported experiencing a WMSD than seeking treatment. Individuals often utilized self-treatment strategies, such as massage, stretching, or ultrasound [33,42]. Lost work days were not associated with medical treatment or whether the injury was reported, suggesting that AHPs are more likely to take sick leave to manage a WMSD than to make an official claim or report their injury to a supervisor [33,42,50,52]. Under-reporting of WMSDs in health care professions has been reported elsewhere [11,23] and also by studies included in this review [33,40,52,57,58].

4. Discussion

A 1-year prevalence rate of between 28% [38] and 96% [18,44] indicates AHPs are at high risk of developing a WMSD. Many studies have reported the reticence of allied health employees to report a WMSD [33,38,40,42,50,52]. Cromie et al [39] report that a perception among physiotherapists was that "to discuss WMSDs was apparently to admit that they failed to live up to the standard required…". Rosenman et al [24] reported that many workers with occupational injuries do not submit a claim for workers' compensation. Analysis of the results from the studies in this review suggest that self-reported career prevalence WMSD injury rates vary [33,52] in contrast to injury reports [33,41]. This suggests that AHPs are not consistent in their reporting of injuries, and as such compensation statistics are unlikely to reflect actual injury rates in AHPs.

Glover and colleagues [42] suggested that WMSD prevalence and risk factors identified by individuals may vary due to inconsistencies in the definitions of WMSDs used in the studies. Definitions of WMSDs ranged from a more general description such as "a job-related ache or pain or discomfort" [13] to the more specific stating "a report of WMSD rated at least 4/10 on visual analogue scale and lasting more than 1 week or presenting more than once a month" [38]. This variation makes comparisons of WMSD prevalence rates difficult and may, in part, explain the large variance in prevalence rates reported across studies.

Prevalence measures, such as career and 1-year prevalence, have their strengths and weaknesses. Career prevalence is likely to be affected by recall bias due to the potential time between injury and data collection of the study. Studies measuring career prevalence may, therefore, under-report actual WMSD numbers. One-year prevalence measures were used by some studies [13,14,16,18,32–34,36,38,42–45,48,50,53,54] to reduce bias issues associated with career prevalence data. One-year prevalence measures may be less influenced by recall bias than by career bias.

Inexperience was identified as a risk factor for WMSD development. The survivor effect [59,60] has been well described in some studies, and affords an alternative explanation to the relationship between inexperience and WMSD risk. WMSD risk factors identified by participants were predominately physical in nature. This may be due to survey design and the fact that questions relating to psychosocial factors were not routinely included in the questionnaires used. The work environment was not well described in the studies examined here. This is a substantial gap in the literature given the important relationship between work environment and development of WMSDs [61].

The heterogeneity of the studies included in this review makes establishing a core set of common risk factors for WMSDs challenging. The majority of studies included in this systematic review were observational, retrospective, cross-sectional studies. Limitations of a cross-sectional design are well described elsewhere [62], and include issues of temporality and bias (response, recall, and selection). An inclusive search strategy revealed a limited scope of literature concerning WMSDs in the AHPs (Table 1). As defined by Allied Health Professions Australia [9], all 16 titles were included in the search terms, yet only five groups were represented in the literature: physiotherapy, occupational therapy, sonography, podiatry, and medical imaging. Significant differences in the outcome measures used, including the survey tools, definitions of WMSDs, and time frames used from injury onset, make comparisons across the literature difficult. Future studies should aim to adopt greater consistency in the survey tools employed and in the definitions of WMSDs, to ensure meaningful comparisons within and across professional groups.

5. Conclusion

Results from the current review suggest that AHPs may experience a WMSD in their career. High risk factors associated with the development of a WMSD include being a younger therapist, having fewer years of experience, and being exposed to higher levels of manual and repetitive tasks.

High-quality research is needed, which employs consistent outcome measures to improve the ability to draw meaningful comparisons across studies. While research supports the complex multifactorial nature of WMSD development, most of the studies included in the current review focused predominately on the physical factors, with negligible attention being given to psychosocial environmental hazards or risks. The high prevalence rates found in this review suggest a need for more effective WMSD risk reduction interventions. In order to achieve this, accurate identification of all the relevant hazards and risks for AHPs is required, suggesting a direction for future research.

Conflicts of interest

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