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MOVEMENT FOR LIFE

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The importance of physiotherapists in promoting sustainable community-based health programmes to improve long-term health outcomes

CHALLENGE THE TRADITIONAL PHYSIOTHERAPY ROLES

There is no question that physiotherapists play a vital role in specialised areas of clinical evaluation and treatment techniques. What is less certain is the role physiotherapists systematically play in long-term, sustainable health and wellness promotion efforts within communities across the world. One of the first articles calling for physiotherapists to promote health and maintain functional independence for people with disabilities by emphasising community-based health promotion initiatives was by Dr James Rimmer who, in 1999 wrote "Health Promotion for People with Disabilities: The Emerging Paradigm Shift from Disability Prevention to Prevention of Secondary Conditions" for the Physical Therapy Journal. Seventeen years later, there is still a need to connect our expertise in health and wellness to community-based programmes that provide long-term opportunities for regular exercise and active lifestyles with peers (Rimmer 1999). Dr Alan Jette in his 43rd McMillan Lecture called for the physiotherapy profession to be "…a central player with other professions in devising, evaluating, and implementing cost-effective health care innovations for communities as well as for individuals…" (Jette 2012). This vision encourages us as physiotherapists to think beyond our traditional clinical roles and to take leadership roles in non-traditional applications of our expertise for use in community-based settings.

COLLABORATE WITH TEAM MEMBERS WHO HAVE COMPLEMENTARY EXPERTISE

Rehabilitation teams may include therapists (physiotherapists, occupational therapists, recreational therapists), nurses, social workers, and physicians. Each team member brings a different perspective to the treatment plan. One strategy for examining recommendations for post-discharge community-based health promotion programmes would be to encourage input from the team members as to their recommendations. These perspectives may include information about the patient's resources (eg transportation, family or caregiver assistance), mobility considerations (eg ambulatory status, safety issues), hobbies and interests (eg ideas for promoting long-term adherence). By including information from these complementary perspectives, the patient's lifestyle, physical and cognitive abilities, and motivational desires can be considered in order to maximise a successful programme fit.

SEEK OPPORTUNITIES FOR EXPANDING EXISTING COMMUNITY-BASED PROGRAMMES

Consider seeking out opportunities for expanding existing community-based programmes by adding health components that could benefit the constituents of those existing programmes. For example, many community centres offer specialised programmes for their constituents. Those programmes may include instructional classes on a variety of topics (eg meal preparation, financial planning, etc.). Often those same community programmes have constituency groups who are seeking information about topics that can improve their lives (eg senior centres, after school programmes, neighborhood centres, faith-based programmes). Approach the directors of these types of centres within your communities to see if you could offer your expertise in areas related to health and wellness (eg exercise programmes, home mobility safety tips, among others). Collaborating with professionals with complementary expertise would also be a good way to customise your health promotion programme. For example, you could partner with a nutritionist to provide a workshop on exercise and healthy eating tips. Attaching a health promotion programme onto an existing community-based one is a good way to initiate a programme for a ready-made audience.

INCORPORATE FACTORS TO PROMOTE LONG-TERM PROGRAMME ADHERENCE

Sustainability of community-based health promotion programmes may be difficult to establish. It may be helpful to first conduct a survey of potential participants to determine the types of activities they may find to be stimulating. They will be more likely to initiate and sustain their involvement with a community-based health promotion programme if it includes activities they find to be interesting and motivating. Another strategy for promoting initiation and sustainability is to encourage peer involvement in the programme. Many people are motivated to attend programmes if their peers attend, so customising the activities to include social interaction may improve adherence.

IMPROVE LONG-TERM HEALTH OUTCOMES

One of the ultimate goals for promoting sustainable community-based health programmes is to improve long-term health outcomes for the people who participate in these programmes. Consider providing some type of health benefit measurement for the participants as a way of promoting long-term adherence. For example, partner with a local health clinic who may visit the community site once every few months to conduct blood pressure screenings or other health-based services. This information may help the participants to see a long-term benefit to the community-based health activities that could motivate them to continue participating in the activities.

CONCLUSION

Physiotherapists are uniquely qualified through their extensive training to evaluate and treat people with many types of

diagnoses. We should also use our expertise to promote health and wellness beyond the clinic in community-based settings as a way of improving long-term health outcomes for our patients.

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Physical therapies in 19th century Aotearoa/New Zealand: Part 1 – Māori physical therapies

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ABSTRACT

This paper is the first of three reporting on a historiographic study of physical therapies in 19th century Aotearoa/New Zealand. This first paper focuses on traditional Māori healing practices. The paper begins by setting out the parameters for the study and outlining the role that massage and manipulation, electrotherapy, hydrotherapy and remedial exercise played in societies around the world prior to the 20th century. We then explore traditional Māori physical therapies, focusing on two broadly 'orthopaedic' conditions (fractures and back pain), before examining accounts of two predominant forms of physical therapy: massage and the use of Aotearoa/New Zealand's abundant thermal springs. We conclude the paper by examining the cultural shift that took place with colonisation after 1840, and consider the effect that this shift had on Māori physical therapy practices prior to 1900.

Nicholls D, Harwood G, Bell R (2016) Physical therapies in 19th century Aotearoa/New Zealand: Part 1 – Māori physical therapies. New Zealand Journal of Physiotherapy 44(2): 75-83. doi: 10.15619/NZJP/44.2.02.

Key words: Māori, Tohunga, Massage, Bathing, Physical Therapy, Fractures, Back Pain, Colonisation

INTRODUCTION

This paper reports on a study undertaken to examine why it appears that the physical therapies (massage and manipulation, electrotherapy, hydrotherapy and remedial exercise) were some of the most popular therapies in Europe and North America during the 19th century, but were almost completely absent from Aotearoa/New Zealand culture before 1900. In the paper, we detail the background to the study and outline a detailed historiographic account of existing texts, which show that there is some evidence of physical therapies being used by Māori prior to and during the 19th century. Subsequent papers will explore the practices of colonial settlers and argue that the particular nature of colonisation in New Zealand failed to create the conditions in which the physical therapies could flourish. We conclude these papers by arguing that although a few practitioners did establish themselves before 1900, accounts of their activities are incidental and piecemeal.

The origins of this study lie in five intersecting conditions. Firstly, physiotherapy in New Zealand celebrated its centenary in 2013, and the profession represents one manifestation of the physical therapies in an organised, disciplinary form. But this organisation only began in 1913, and in undertaking research into the profession's early history it appeared that there were few physical therapy practitioners in New Zealand prior to 1900. Secondly, a great deal of data exists indicating that the physical therapies were extremely popular and widely used in Europe and North America during the 19th century. And so thirdly, we assumed that many of the colonists who arrived in New Zealand from Australia, Europe and North America in the 19th century would have known about or been exposed to at least some of these therapies, and some may well have been practitioners themselves. Fourthly, we were aware that Māori used physical therapies as part of Indigenous healing practices, but that published accounts of massage and the use of thermal springs were limited. Finally, despite much of the development work taking place in the last two decades of the 19th century, the largest organised centre for the development of the physical therapies in New Zealand prior to 1913 – Rotorua Spa – did not become established until after 1901 with the creation of the world's first Department of Tourist and Health Resorts.

Given these five conditions, we asked what evidence existed for physical therapies in New Zealand; to what extent were they practised; by whom, where and when. The study used historiographic methods to identify and review texts from a wide range of primary and secondary sources, including published and unpublished manuscripts, period newspapers, personal accounts, photographs, registers and directories, available either online, through databases like *Papers Past*, or with first hand archival searching at Archives New Zealand, the Alexander Turnbull Library and the National Library.[1] Secondary texts were also examined for accounts of physical therapies and evidence of interest in the subject. Before presenting the findings of the study, we will unpack some of the context underpinning the

[1] All of the texts examined in this study were in the form of written documents. These inevitably privilege 'western' modes of historiographic recording. No primary oral accounts of Māori healing practices were identified, although some of these are reported by Pakeha in their own accounts of 19th century practices.

study and explain in more detail how the texts were identified and read.

BACKGROUND

Physical therapies were some of the most popular and widely used therapeutic remedies in Europe and North America in the 19th century. Prior to the discovery of germ theory in the 1880s, pharmaceutical and surgical interventions were both potent and risky, with doctors actively engaged in 'heroic medicine,' in which their remedies were deliberately designed to be more arresting than the disease. Doctors regularly used blood-letting, purging and blistering, aggressive and unnecessary surgeries, and prescribed poisons such as arsenic and calomel (a mercury salt) to treat everything from acute fevers, chronic diseases and diarrhoea to teething pains (Wilson 1998, pp. 16-17). More conservative therapies like massage and bathing were therefore popular, not least because they were less draconian.

Among the many manual therapies practised in the 19th century, which included bone setting and manipulation, massage had achieved particular prominence, not least as an expression of luxury and status, as increasing urban wealth gave birth to the idea of leisure industries focused on the body. Variously qualified massage practitioners began to advertise their services in all major cities across Europe and North America, and massage became a new and appealing career choice for educated young women. Nurses and midwives received special training in massage, allowing them to diversify their practice to incorporate therapeutic as well as caring capabilities. Independent practitioners worked from practice 'rooms' or visited wealthy clients in their own homes. But perhaps because of its popularity and association with sensual touch, massage began to acquire an unsavoury reputation in the 1880s, and by the mid-1890s had begun to create scandal, as poorly trained masseurs, brothels and bagnios came to the attention of Victorian civic reformers. As a result, massage began to be formally organised and regulated after 1900 in many western states.

Electrotherapy was, perhaps, even more popular than massage as a therapeutic remedy in the 19th century. After the development of the electric battery by Galvani and Volta in the late 1800s, and the realisation that electrical charge could be applied to animate the human body, the possibility that weak, fatigued or ailing bodies could be 'galvanised' became a reality. Electricity entered the popular imagination, and people believed that the vital powers of electrical energy could raise the dead or be used to create life from inanimate tissue.[2] Galvanism and faradism became the mainstay of therapies for some of the most prevalent 'nervous' conditions known in the 19th century, including hysteria, neurasthenia and hypochondria, and a number of electrical consumer products were developed to 'recharge' people's ailing constitutions.

Hydrotherapy and balneotherapy, including bathing, steaming and drinking spa water, were known colloquially as 'taking the waters,' became significant industries in the 19th century and gave birth to the development of spa centres and entire towns devoted to hydropathic tourism. Spa centres in America, Austria, England, France, Germany, India, Japan, Romania, and South America became resorts, frequented by some of the first leisure tourists, and a vast array of remedies began to emerge, with each centre promoting the specific chemical composition of the waters and innovative modes of delivery. Spa therapies connected the Victorian romantic passion for the power and mystery of nature with the technological innovations that arose after the Industrial Revolution, and provided a way for wealthy leisure travellers to escape the pressures of urban living. The development of railways and inter-continental travel made spa centres much more accessible and increasingly popular as the century progressed.

Remedial exercise and gymnastics. Physical fitness had been recognised for many centuries, dating back to at least Greco-Roman 'gymnasia,' but physical conditioning became a major concern in the 19th century through the work of Pehr Henrik Ling (1776-1839) and the Royal Central Institute of Gymnastics in Stockholm. Ling trained doctors in a regime of educational and remedial gymnastics that would be exported throughout Europe and influence the physical culture movement in America and elsewhere. Physical culture itself was a powerful response to nationalistic fears of racial degeneration that began to emerge after Darwin's *On the Origin of Species* was published in 1859, alongside the racial pressures caused by incessant national wars, industrialisation, colonisation and migration. Physical exercise moved from being a pastime to a regime that could be used to develop the strength of children, improve one's health, and facilitate convalescence and recovery from incapacity. Physicians like Jonas Zander (1835-1920) in Sweden and John Harvey Kellogg (1852-1943) in the United States would have a profound effect in shaping the popularity and utility of exercise in the 19th and early 20th centuries.

THE NEW ZEALAND CONTEXT

It was known that some physical therapists existed in New Zealand prior to 1900, because in undertaking research for the physiotherapy profession's centenary in 2013 we had come across people like Matthew Guinan, John Jenkins and Edwin Booth, who had all practised in the 1890s. We also knew that Māori healing practices included many forms of physical therapy. But accounts of the physical therapies in the published medical histories of the period made scant reference to any specific practices. L. K. Gluckman's *Tangiwai* and T. M. Hocken's *Bibliography of the literature relating to New Zealand*, for example, make no mention of any physical therapies (Gluckman 1976, Hocken 1909). There are accounts of institutions where physical therapies may have been taught, like Carmalt Jones's *Annals of the University of Otago Medical School* (Carmalt Jones 1945), and places where physical therapists may have been employed (Angus 1984, Williams 2010). Equally there are histories of allied health professions that were known to have either deployed physical therapies, or worked alongside therapists (Maclean 1932, Smillie 2003, Wilson 1998), but in all cases there are few if any specific references to the practices of the physical therapies, or its practitioners.

[2] See, for example, Mary Shelley's Frankenstein, originally published in 1831.

The same picture can be seen in some of the specific local histories of health events that one would assume to be amenable to physical therapy practice (Bryder 1996); in general relevant histories of New Zealand in the 19th century (Olssen and Stenson 1989, Werry 2011); and in accounts of injurious or regrettable lifestyles led by colonists, prospectors and settlers (Eldred-Grigg 2008). Historical accounts of the thermal springs so highly prized by Māori and colonial settlers focus heavily on the location and configuration of thermal pools (Petty et al 1987, Rockel 1986), and when centres of physical therapy practice are mentioned, as in the history of Rotorua Spa, the focus is on the socio-political machinations and significance of the centre, not on the therapists who undertook the day-to-day work of the spa (Bassett 1998, Loader 2012, McLure 2004). Indeed, the physical therapies are almost entirely absent from most of these accounts.

In Eldred-Grigg's account of life in the gold rushes of the 1860s, for example, we are provided with a picture of unremitting debauchery, disease and squalor, as well as regular death and physical injury, among the communities of transient prospectors that mined the fields on the West Coast, Central Otago and the Coromandel. At no time, however, is it even suggested that a masseur, medical electrician, balneologist or other physical therapist may have been operating among communities that effectively functioned as small towns. Nor is it evidenced that anyone received any kind of rehabilitative physical therapy as part of their recovery from the recurrent amputations, head injuries, fractures and debilitating diseases. This is not to say that physical therapies were not provided, only that, until now, the question has not been deemed interesting enough to warrant scholarly attention.

A similar picture emerges in the literature on colonial relations (Moon 1993, 2009), settler lifestyles (Macgregor 1973), and urban development (Fairburn 2013) in New Zealand during the 19th century. It may be, of course, that the physical therapies were almost entirely irrelevant in large parts of New Zealand, where the struggle to survive and cope with isolation or grinding poverty were more significant considerations than massages and spa baths. Certainly Eldred-Grigg provides a paradigm case for such an argument;

> When Isaac McCulloch fell sick with 'brain fever' he was carried by his mates overland for several days from Gabriel's Gully. A digger who twisted his leg on the Waipōri diggings was carried by his mates for three days…A 'powerfully built young fellow' whose ankle was smashed at Kaniere was carried by his mates in a litter to Hōkotika, where he in turn spent months nursing a 'young frail lad' dying of tuberculosis (Eldred-Grigg 2008, p. 257).

Accounts of this sort suggest that the physical therapies were a luxury to many living in colonial New Zealand. But to establish the evidence to support such a claim, it was necessary to undertake an exhaustive search of existing texts pertaining to health care in 19th century New Zealand, and establish exactly what evidence existed for the argument that the physical therapies were largely ignored as therapeutic interventions, despite evidence of their significant popularity in Europe and North America at the time. What follows is an outline of the methodology used to identify relevant texts.

METHODOLOGY

The project to retrieve archival texts centred on two principal 'locations': an online database and a physical search of national libraries and archives. The online database used was *Papers Past*, a catalogue of over 120 full text, digitised New Zealand newspapers, dating back to 1839. The physical search centred on Archives New Zealand, Alexander Turnbull Library, and the National Library located in Wellington, New Zealand. The majority of the search was undertaken between September 2014 and March 2015, and the archival work was undertaken entirely by the paper's authors. An initial data trawl was conducted using *massage*, *hydrotherapy*, *electrotherapy* and *therapeutic exercise* as key words, with the relevant time period set at 1800-1899. Relevant texts were selected and closely read to draw out appropriate key words which were used to form an expanded search strategy. A refined search was then undertaken based on parameters set out in Table 1 below.

Table 1: Primary and secondary data sources

Media	Named source
Newspapers	Ashburton Guardian, Auckland Star, Bay of Plenty Times, Bruce Herald, Bush Advocate, Clutha Leader, Colonist, Daily Southern Cross, Daily Telegraph, Ellesmere Guardian, Evening Post, Feilding Star, Grey River Argus, Hawera and Normanby Star, Hawke's Bay Herald, Hot Lakes Chronicle, Inangahua Times, Lake Wakatipu Mail, Manawatu Herald, Marlborough Express, Mataura Ensign, Mount Ida Chronicle, Nelson Evening Mail, New Zealand Herald, New Zealander, North Otago Times, Northern Advocate, Oamaru Mail, Observer, Ohinemuri Gazette, Otago Daily Times, Otago Witness, Poverty Bay Herald, Press, Southland Times, Star, Taranaki Herald, Te Aroha News, Thames Advertiser, Thames Star, Timaru Herald, Tuapeka Times, Waikato Times, Wairarapa Daily Times, Wanganui Chronicle, Wanganui Herald, West Coast Times.
Published and unpublished manuscripts	Personal accounts, government legislation, correspondence with Ministry, correspondence to family, medical registers.
Photographs	Tourist Department Album, regional photo archive, subject photo archive.
Directories	Post office, trades, and medical directories.
Secondary texts	Medical history, 19th century NZ history, major hospital histories, Maori history, medical and nursing history, guides, thermal springs and sanatorium history, NZ regional history.

Online searching was conducted methodically, using a range of refined Boolean search parameters, including: balneo*, exercis*, hauwai, waiariki, ngawha, masseu*, mirimiri, "Swedish movement cure," gymnastics AND correct*, electrotherap*, health AND physical, "hot springs". Search results were individually scrutinised and collated into a catalogue, indicating the relevance of each of the findings (see Figure 1 below for an example of the catalogue reporting structure.)

PP[balneo*] [1 Jan 1880-31 Dec 1889] [articles only]: 9 results

- Star, 30 July 1880, Local and General – Describes a 'balneological exhibition' happening in Germany
- Wararapa Daily Times, 7 January; Auckland Star, 7 January; Otago Daily Times, 31 December 1880 – Mentions the exhibition in Germany and asks why New Zealand isn't represented there
- Mount Ida Chronicle, 30 September; 2 October 1886, Miscellany – Mentions the treatment of obesity including diet, exercise and balneotherapy (or bathing)
- Waikato Times, 9 February 1884, Syndey Sketches – Mentions 'Koumiss,' a dietetic and hygiene remedy written about in the Journal of Balneology
- 2 errors

Figure 1. Catalogued findings from Papers Past archive search

Each catalogue item was then read and organised into a thematic archive organised around events, geographical locations, and named individuals or groups. Key moments of significance, including analyses, arguments, images, policies and statements, were highlighted and cross-referenced across the archive. The archive could then be synthesised and reported.

FINDINGS

Physical therapies in 19th century New Zealand can be broadly understood in two distinct, yet significantly overlapping categories: traditional Māori healing, and post-colonial practices. Traditional Māori practices were those that existed prior to colonisation, a point formally recognised by the signing of New Zealand's founding document Te Tiriti o Waitangi or The Treaty of Waitangi in 1840. These practices continued after the signing of Te Tiriti, but suffered with the decline of the Māori population and attempts by various governments to outlaw the practices of tohunga.[3] Post-colonial practices were introduced by early settlers, with many thousands of immigrants arriving from Europe (mainly England and Scotland), the United States and Australia.

As with many Indigenous healing practices, Māori physical therapies included beliefs, customs and rituals that differed significantly from the practice conventions western doctors began to actively construct in the 19th century. Māori physical therapies cannot be seen in isolation from other therapeutic practices, including the tohunga's invocation of atua (or gods/spirits); customary practices, like the isolation of the injured (or *tapu*) *person*, from the rest of the tribe; or the use of plant matter for practices like massage, steaming, and splinting. The flax bush, for example, would be cut to make matting, bandaging, and mobile splinting. But at no stage would the flax be cut or used without an appropriate appeal to atua. W. M. Goldie, for example, states that Māori invoked the god *Maru* to 'descend upon the crown of the head (the most sacred part of the body) of the injured person, and apply his healing power to the wound or the injured limb' while repeating an ancient karakia [incantation] originally used to 'raise Rakei from the dead' (Goldie 1903, p. 58). The tohunga's role was to mediate between the spirit world and the injured person, and the various therapies available to tohunga were learnt through years of contemplation, korero [conversations] and spiritual practices (Riley 1994).

By contrast, 19th century medicine was developing the reductionism that would lead to the creation of medical specialties (orthopaedics, neurology, respiratory, etc.), and the separation between different practical modalities (massage, hydrotherapy, pharmacopoeia, etc.) (Nicholls and Gibson 2010, Turner 2008). Reflecting the colonial influence on Māori healing practices over the 19th century, we have retained these organising principles and structures in structuring this paper. Thus we will illustrate two of the main therapeutic approaches (massage and bathing), and two of the main 'orthopaedic' insults: back pain and fractures, to reflect the gradual supplanting of Māori cultural practices with western medical approaches during the century. It should be noted, however, that fractures and back pain, massage and bathing, were only small constituents in the vast sweep of health problems and practices seen in 19th century Māori health, and as an organising structure it pays little heed to the extensive use of plant materials and spiritual practices that were so important to the holistic and integrated approach to healing offered by the tohunga.

Back pain / Tuarā mamae

Back pain was probably very common among Māori. G. S. Cooper, travelling from Auckland to Taranaki with Māori porters in 1849/50, recounts that;

> The natives all complained very much of pains in the backs and legs from the weight of their loads, some of which were undoubtedly very heavy; their mode of curing these pains was by lighting enormous fires and placing the aching part as close as possible to the heat, this they said had the effect of relaxing the muscles and rendering them fit for service on the following day (Cooper 1851, p. 32).

Philip Houghton's examination of pre-European skeletal remains showed that cervical and lumbar degeneration was common even in young adults (Houghton 1980). Houghton followed William Colenso in speculating that this may have been caused

[3] Tohunga refer to healers, educators, and tribal leaders who possessed special connections with ancestors and knowledge of plant lore, healing and educational practices. Tohunga held similar social status to doctors in western society but had a wider range of skills and responsibilities. Tohunga were the guardians of Māori traditional healing practices and attempts to outlaw their practices converged in the 1907 *Tohunga Suppression Act*.

by heavy canoeing, particularly powerful stroke angles; carrying heavy loads; and the heavy labour involved in kumara and fern root cultivation and excavation (Colenso 1869). The treatment for back pain included the use of heat for relaxation, massage and bracing. J. White (White n.d.) provides one account of this treatment:

> If the back is sore from lifting or is simply giving pain, the patient goes to the water (river) and sits, whereby he is massaged by the tohunga using his hands. The patient then returns to stand beside the fire, with his back to the fire. He then returns to the tohunga, who again massages the painful area. The patient then returns to the fireside to bask in the heat, the whole process being repeated two, three or four times, and then the painful area is strapped with a woven flax belt and left like that till the back is healed (n.d.).

The tohunga would deploy a range of massage techniques and lubricants (see below), including the use of heated stones, but extreme care was needed here, because although '[p]ressure on the body by placing heavy bags of stones or earth was said to cure disease by squeezing out the evil spirit…the method sometimes proved fatal' (Thomson 1859, p. 141).

Fractures / Wheua whati or Poroiwi whati

Prior to colonisation and the arrival of munitions into New Zealand, it is likely that fractures among Māori were rare. But Houghton's osteoarchaeological research suggests that they were frequent enough to provide evidence of well developed healing skills (Houghton 1980). Riley argues that '[u]ndoubtedly [Māori] knew what they were doing when it came to fractures' (Riley 1994, p. 59). Dr. Tuke also notes that 'the results bear excellent comparison with the cures effected by bone-setters in our own country [England]' (Tuke 1863).

The methods used for treating fractures included isolating the injured person from the rest of the tribe, bathing the fracture site in steam and, when relaxed, reducing and splinting the limb. The whole procedure would be accompanied by specific incantations, or *hono* (meaning 'to join'), performed by the tohunga (Goldie 1903):

> If a person has broken, fractured or chipped a bone, he is taken from the village to a place away from where people sleep. A sacred fire is lit and the tohunga performs a ritual. Stones are not allowed by this fire ??? but the koromiko, the whau (possibly the cork tree, Entelea arborescens), and the karamū (Coprosma spp.) are broken off, taken to the water, wetted, and while the fire is burning well the wet branches are thrown over it. These are then placed over the wound??? so that the whole area of the wound is steamed. This is to soothe the flesh around the area of the break. If this does not have the desired effect at the first steaming, then another is done and more fires have to be lit. When the wound is being steamed that is the time to re-set the bone so that everything is in place as before. When the bones are re-set the area is kept heated and a splint made. The splints, one on top and one on the bottom, are tied firmly together with flax. All this is closely observed by the tohunga. When the wound is healed the whole tribe feasts on the marae (the Māori meeting house) (Riley 1994 p13).

Back pain and fractures represent just two of the many conditions treated by Māori using physical therapies. Arthritis or mate kaikōiwi,[4] asthma, bronchitis, burns, headaches, neuralgia, sprains, strains and wounds, as well as evidence of a full range of medical conditions, including cancer, diabetes and tuberculosis were also treated (Riley 1994). Massage and steam bathing appear to have been the predominant physical therapies used, or at least those cited by 19th century colonial travellers. In comparison with their colonial counterparts, there is no evidence of any access to electrical modalities, and no evidence of well known Māori occupations and activities that might have been used therapeutically, including kapa haka (traditional dance) or waka ama (outrigger canoe racing); occupational activities like tinana waka/marae (building and restoring boats/meeting houses) or flax weaving; hikoi (walks); or warrior training 'games' like poi rākau (long staff) or patu (short handled club).

Massage

The main types of massage utilised by Māori included tōtō, romiromi, takahi, mirimiri and tukituki. These terms referred to the method of application, but in some cases they also described the relationship between the practitioner and their subject.

1. Tōtō

Tōtō involved the gentle, general massaging of children, using stroking and rubbing movements akin to effleurage. It was performed on infants and children by the women of the tribe, and was considered a vital part of the child's development. Maggie Papakura (Makareti) recounts in 1938 that Māori children were massaged from birth and wrapped in a pūera (cloak) to ensure they developed a strong, straight back (Makareti 1938).[5] Infants were massaged each day to develop their comportment. Elsdon Best, one of New Zealand's earliest anthropologists, noted that:

> If ears projected, they were pressed in. If the legs were curved they were straightened. If toes spread out they were pressed in. A projecting heel pressed. Bowed shoulders pressed back to straighten them and make the chest prominent. The process continued for weeks (Best n.d.).

Numerous observations pointed to the widespread use of tōtō and other manipulations performed on children to develop their physical form: Colenso described the massage of the nose and forehead, supposedly performed to make hongi (nose pressing as greeting) easier (1869); Tregear and Makareti described approaches designed to produce slightly bowed legs – a form 'much admired' by Māori (Makareti, 1938, Tregear 1904). Riley states that:

> [c]hildren were bathed in cold water and slapped vigorously with the partly clenched hand and knuckles to make the flesh firm. Female infants had the first joint of their thumbs half disjointed or bent backwards so that when they were older they could more easily prepare and weave flax. Male

[4] Mate kaikōiwi literally translates as 'death by bone.'
[5] Dr Tuke in 1863 reported that spinal malformations were rare among Māori (Tuke 1863).

children were massaged so they would have a good physique to fight, do war dances etc. when they grew up (Riley 1994, pp. 73-4).

2. Romiromi

Romiromi also refers to a general massage, but one performed on adults akin to petrissage, involving repetitive squeezing and compression of soft tissues. White reports that 'Romiromi was carried out each night at sunset before the evening meal, always at the same time. The fleshy parts of the patient's body were gently squeezed or pinched, the legs, arms and back getting specially rubbed' (White 1883).

3. Takahi

Takahi refers to a vigorous form of massage in which the masseur 'tramples' barefoot on the patient. In some tribes takahi was performed by someone who carried the special significance of being born feet first. This person was known as whānau weawae (meaning literally 'bare feet') (Buck 1910). Takahi would normally be accompanied by oiling of the body and steam bathing, in the manner described here by White;

> The patient would make a couch of grass or mats, as long as the body, and then lie down on it with the stomach to the couch. The person acting as Doctor [sic] would stand on the patient's back and with his or her feet placed across the back, move each foot on the patient's back, commencing at the nape of the neck and treading with each foot downwards to the hips, moving each foot a little space onwards and following it with the other. Then after doing this up and down the patient's back a few times, the patient would go and sit in a steam bath for some time. Coming from that, the oil of miro would be rubbed in the back to cure what was called a "kope" (crack, twist or kink) of the back (White n.d.).

4. Other methods

Phillips reports that Māori practitioners would also use short strokes with fingers, called mirimiri, and tukituki, a technique using a pounding action of the fists, moving up and down the body (Phillipps 1973). Lubrication with pigeon fat, whale oil, and the odourless fat from the lining of the intestines and stomach of a pig might also be used (Pōmare 1908, Rolleston 1989).

What we know of Māori massage practices in the 19th century depends to a large extent on the veracity of accounts offered by travellers and anthropologists, since knowledge of Māori healing practices was conveyed orally by generations of tohunga and kaitiaki (tribal guardians). It is likely that practices would have changed during the century because of the dramatic increase in traumatic injuries that accompanied the introduction of munitions and heavy artillery after 1840. It is reasonably clear though, that massage performed by Māori bore many similarities to that undertaken by their European and North American counterparts: it was performed by someone with special responsibility and, in most cases, supervised training, and it was a major part of the 19th century therapeutic armamentarium. There is also evidence that a gender role separation operated in both cultures. Wilson (1932) states that tohunga were always male, and there is some evidence of tohunga performing massage and tissue mobilisations on ill and injured patients, but Wilson reports that it was older women who were the chief massage practitioners (Wilson 1932). Elsdon Best also supports this role definition, stating that women learned massage by observing the way wahine kaumatua (women elders) massaged children each day (Best n.d.).

Steam and water bathing

In contrast with massage, bathing was a relatively passive therapeutic practice that required no intermediary. Evidence from settlers and travellers throughout the North and South Islands suggests that Māori made extensive use of thousands of naturally occurring mineral springs and pools for cooking, washing, relaxation and therapy. Indeed, Henry Morton recounted that 'To the natives, bathing is a 'cure for every ill, a salve for every wound' and whether it be a broken limb, a rheumatic pain, or any widely-different malady, they fly to the warm baths from all parts for relief' (Morton 1886, p. 23). Some thermal springs were considered highly prized for their physical beauty, their balance of hot and cold water, as places of ritual and ceremony, and as places of deep spiritual significance (Loader 2012).

Māori made therapeutic use of pools formed by waiariki (springs just hot enough to bathe in), ngawha (boiling spring forming pools into which cold spring water could be channelled or added), and mud baths. Steam was also utilised, either by placing the ill or injured person directly over a steam vent (protected by flax matting, herbs or branches of beneficial plants), or by fashioning a steam pit into which hot rocks, water and wet plant matter might be added, sometimes enclosing the patient within the pit for many hours.

Many of the accounts we have of Māori uses of water and steam bathing derive from the diaries and reports of 19th century colonial travellers. People like J. T. Large, whoes 'Notes of a Trip to the Hot Lake District' were published in the Thames Advertiser in 1879:

> After having partaken of a meal of boiled vegetables I went down to a famous waiariki to have a bath. This is situated on the large platform of silicious deposit, extending right down to the river, and in which there are many pot holes, some boiling, and others gently simmering, and others again of an intermittent character: one or two I noticed with a regular rise and fall at stated intervals; I had not been long immersed in my bath before I was joined by two young damsels from the pah [pā] above, who, nowise abashed by the presence of a stranger, entered readily into conversation about different things. We chatted, laughed, and foundered about and splashed one another till long after dark, and they freely confessed that I was the jolliest night companion of the bath they had ever met with. The bath was so luxurious and enjoyable that I felt inclined to remain there all night (Large 1879).

Luxury spas and the idea of 'taking the waters' had become a feature of leisure tourism in 18th century Europe and North America, with spa centres developing wherever hot springs were found, so it is likely that many travellers saw the abundance of hot springs as further evidence that New Zealand was a place of natural wonder. The region in the North Island that was

most geothermally active was called the 'Hot Lakes District' as a reflection of the English Lake District, and became the focal point for travellers through the country:

> Early European visitors to the Lakes Thermal District included John Bidwill (1839), Ernst Dieffenbach (1841)…and Sir George Grey (1849), and several others. These men published accounts of their visits, describing the palliative and curative properties of the hot springs, the fabulous formations of the Pink and White Terraces on Lake Tarawera, geysers, mud pools and other attractions such as mixedgender bathing (Matthews and Matthews Architects Ltd, Stafford, Williams, Mercer, and Gainsford, 2007/2010).

One such traveller, Dr John Johnson, first colonial surgeon and physician to Governor William Hobson during his illness and subsequent stroke (Moon 1998), travelled through New Zealand recording his observations. His account of his arrival in Rotorua reflects the wonder expressed by many:

> Continuing our course parallel to the shores of the lake, we came to a pool, from which vapour was rising, and on immersing our hands, found it to be of a temperature from which we quickly withdrew them. This then was our first acquaintance with the boiling springs of Rotorua, and we had now fairly entered upon this extraordinary region (Johnson 1847a).

After a night's sleep, Johnson recounts his first experience of bathing in the hot lakes;

> We rose at day-break, and on going out found the whole pa[6] enveloped in vapour, which was rising from the numerous Ngawha [sic], and we could hear the voices and the splashing, though we could not see the persons, of a number of people in the lake below, who were enjoying the luxury of a bath, in the common bathing-place…On reaching the edge of the basin, a scene, certainly unique of its kind, presented itself. About a hundred and fifty people of all ages were engaged in bathing, all in a state of nature, with the exception of the women, who, beyond a certain age, wore the bouraki, a species of kilt made of flax, reaching from the waist to the knee. In one corner might be seen a group of young women with dripping tresses, like so many Stygian Naiads,[7] in another, a swarm of young urchins, sporting about like so many imps in Dante's Inferno (Johnson 1847b).

Johnson reported that many local Māori spent 'half their time' bathing (ibid) and speculated that although this might be therapeutic and beneficial to the skin, it may also be the cause of disease, resulting in children 'disfigured by glandular swellings about the neck, and other scrofulous tumours' (ibid). Johnson speculated that the acidity was the cause of the inhabitants' blackened and decayed teeth, and that imbibing the water caused Europeans, who were unused to it, to develop indigestion and 'irregularities of the bowels' (ibid).

Hot springs were one of the principal modes of health promotion and recovery for Māori, with travellers like William Wade recounting in 1842 that 'the springs at this place [the Bay of Islands] are much resorted to by diseased natives…who bring baskets of provisions with them, and remain on the spot to use the sulphur warm-bath till a cure is effected' (Wade 1842). John Johnson concurred, claiming that the thermal springs and pools '…possess valuable medicinal qualities both for internal use, and external application, as the Natives [sic] cure many diseases by simple immersion in them, but I should imagine that their uniform heat is the most active agent in the cure' (Johnson 1847b). Johnson believed like many of his counterparts though, that 'an accurate analysis of their individual composition… would throw light on their use in specific diseases, and it would be desirable that such should be made under the auspices of Government' (ibid).

Māori also used a variety of methods to generate steam for therapeutic purposes, or to utilise naturally occurring steam. Umu (baking a steam bath over heated stones or a small oven), and umuroa (steaming in a full earth oven), were both common. Dr. Arthur Thomson described the way an umuroa functioned after travelling through New Zealand in 1854-5:

> The vapour bath is made by digging a hole in the ground about two feet deep, and as large as is required: into this a number of very hot stones, about the size of a large orange, are put, a quantity of water is sprinkled over the stones, and over them a thick bed of the leaves of the plants which are supposed to be efficacious in the cure of the disease are spread. The patient either lies down on them, or sits on them…the body is covered with a mat and a layer of earth… the steam generated by the water on the hot stones rises through the leaves, envelopes the body, and produces a copious perspiration. This bath is often given; sometimes the patients are kept in it from sunrise to sunset, but generally for two or three hours' (Thomson 1855).

Riley reports that umuroa were observed by the crew of Captain Cook's ship *Endeavour* on its first exploration of New Zealand in 1769, when 'stones [were] being heated and green celery placed on them. An old woman then seated herself on a mat over the steam rising from the celery placed on them' (Riley 1994, p. 22). Another method, huahua, involved bathing in water that had been heated in a container into which hot stones had been thrown. Commonly herbs, tree barks and seaweed would be added to the water to effect a particular cure (Macdonald 1973).

DISCUSSION

The purpose of this paper was to present the first organised account of physical therapies among tangata whenua (Indigenous peoples of the land) in 19th century New Zealand, before organised health professionals colonised the physical therapies and turned them into state-supported occupations. One cannot provide such an account, however, without also considering the practical, day-to-day changes that were brought about during a century of colonisation. This is perhaps

[6] A Māori pah (or more correctly *pā*) site is a promentory used for settlement (sometimes defensive) akin to a hill fort.

[7] In Greek mythology, the Naiads were water nymphs or female spirits who presided over fountains, wells, springs, streams, brooks and other bodies of fresh water. Stygian here refers to the mythical River Styx.

particularly relevant when we consider the thermal springs that were a significant feature of Māori daily life in some parts of New Zealand, because these springs represented a powerful physical, spiritual and cultural asset that was much coveted by the colonists.

Interest in the thermal springs was such that measures were taken in 1881 to cede control of ngawha, waiariki, lakes, rivers, and bodies of water under the auspices of the *Thermal Springs Act* and effectively remove governance of the land from Māori. According to the Bay of Plenty Times, the Act:

> …put an end to the chronic disputes that have arisen between Europeans that were enterprising enough to risk their money upon the mere promises and good will of the native owners in order to make some provision for the accommodation of visitors ("Thermal Springs Act 1881," 1881).

The Act made it unlawful for anyone other than 'Her Majesty to acquire any estate or interest in native land therein' (ibid), and gave the colonial government powers to 'Manage and control the use of all mineral springs, hot springs, ngawha, waiariki, lakes, rivers, and waters, and fix and authorise the collection of fees for the use thereof.' The Act allowed representative authorities to '[e]rect pump-rooms, baths, bath-rooms, and other buildings for the convenient use of the baths, springs, and lakes' (*Thermal Springs Act* 1881). The Act was penned as hostilities between Māori and colonialists began to abate after the New Zealand Wars of the 1860s and safe leisure travel to New Zealand became a possibility.[8] As such, the Act began a period of hostility towards Māori traditional healing practices that would be book-ended by a second piece of legislation called the *Tohunga Suppression Act* in 1907, whose sole purpose was to criminalise Māori Indigenous healing practices.

Much of the inspiration for the colonisation of Māori healing sites and practices lay in a desire to exploit the commercial potential of the thermal springs; a process that was only briefly interrupted by the eruption of Mount Tarawera and the destruction of the famous Pink and White Terraces on 10 June 1886. From the arrival of the first colonial travellers to the country's ngawha and waiariki in the 1830s, to the creation of the Rotorua Spa in 1908, an incremental wave of policies and practices, incursions and exclusions, moved Māori from their status as kaitiaki and tohunga, to one of exotic, Indigenous inhabitants in a colonised land.

The great irony of this action, of course, was that many of the physical therapies practiced by Māori were identical to those known to colonial settlers. The physical therapies, after all, had remained largely unchanged across cultures for many millennia, and so, clearly, the therapeutic practices themselves were not the focus of colonial interest, but rather the assets that provided the cultural context for their operation. In the following paper we will examine the way Māori healing arts were supplanted by European and North American physical therapy practice culminating in creation of the 'spa town and ethnic tourism enclave of Rotorua' that 'was at once a wonderland and a hellhole' (Werry 2011). In the second paper we address why it was that so few physical therapy practices and practitioners came in to fill the void made possible by the marginalisation of traditional Māori physical therapies.

CONCLUSION

In this first paper of three looking at the history of the physical therapies in 19th century New Zealand, we have concentrated on traditional Māori healing practices, most especially relating to the management of two 'orthopaedic' conditions: fractures and back pain; and two principal practices, massage and bathing in thermal waters. As stated above, this study has focused on Māori massage practices in the 19th century using written accounts of travellers and anthropologists. The study did not focus on oral texts that would have furnished other accounts of Māori healing practices. We acknowledge that this limits the inclusiveness of the data. Our hope is to supplement this preliminary data with oral historical accounts in the near future. From the data we have presented, it appears that physical therapies used by Māori bore many similarities to those practised by most cultures prior to colonisation and the advent of modern medicine. New Zealand's geothermal resources afforded some tangata whenua particular privileges that would become the envy of colonial settlers, and result in the thermal springs becoming a feature of the colonisation project that began in earnest after 1840. The effect of the annexation of land, the introduction of new communicable diseases, war and other mechanisms of colonisation, significantly affected the practices of physical therapies among Māori, and accounts suggest that although still practised, they became increasingly isolated events as the century wore on. In the following paper we discuss the very limited emergence of physical therapies among the settlers and the exceptional government-led project to create a spa town to attract a better class of invalid (Werry 2011), and kick-start a new era in health tourism at the end of the old century of conflict, and what was hoped to be the dawn of a new century of prosperity and cultural stability.

KEY POINTS

1. There is good evidence that Māori practised physical therapies long before colonisation and that these therapies were as successful as anything offered by colonial settlers at the time.
2. Physical therapies were performed by many members of the tribe, including tohunga, women, and whānau weawae – all of whom would be trained to perform their particular techniques.
3. Māori use of physical therapies, along with other cultural assets, suffered as a result of colonisation, and reporting on the use of physical therapies by Māori declines after 1860.

DISCLOSURES

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[8] The opening of the Suez Canal in 1869 not only boosted the tea trade with China, but also significantly shortened the sailing distance to Aotearoa/New Zealand.

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Physical activity levels and injury prevention knowledge and practice of a cohort of carpentry students

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ABSTRACT

The levels of physical activity and knowledge about postures and practices in carpentry students have not been extensively investigated. This study will inform occupational health practitioners about carpentry students' physical activity levels and workplace practices, so that back care and injury prevention education can be included in the curriculum. Data were collected from 51 participants using a questionnaire that asked about levels of physical activity and knowledge and practice for injury prevention. On average 6.4 hours of physical activity was performed weekly outside of work and/or study hours by 86% of participants. Most participants identified components of a safe lifting technique ('bend knees' 76%; 'back straight' 45%). They reported that heavy loads were frequently lifted (51% often/always lifted weights of 20-30kg independently and 69% rarely using the assistance of a co-worker or lifting device). Although participants had a basic knowledge of common lifting strategies for back care and injury prevention, weights lifted independently were frequently over the deemed safe lifting level. The findings indicate that carpentry students have a basic knowledge of injury prevention and lifting techniques but do not necessarily implement their knowledge into practice.

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Key words: Injury prevention, Physical activity, Carpentry students, Occupational injury, Education.

INTRODUCTION

Between September 2010 and June 2011 the city of Christchurch in the Canterbury region of New Zealand was struck by a series of devastating earthquakes that resulted in severe damage to the city's infrastructure and residential areas. To repair this damage Christchurch has undertaken a citywide rebuild plan (Bradley and Cubrinovski 2011). As a result, there has been a large increase in demand for trade workers. This has been reflected by an increase in students enrolling in trade courses at the local institute of technology.

Manual handling is frequently required in a number of occupations, often leading to injury. For example, in the construction industry, the physical demands of the job (constant gripping, prolonged bending, being in awkward/confined spaces and high repetition) can cause injuries in the lower back and upper limbs (Accident Compensation Corporation 2011). Studies have shown that by reducing these physical demands, the prevalence of work-related injuries is also reduced (Owen et al 2002). Construction and carpentry work is highly physical and involves frequent manual handling of equipment and supplies. Such physicality increases workers' risk of acquiring a work-related injury. Injuries can be caused by activities such as lifting heavy loads, vibration, kneeling and reaching activities as well as being in vulnerable positions such as twisting or leaning (Accident Compensation Corporation 2013). Over-exertion also plays a role in work-related injuries, being often associated with workers who push and pull objects using the upper limbs (Ray

and Teizer 2012). The most common musculoskeletal injuries in manual labour professions are reported in the lower back and upper arm (Muggleton et al 1999).

Educational programmes are a preventative strategy commonly used to reduce work-related injury. Through practice of injury prevention strategies and by keeping fit and healthy, the risk of injury can be reduced (Dong et al 2004). Research has also shown that those who are involved in heavy manual handling are more likely to be active outside of their job, compared to sedentary workers (Kruger et al 2006). The strongest evidence to reduce work-related injury supports the use of multifactorial interventions. These include promoting physical activity, provision of equipment to assist with lifting and manual handling of loads and improving injury prevention practices (Accident Compensation Corporation 2011).

The physical demands of young manual workers (under 25 years) have been reported to be higher than of older workers (over 25 years) due to the different distribution of work tasks as reported in a study by Kjestveit et al (2011). This study noted that the tasks of younger workers included vibration, heavy lifting, repetitive movements and overhead activities, all of which have the potential for injury. The study demonstrated that workers under 25 years of age were more likely to suffer injuries at work compared to their older counterparts (Kjestveit et al 2011). In another study, it was found that upper limb postures during lifting tasks differed between novice and experienced carpenters, with the latter tending to maintain more neutral postures while lifting (Ahmed and Babski-Reeves 2012). It has been suggested that younger workers have a higher level of risk acceptance in their trade due to lack of experience and a higher risk threshold. This risk threshold decreases with more experience and integration into the work environment (Kjestveit et al 2011).

Levels of physical activity and knowledge about postures and practices in carpentry students have not been extensively investigated in New Zealand. With the increased number of carpentry students in the Canterbury region, there could be an increase in work-related injuries in this industry. Our aim therefore was to determine the adequacy of carpentry students' injury prevention knowledge and practice, as well as to investigate their levels of physical activity.

METHODS

This study was a cross-sectional cohort study, approved by the University of Otago Human Ethics Committee.

Study location, recruitment and participants

The study was conducted at a local institute of technology in Christchurch, New Zealand. Students enrolled in the Carpentry Diploma course were invited to participate in this study. The course is taught over one year and qualifies the student as an apprentice carpenter. Carpentry consists of mostly manual labour in the construction and maintenance of buildings. The course involves a large practical component with involvement in an apprenticeship throughout the year. There was a potential pool of 80 students. We arranged with the Head of Department at the campus to inform the students about the study and allow them to participate in data collection following one of their lectures. Fifty-five students were present on the allocated day and 51 gave their written consent to participate in the study.

Data collection

We collected data via a questionnaire that was adapted specifically for this study from a questionnaire developed for trade workers by Vieira and Kumar (2005). The questionnaire obtained data on the participant's demographics, injury prevention knowledge, postures, work practices, physical activity levels, discomfort levels and work-related effort and exertion. The questionnaire also ascertained perceived level of exertion of the job via Borg's 10-point scale of Perceived Exertion (Borg and Kaijser 2006). The level of perceived effort used in the following categories: force; repetition; duration; maintaining one posture; and overall effort during the participant's workday was measured via the 10-Centimetre Visual Analogue Scale (VAS) (Williamson and Hoggart 2005). Also obtained was the level of discomfort perceived in an identified body area(s) at the end of the participant's work day via the 10-point Body Part Discomfort Index (Corlett and Bishop 1976).

Four members of the research team were present for the data collection period. Data were collected under the researchers' supervision over a 30 minute lecture period. Participants were allowed to ask the researchers for clarification regarding any section of the questionnaire if required.

Data analysis

Raw data were collated into a Microsoft Excel document from which means and standard deviation calculations were derived.

RESULTS

Forty-eight males and three females participated in this study (mean age, 20 years; age range, 17-50 years; mean weight, 77kg; mean height, 178cm). Twenty-five participants identified as being New Zealand European, 15 as Māori, 10 as Samoan and 10 as other (Czech, British, African, Scottish, Filipino), with some participants identifying with more than one ethnicity. Their level of experience varied from being new to a trade (70%), an apprentice (24%) or employed in carpentry (6%) and the mean time spent by participants in the carpentry trade was 22 (SD 21) weeks.

Most (84%) participants reported having had some formal training (type and frequency unknown) on correct techniques for lifting with some receiving training from more than one source. Figure 1 shows the sources where participants identified that they had received formal training on correct lifting techniques. The category of 'other' included 'at the gym', 'posters' and 'sports'. Furthermore, 88% of participants reported feeling that they had adequate knowledge to protect themselves from a lower back injury.

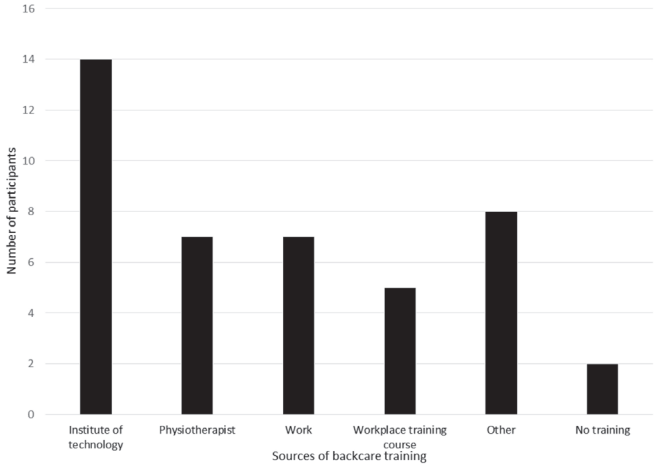

Figure 1: Sources where participants had received formal training on correct lifting

Participants perceived that good lifting techniques included 'bend knees' (76%), 'back straight' (45%), 'keep weight close to body' (12%), 'avoid twisting back while turning' (4%) and 'other' (27%). Participants provided examples of 'other' as 'push through your legs', 'transfer weight through your body' and 'squeeze bum'.

Participants also commented on strategies they could practise to prevent a back injury while working. The three most common answers given were 'avoid lifting excessive load' (55%), 'bend knees' (53%) and 'keep back straight' (39%). Multiple answers were permitted in the questionnaire, therefore percentages from the sample total were calculated.

Figure 2 shows the weights participants perceived that they lift independently while working. Forty-four percent of participants reported they would 'never/rarely' lift 40-50 kg and 37% stated they would 'sometimes'. At 50-60 kg, 65% of participants indicated they would 'never/rarely' attempt lifting this weight independently. However, 8% of participants reported they would 'often/always' lift 50-60 kg by themselves. In the 60+ kg category, 53% of participants stated they would 'never/rarely' lift this weight independently. The trend lines on Figure 2 show that as the weight of an object increases, the frequency of lifting such a weight decreases.

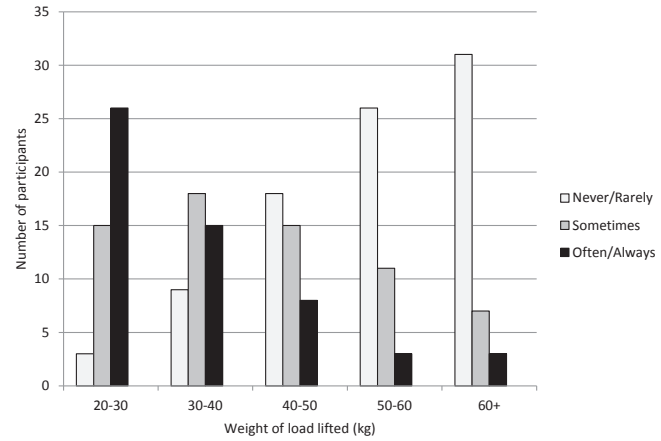

Figure 2: The perceived weight of loads lifted independently by participants when working

The percentage of participants who used a device or a co-worker during lifting tasks indicated they did not generally seek help. Sixty-nine percent of participants reported they 'rarely' got the assistance of a colleague or lifting device. Using assistance 'half of the time' was reported by only 12% of participants while only 19% reported getting assistance 'most of the time'. The main reasons for not seeking assistance included lack of co-worker availability, limited time or perceived sufficient strength for the task.

Figure 3 shows the devices that participants used to assist them when lifting heavy objects. Some participants reported multiple answers. The results show that most participants who answered this question had knowledge of different devices available to them, with only one participant reporting they were 'unsure'. Machines (cranes, forklifts, elevated work platforms) were the most popular choice with 38% of participants reporting using these. Manual devices (wheel barrow, trolley, sack barrow) were reported to be used by 35% of participants, while 21% reported never using a lifting device.

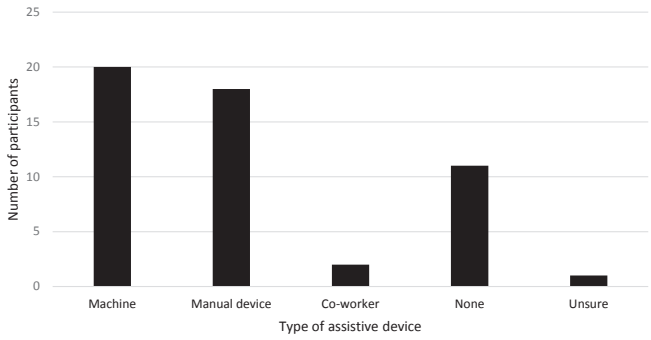

Figure 3: Assistive lifting devices used by participants at their worksite

Table 1 shows the percentage of participants and their usual practices in performing specified work-related activities during an average working day. Twisting when lifting/lowering was reported to be 'often/always' performed by 23% of participants. Fifty-three percent of participants stated they would 'often/always' squat while lifting/lowering. Pushing and pulling was reportedly performed 'often/always' by 52% of participants. Fifty-eight percent of the participants indicated they would 'never/rarely' stoop when lifting/lowering.

Table 2 shows the percentage of participants and their usual practices in performing specified work-related postures during an average working day. Kneeling on one knee was a common posture with 35% of participants reporting to 'often/always' adopting this position. Standing with trunk rotated and with trunk flexed and rotated was reported as being adopted less often with 69% of participants reporting to 'never/rarely' be in the latter position.

Table 1: Percentage of time spent performing work-related activities

Activity	Never-rarely	Sometimes	Often-always
Twisting when lifting and lowering	53%	24%	23%
Squat lifting and lowering	21%	26%	53%
Pushing and pulling	18%	30%	52%
Stooped lifting and lowering	58%	17%	25%

Note: Percentage of participants and their usual practices in performing specified work-related activities during an average working day.

Table 2: Percentage of time spent in work-related post

Posture	Never-rarely	Sometimes	Often-always
Kneeling on one knee	25%	40%	35%
Kneeling on both knees	40%	41%	19%
Standing with trunk rotated	52%	33%	15%
Standing with trunk flexed	54%	33%	13%
Standing with trunk flexed and rotated	69%	25%	6%

Note: Percentage of participants and their usual practices in performing specified work-related postures during an average working day.

Figure 4 shows the average level of perceived effort while working, measured in centimetres on a VAS out of 10. Participants were asked to rate their perceived effort in five different categories. The average perceived efforts were: force (5.9cm), repetition (5.8cm), duration (5.9cm), maintaining one posture (4.7cm) and overall effort, which was rated the highest (6.8cm). Perceived overall effort was assessed using the Borg Scale. The average effort was 5.6/10 which correlates to a 'strong' level of effort.

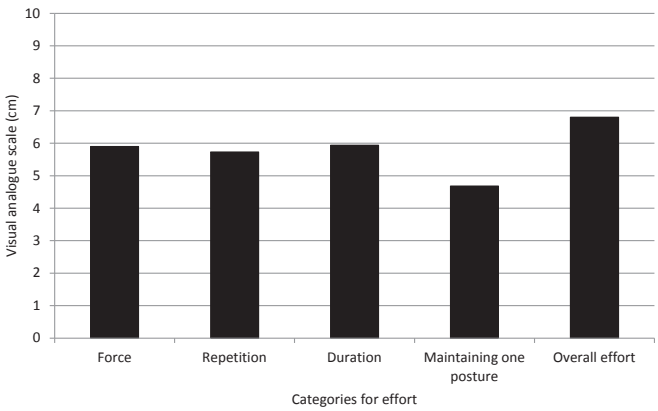

Figure 4: Average perceived effort while working

Participants reported using machinery that exposed them to whole body vibrations on a daily basis. While 58% of participants stated they were 'never/rarely' exposed, 36% reported they were 'sometimes' exposed and 6% indicated they were 'often/always' exposed to whole body vibration.

Figure 5 presents the reported prevalence of discomfort in different body regions at the end of an average working day. The 'lower back' was the most common area for discomfort, reported by 33% of participants. Discomfort in the 'lower arm' (which comprised the elbow, forearm, wrist and hand) was reported by 25%, while 22% indicated discomfort in the 'middle back' region. Discomfort in the 'shoulder', 'neck' and 'foot' were each reported by 18% of participants.

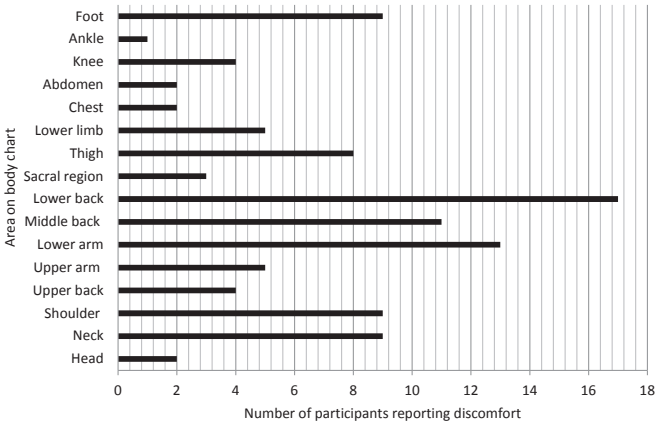

Figure 5: Prevalence of discomfort over specific body regions after an average working day

Figure 6 presents the mean level of discomfort reported by participants at the end of a working day in the respective body areas, using the VAS. The area which was reported as having the highest discomfort level was the 'lower back' (5.4cm) followed by the 'lower arm' (5.1cm) and 'lower leg' (5.0cm). The overall average level of discomfort reported across all body areas was 4.6/10.

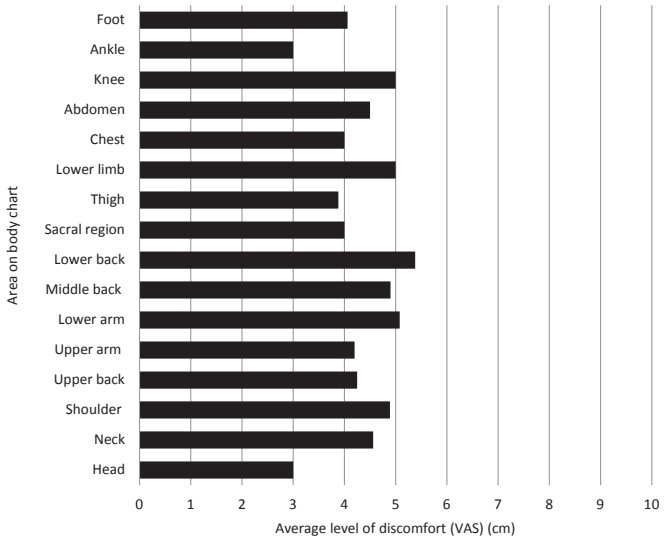

Figure 6: Average level of discomfort over different body regions at the end of a working day

Figure 7 shows the modes of physical activity that participants reported. Most participants (86%) reported exercising weekly with 43% being involved in more than one type of exercise. The modes of physical activity were cardio-based such as biking and running (49%), sports such as rugby and basketball (39%), gym work such as lifting weights and resistance exercises (31%) and other miscellaneous activities (6%). The average duration of weekly physical activity was 6.4 (SD 4) hours per person.

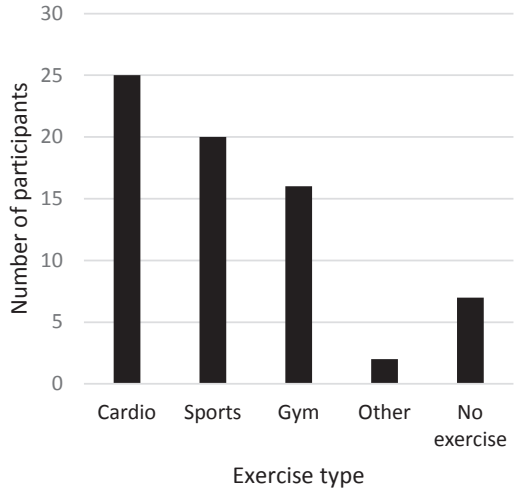

Figure 7: Weekly modes of physical activity reported by participants

Nine participants (17%) reported they were smokers, smoking an average of 8.4 cigarettes per day. Eight of the smoking participants reported they regularly participated in exercise with a weekly average of 3.8 hours. The group who smoked were found to be less active than the rest of the participants, with non-smoking participants completing an average of 7.1 hours of exercise per week.

DISCUSSION

This self-report study was conducted to determine the physical activity, injury prevention knowledge and practices of a new cohort of carpentry students. Results from the study indicated that participants had a basic level of knowledge of common lifting strategies for back care and injury prevention. However, some postures commonly adopted by participants were potentially unsafe and weights lifted independently were frequently over the deemed safe lifting level (Occupational Health Department: Imperial College 2007). Most of the participants reported that they experienced some musculoskeletal discomfort after a work day. On the whole, participants engaged in regular physical activity outside of work although those who smoked were found to be less active than non-smokers.

Recommendations for lifting weights under ideal conditions (upright and straight trunk, weight close to body, firm grip on object with the wrist in a neutral position and a lifting duration of less than one hour per day) are 25 kg for 95% of males and 15 kg for 99% of females (Occupational Health Department: Imperial College 2007, Gallagher et al 2005). Over half of our participants reported 'often/always' lifting greater than 30kg. Lifting heavy loads is a risk factor for lower back disorders (Burdorf and Sorock 1997, WorksafeNB 2010) and therefore our participants are potentially at a higher risk of sustaining a lower back injury. Even though the participants acknowledged that lifting heavy weights should be avoided, this behaviour was not observed in their work practice. The gap between knowledge and practice highlights the challenges of incorporating theory into practice. Literature shows that using a lifting device during manual handling has a significant relationship with reducing musculoskeletal symptoms and physical work demands (van der Molen et al 2005). Most participants in our study reported lifting unsafe weights independently, with most reporting that they 'never/rarely' seek the help of a co-worker and 69% of participants reporting 'rarely' using a lifting device.

Along with weights lifted, participants were also questioned regarding their lifting techniques and the postures they adopted during the work day. Squat lifting was reportedly 'often/always' performed by over half of the participants. In manual handling education, a strong emphasis has been placed on squatting (back remains as erect as possible while the knees are flexed) while lifting heavy loads (van Dieen et al 1999). However, additional recommendations during squat lifting include lifting loads of moderate weight, restricting load width and eliminating repetitive lifting (Jones and Kumar 2001). Just over 20% of participants reported they 'often/always' twisted when lifting or lowering, which places them at a higher risk of injury. Twisting can result in a 50% loss in tensile strength of the structures supporting the spine and is associated with an increased prevalence of back injuries (Jones and Kumar 2001). A consistent relationship has been shown between non-neutral trunk postures and musculoskeletal disorders of the back, with exposure to more than one non-neutral posture further increasing the risk (Punnett et al 1991). More than half of the participants reported they 'often/always' pushed or pulled objects while in an upright position. Pushing or pulling has been found to be consistently associated with shoulder pain and

when performed excessively, shows a dose-response relationship (Hoozemans et al 2002).

Further back care and safe manual handling education has been identified as important for this cohort of carpentry students. Education should also be provided to their employers to ensure that strategies are being implemented into the workplace as employers are required to eliminate, isolate or minimise hazard as far as is reasonably practicable (Health and Safety at Work Act 2015). Current intervention includes safe manual handling and lifting advice as well as postural education. However evidence to reduce risk of back injury in a cohort such as the one in this study supports a multifactorial intervention to reduce back injury prevalence and pain, targeted at individuals, employers and at policy makers in the industry (Accident Compensation Corporation 2011, Hignett 2003, Oakman et al 2014). Strategies include: risk assessment, education and training, feedback, group problem solving/team building, discussion of goals, assessment systems, hazard registers, physical fitness training and medical examinations (Hignett 2003).

Strategies which target senior staff, employers, educators and policy makers include: equipment provision, equipment evaluation, equipment maintenance, work environment redesign, work organisation changes, changing of policies and procedures, injury monitoring systems and auditing working practices (Hignett 2003, Oakman et al 2014).

Our participants reported the effort to maintain postures to be relatively high (6.8/10) and the average perceived exertion was rated as 'strong' on the Borg Scale. Participants therefore perceived their job to require a high amount of effort and energy. Literature shows that maintained static postures can contribute to injury (Jones and Kumar 2001). These prolonged postures can lead to changes in the viscoelastic properties of collagenous tissue. The lengthening of the tissue may cause functional instability, further contributing to work-related injury (Jones and Kumar 2001). As well as static postures, daily exposure to whole body vibration was reported in over one third of our participants. Current research shows that this kind of exposure has a dose-response relationship with back disorders (Xu et al 1997). A higher overall effort is required to maintain a correct posture and these sustained contractions could lead to musculoskeletal disorders in the future. However, literature shows that workers perceive their work as more strenuous when they have chronic lower back pain (Elders and Burdorf 2001). The lower back pain reported by a third of our participants could have affected their level of perceived exertion.

Sustained positions and muscular contractions can often lead to pain and discomfort of body structures, especially the lower back (Burdorf and Sorock 1997). The most common body areas where our participants reported feeling discomfort at the end of a work day were the lower back, mid back, lower arm, shoulder and neck. These findings are supported by other studies (Dimov et al 2000, Holmstrōm et al 1992). A history of lower back pain results in a likelihood of recurrence in the future. A study that investigated this involved 10,000 Danish adolescents. Results found that the participants with lower back pain in the previous year had an odds ratio of 3.5 for recurrence of the pain within the next eight years (Hestbaek et al 2006). Therefore interventions that prevent recurrence of lower back pain have the potential to reduce time off work in the future.

It was interesting to find that the majority of our participants were involved in weekly physical exercise outside of their work hours. What they reported exceeds the American College of Sports Medicine cardiorespiratory exercise recommendations, which is 30 minutes of moderate intensity exercise five times a week (Haskell et al 2007). We also found that those who smoked were less active, exercising for approximately half the time of non-smoking participants. These findings are similar to the inverse relationship between smoking and physical activity identified in literature (Kaczynski et al 2008). Overall our participants were very active and involved in a variety of physical activities despite being at risk for injury and discomfort because of the nature of their work.

A limitation for this study was the sample size and that all participants were studying carpentry. Therefore the results and conclusions should not be generalised to carpentry students in other courses and institutes, nor to other students studying trades. Another limitation includes the potential overestimation in cross-sectional self-reporting questionnaires which could have influenced the results of this study, as there is likely to be a difference between perceived and actual task performance. Overestimation is often linked to the following: male gender, a lower body mass index, finishing full-time education at a younger age and having good general personal health perception (Corder et al 2010). Most of our participants fitted into these categories. Indeed, there are more accurate ways to measure levels of physical activity, for example, via a pedometer (Ainsworth 2009) and it must also be acknowledged that our questionnaire's validity and reliability are yet to be tested. However, this study was the first of its kind to investigate the injury prevention knowledge and practice of first year carpentry students in New Zealand.

CONCLUSION

This study investigated the knowledge and practice of a cohort of first year carpentry students at an institute of technology in New Zealand. Our study found that participants had knowledge regarding posture and lifting technique but were not necessarily implementing this knowledge into practice. Further studies with a larger sample size, more robust methodology and questionnaire validity testing are recommended. Findings from this study suggest that education on injury prevention strategies with a multifactorial approach be implemented to decrease the risk of workplace injury.

KEY POINTS

1. A multifactorial intervention aimed at improving workplace injury prevention practices could assist in reducing the likelihood of workplace injury. This could include:
    - Educating employers on implementing injury prevention strategies in the workplace.
    - Motivating employers to prioritise the health and safety of their staff.
    - Teaching employees and employers back injury prevention strategies

2. Physiotherapists could play a key role in implementing this multifactorial approach due to their expertise in human biomechanics, ergonomics and risk factors for workplace injuries.

PERMISSIONS

This study was approved by the University of Otago Human Ethics Committee under the reference number 13/048. Informed consent was obtained (both verbally and written) by all study participants.

DISCLOSURES

This study had no source of funding. No conflict of interest was identified by any party.

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Retention of pain neuroscience knowledge: a multi-centre trial

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ABSTRACT

Pain Neuroscience Education (PNE) has been shown to increase patient and healthcare provider knowledge of pain. To date, however, no study has examined if that knowledge is maintained over time. Patients suffering from chronic pain were invited to attend a free PNE lecture. Patients were required to complete intake demographics followed by two self-report measures 2 weeks before, 48 hours before, 48 hours after, 6 weeks after and 12 weeks after the PNE lecture. The two self-report measures collected at each interval were pain ratings (numeric rating scale [NRS]) and knowledge of pain (Neurophysiology Pain Questionnaire [NPQ]). Only data from patients who completed these measures at each interval were analysed. A repeated ANOVA was used to analyse the changes in NRS and NPQ over time. Forty-seven patients (11.4 years of pain) completed all five surveys for analysis. The NPQ scores showed significant increases in pain knowledge from 2 weeks pre-PNE to all post-PNE intervals ($p = 0.002$, $p = 0.001$, $p = 0.005$), as well as 48 hours pre-PNE to all post PNE-intervals ($p = 0.001$, $p < 0.001$, $p = 0.001$). A single PNE session has the ability to increase pain knowledge, and maintain the increased knowledge 3 months later.

Louw A, Zimney K, Puentedura E (2016) Retention of pain neuroscience knowledge: a multi-centre trial. New Zealand Journal of Physiotherapy *44(2): 91-96. doi: 10.15619/NZJP/44.2.04.*

Key words: Pain, Neuroscience, Education, Knowledge, Retention

INTRODUCTION

Teaching people about the neurobiology and physiology of pain has gained popularity in physiotherapy in recent years (Nijs et al 2011, Nijs and Van Houdenhove 2009). This approach of teaching people more about the biology and physiology of a pain experience is referred to as pain neuroscience education (PNE) (Louw et al 2015a, Louw and Puentedura 2014, Zimney et al 2014). For people suffering from persistent pain, several randomised controlled trials and a systematic review have reported compelling evidence for PNE having a positive effect on pain, function, pain catastrophisation and physical movement (Louw et al 2011, Moseley et al 2004, Moseley 2002). For more acute and sub-acute conditions, a recent multi-centre randomised controlled trial of PNE provided preoperatively for lumbar surgery reported a significant reduction in healthcare utilisation at 1-year follow-up, as well as superior surgical experience from the patient's perspective (Louw et al 2014a).

In lieu of the positive outcomes associated with PNE, various authors have proposed different mechanisms behind the success of PNE (Meeus et al 2010, Moseley 2003a, Moseley et al 2004). Some authors have argued that PNE reduces fear, which in turn leads to improved movements, function and a decreased pain experience (Moseley et al 2004). Moseley (2002) argued that PNE's proposed success may be associated with a reconceptualisation of pain by the patient. This reconceptualisation dichotomises tissue issues (nociception) and pain, thus helping patients understand that tissue injury and pain are not synonymous (Nijs et al 2013, Puentedura et al 2009). Furthermore, it has been argued that one of PNE's benefits may be associated with a "new" pain language which utilises fewer provocative words, thus decreasing the pain experience (Louw et al 2013a, Louw et al 2014b). Louw et al (2015a) showed that PNE provided prior to lumbar surgery resulted in patients having a more realistic expectation about pain after surgery, and helped them appreciate that pain is a normal part of the human experience.

Although these studies all argue various aspects of the proposed mechanism behind PNE's success, all of the studies assume that patients' understanding and knowledge of pain has increased. In 2003, Moseley (2003b) conducted a study whereby he used a Neurophysiology of Pain Questionnaire (NPQ) to measure if patients and healthcare providers indeed experienced an increase in knowledge of pain, following a 3 hour PNE lecture. The results from 276 patients with chronic pain and 288 healthcare providers showed that following a PNE lecture, both patients and healthcare providers had an increased knowledge of pain (patients improved by 32%; healthcare providers 23%). To date, however, no studies have tested if NPQ increases following an initial PNE presentation are sustained when measured at a later interval. The purpose of this study was therefore to examine if an increased knowledge of pain neuroscience is maintained after an initial pain neuroscience educational session.

METHODS

Study design

This was a multi-centre trial. All participants acknowledged their understanding and willingness to participate by providing signed consent. Prior to the study, ethics approval was obtained. Participants were informed that the study was aimed at measuring their level of pain before and after a community-based lecture on PNE. Participants were blinded to the true purpose of the study, i.e. retention of pain neuroscience knowledge.

Setting

An educational seminar company specialising in PNE for physiotherapists secured large auditoriums in three different cities for the study. One venue was a hotel conference room and the other two were physiotherapy school auditoriums. Each facility was disability accessible, with overhead sound, a projections screen and projector.

Participants and recruitment

Brochures advertising the event were sent to physiotherapists in the seminar company's database who worked in the three designated cities. Physiotherapists were alerted to the event and asked to encourage current or past patients with chronic pain to attend the 2 hour evening lecture. The brochures indicated that the physiotherapists in the area would be hosting a free 2-hour evening lecture on the latest understanding of pain and feature a pain specialist. The brochures encouraged anyone currently experiencing chronic pain and interested in knowing more about "how pain works" to attend. No specific exclusions were listed in regards to diagnoses, duration of pain, and location of pain, gender, age or ethnicity, except the disclaimer that the presentation was being delivered in English. Family members interested in attending were allowed to attend the lectures. Even though the presentations were free, interested patients were asked to sign up for the event, allowing organisers to mail attendees details about the evening lecture (location, date, times) and allowing the researchers to send a letter to each patient inviting them to be part of the study. The letter explained that participation in the study was completely voluntary and their participation would not be reported to any healthcare provider. Additionally, participants were informed that the speaker of the event would be blinded to their being part of the study or not. The letter informed attendees they would be required to complete two questionnaires at five different intervals (2 weeks before; 48 hours before; 48 hours after; 6 weeks after and 12 weeks after) (Figure 1). Participants were furthermore informed that those who participated in the study and completed the questionnaires at all of the five intervals would be compensated for their time with a gift card.

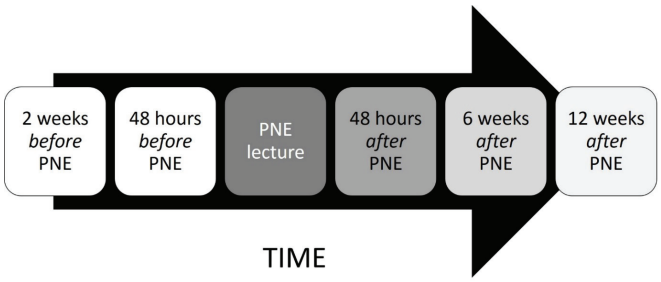

Figure 1 Study timeline

Notes: PNE, Pain Neuroscience Education.

Intervention

The content of PNE is well documented and in line with other studies (Louw 2014, Louw et al 2013a, Moseley 2003b, Zimney et al 2014). The 2-hour PowerPoint presentation's main themes included a discussion of peripheral sensitisation, central sensitisation, bio-psycho-social factors associated with chronic pain, immune responses in pain, threat appraisal of the brain, the pain neuromatrix, nociception, somatosensory cortex changes and pain, stress and endocrine responses in pain as well as various therapeutic strategies to ease pain (Louw 2014, Louw et al 2013a, Moseley 2003b, Zimney et al 2014). Various images, metaphors and examples were used to convey the PNE to the attendees (Louw 2013). Notepads and pens were provided for patients to take notes. A small summary booklet was provided to each participant upon completion of the lectures. Following the formal presentation, participants were encouraged to ask questions. The presentation did not specifically address or target any questions contained in the NPQ.

Outcome measures

Participants interested and willing to participate completed a demographic survey capturing their age; gender; duration of pain; height; weight; and location of their pain. Additionally, participants were asked to complete two self-report outcome measures:

- *Pain:* Pain was assessed using the Numeric Pain Rating Scale (NRS), as has been used in various PNE studies measuring pain outcomes (Moseley 2003a, Moseley 2005, Moseley 2002). The minimal detectable change (MDC) for the NRS is reported to be 2.1 (Cleland et al 2008).
- *Pain Knowledge:* Pain knowledge was measured using the NPQ. The NPQ is based on a current pain science text (Wall and Melzack 1999) and was used in a previous study measuring the neurophysiology knowledge of patients and healthcare personnel (Moseley 2003b). The NPQ is a 19-point questionnaire requesting 'true'; 'false'; or 'not sure' answers to statements, with higher scores indicating more correct answers. The questionnaire used in this study was similar to the one used by Moseley (2003b) and adapted slightly to make it easier for patients to understand, e.g., "nociception" was replaced with "danger messages." Since the development of the NPQ a statistical analysis of the NPQ has led to the development of an abbreviated NPQ which removed ambiguous questions (Catley et al 2013). The revised NPQ was not available by the time this trial started.

At the designated timed intervals (Figure 1), participants were sent online links and reminders (Surveymonkey) (George et al 2013) to complete the NRS and NPQ. The demographic sheets were only to be completed at the initial survey starting point 2 weeks before the lecture. Reminders and links were e-mailed to patients 48 hours prior to, 48 hours after, 6 weeks after and 12 weeks after the PNE presentation. All e-mail links and e-mail correspondence with participants were performed by an independent research assistant and none of the primary investigators.

Data analysis

All data were analysed using SPSS version 22.0 (SPSS Inc., Chicago, Illinois, USA). Level of significance was set at α=0.05. To determine whether there were any significant differences in NPRS and NPQ at each time point, a repeated measures ANOVA (five time points) was conducted for each of the dependent variables (NRS and NPQ). If an interaction was observed then simple main effects were tested, with appropriate Bonferroni correction.

RESULTS

Patients

Figure 2 provides a flow chart of the study. Out of 228 eligible patients with chronic pain, only 132 (57.9%) indicated they were willing to participate by completing the initial intake forms; NRS and NPQ 2 weeks before the PNE Education session. Of the 132 entered into the study, 85 failed to complete post-PNE outcome measures from at least one follow up time point leaving us with viable data from only 47 participants. Analysis for this study was therefore based on data from 47 participants (Table 1), with a mean age of 56.5 years and a mean duration of pain of 11.4 years.

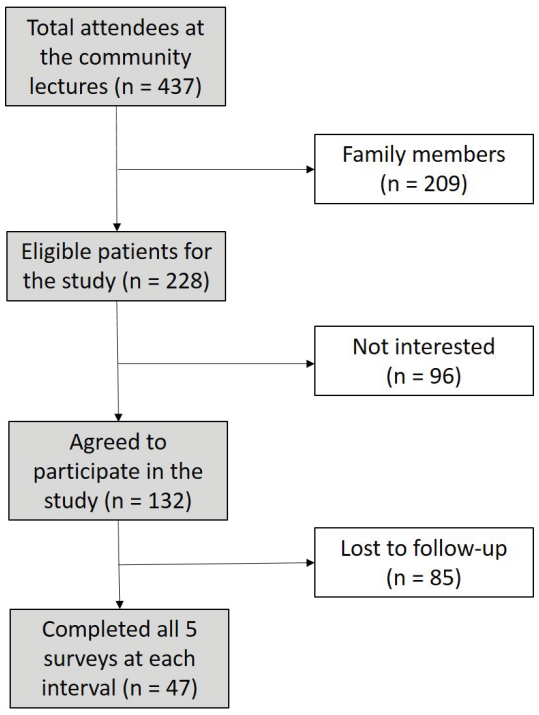

Figure 2 Study flow sheet

Table 1 Demographic information for study participants

Characteristics	Results
Age (mean (standard deviation) years)	56.5 (SD 10.64)
Sex	37 females (78.7%)
Duration of symptoms (mean (standard deviation) years)	11.4 (SD 11.86)
Pain rating (mean NRS)	5.02
Pain knowledge (mean NPQ (frequency))	8.86 (46.6%)
Height (mean; cm)	168.4 (SD 9.5)
Weight (mean; kg)	85.55 (SD 22.27)
Highest rated areas affected by pain	Low Back 55.3% Lower Legs 46.8% Neck 40.4% Hips 31.9% Upper Back 29.8%

Notes: NRS, Numeric Pain Rating Scale; NPQ, Neurophysiology Pain Questionnaire

Pain knowledge

The pre and post-PNE NPQ scores are found in Figure 3 and Table 2. The NPQ scores showed significant increases in pain knowledge from 2 weeks pre-PNE to all post-PNE intervals, as well as 48 hours pre-PNE to all post PNE-intervals. During the control period (no PNE), from 2 weeks prior to PNE to 48 hours pre-PNE, there was no statistical difference in pain knowledge ($p = 0.46$). Immediate post PNE NPQ scores remained similar to scores at 6 and 12 weeks post-PNE ($p = 1.00$ and $p = 0.55$ respectively).

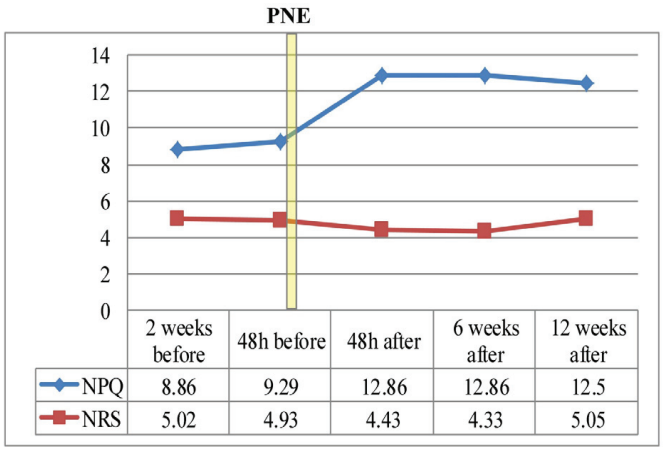

Figure 3 NPQ and NRS data at each intake interval

Notes: NPQ, Numeric Pain rating Scale; NRS, Numeric Pain Rating Scale; PNE, Pain Neuroscience Education

Table 2 NPQ differences for the timed intervals

2 weeks before	48 hours before	48 hours after	6 weeks after	12 weeks after	Difference
8.86	9.29				p = 0.463
8.86		12.86			p = 0.002*
8.86			12.86		p = 0.001*
8.86				12.5	p = 0.005*
	9.29	12.86			p = 0.001*
	9.29		12.86		p < 0.001*
	9.29			12.5	p = 0.001*
		12.86	12.86		p = 1.000
		12.86		12.5	p = 0.545
			12.86	12.5	p = 0.560

Notes: *, statistically significant

Pain

The NRS scores at each interval are found in Figure 3. There were significant differences in pain (NRS) between 2 weeks before and 6 weeks after (p = 0.02), 48 hours after and 12 weeks after (p = 0.03) and between 6 weeks after and 12 weeks after (p = 0.03), but the differences did not meet the minimal detectable change of 2.1.

DISCUSSION

This is the first study to show that a single PNE session for people in chronic pain has the ability to increase pain knowledge, and this increased pain knowledge remains intact three months following the single educational intervention.

It can be argued that for PNE to be effective patients need to receive the message, internalise the message and then apply it to their current pain experience. This premise is the fundamental underpinning of deep learning (Sandberg and Barnard 1997, Wittmann-Price and Godshall 2009). Various studies discussing behaviour change call for deep learning whereby patients indeed need to be exposed to a conceptual change, with application of the information to their situation, and the message must be carried away with them to allow true change (Crabtree et al 2001). In contrast, it is argued that a main reason why healthcare education fails is because of superficial learning. In superficial learning, a patient receives the message, but the message is not internalised and applied to the healthcare issue, thus eroding over time. Although various factors such as motivation, social and environmental influences, all play a role in deep learning (Sandberg and Barnard 1997, Wittmann-Price and Godshall 2009), it can be argued that a fundamental starting point has to be a gained knowledge of the healthcare information imparted by the healthcare provider and this information should not erode over time. To prevent the erosion of gained information, various strategies such as follow-up phone calls; websites with information; and providing a handout of the educational material can be implemented (Cherkin et al 1996, Louw et al 2013b, Oshodi 2007). In regards to PNE and physiotherapy, this is the first study to report that gained PNE knowledge immediately after a single PNE educational session remains intact three months later.

The results from this study warrant an investigation as to why the gained knowledge remained intact three months later, in comparison to various studies reporting a typical erosion effect with single-educational-design interventions. One argument is the interest in pain by people suffering from pain (Louw et al 2009). Various authors have implied that the current models used to teach people about pain are inadequate (Gifford 1998, Moseley 2007, Nijs et al 2013). In orthopaedics, as an example, as a means to explain pain to a patient, healthcare providers often migrate towards biomedical models such as anatomy and biomechanics. Not only have these models been shown to be unhelpful in understanding why they hurt, but they also induce fear and anxiety in patients (Sloan and Walsh 2010). PNE by definition aims to reconceptualise pain, thus minimising biomechanical and anatomical issues as a main source of pain, and rather focuses on the biological processes associated with persistent pain, such as central sensitisation (Moseley 2007). Given that this cohort of participants comprised a seasoned chronic pain population with a mean duration of pain over 11 years, it could be argued they were seeking a new paradigm to understand why they still hurt. Participants were clearly engaged and interested in the material, since their knowledge of pain neurophysiology increased by 38%, which correlates well with the 32% reported by Moseley (2003b).

To date, no study has shown that an increase in NPQ is correlated to decreased pain. In fact, a recent case series of patients preparing for lumbar surgery (Louw et al 2015a), as well as a single-case functional magnetic resonance imaging (fMRI) study (Louw et al 2015b), showed that immediately after PNE, patients often have a small increase in their pain, often clinically referred to as "*explain pain pain*." Educational theorists believe this slight increase may in fact be a sign of deep learning, indicating patients received the message and internalised it, which may lead to an emotional response. The fact that pain in itself was not meaningfully changed at any interval after PNE is not surprising. In people with chronic pain there are various biological changes associated with an increased pain experience as a means to protect (Woolf 2007, Woolf and Salter 2000). These changes are often either irreversible or likely to take a long time to change, allowing pain

to ease. This belief is underscored by the fundamental premise of cognitive behavioural therapy that aims to improve function despite pain (Nijs et al 2012, Ostelo et al 2003). In a recent multi-centre randomised controlled trial, Louw et al. showed that after low back surgery, patients who received PNE prior to surgery had similar back and leg pain ratings one year after surgery, but despite the pain, spent 45% less on healthcare in the 1 year after surgery and rated their surgery as a success, when compared to patients who did not receive PNE (Louw et al 2014a). The results from these studies, along with this study's results, may in fact indicate that pain ratings may not be an appropriate indication of success of PNE. PNE reconceptualises pain and aims to help patients understand that pain is not an indication of the health of their tissues.

Limitations

This study contains various limitations. Only patients with access to the Internet, ability to attend an evening lecture, and to listen to and speak the English language were able to participate. In addition, only 47 out of 132 (35.6%) of the attendees consenting to participate ended up completing all of the necessary surveys at follow-up. The high loss to follow-up may have potentially skewed the results. Finally, we also cannot discount the possibility that the NPQ may have served as a refresher to the pain education material and therefore, had an impact on results.

CONCLUSION

A fundamental cornerstone of PNE is gained knowledge of pain science. PNE is able to increase people in pain's knowledge of pain, according to modern pain science, and this enhanced knowledge of pain remains intact three months after a single educational intervention.

KEY POINTS

1. Pain neuroscience education (PNE) is able to increase a person's knowledge of pain.
2. The increase in pain knowledge following a PNE session is maintained three months after the PNE session.
3. Although PNE increases pain knowledge and is maintained three months later, it does not lead to decreased pain ratings.
4. The ability to produce a gained knowledge of pain with a PNE lecture can be replicated in a multi-centre approach, thus providing the potential for large scale therapeutic educational approaches to help people suffering from persistent pain.

PERMISSIONS

The study was approved by the Internal Review Board (IRB) / Ethics at Southwest Baptist University in Bolivar, MO. Patients provided written consent to participant in the study.

DISCLOSURES

The authors affirm that they have no financial affiliation (including research funding) or involvement with any commercial organisation that has a direct financial interest in any matter included in this manuscript. The authors do receive royalties for patient books on pain. A full disclosure was provided at the start of the PNE lecture and no teaching material referred to any of the patient books.

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Te Vaerua Community Rehabilitation Service: a Participation Action Research study of Community Based Rehabilitation in the Cook Islands

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ABSTRACT

Community based rehabilitation (CBR) is a World Health Organisation initiative to support people with disabilities to attain maximal life participation through locally based programmes. Te Vaerua Community Rehabilitation Team (Te Vaerua) is a provider of CBR in the Cook Islands. This study used a Participatory Action Research (PAR) framework to explore cultural values, motivations for and provision of rehabilitation by Te Vaerua in the Cook Islands. Data was collected through focus groups, interviews, participant observation, and an emergent process of action cycles with local rehabilitation stakeholders. Three key themes were identified: 1) rehabilitation is available, 2) rehabilitation has heart, and 3) rehabilitation gives hope. These themes have an overarching concept of 'ko te iti tangata te mea maata' – that people are the most important thing. Rehabilitation was seen as central to broader social objectives to strengthen families, empower Cook Islands citizens, support people to remain in the Cook Islands, and to provide opportunities for people to give back to their communities. The study concluded that strong relationships between providers and the local community are essential to successfully implement both PAR and CBR.

Washbourn R, Levack W, Graham F, Currey N (2016) Te Vaerua Community Rehabilitation Service: a Participation Action Research study of Community Based Rehabilitation in the Cook Islands*. New Zealand Journal of Physiotherapy 44(2): 97-104. doi: 10.15619/NZJP/44.2.05.*

Key words: Rehabilitation, Community-based participatory research, Polynesia, Cook Islands, Pacific, Action research

INTRODUCTION

Community Based Rehabilitation (CBR) was initially developed by the World Health Organisation in the 1970s as a strategy to provide better rehabilitation services to people with disabilities by drawing on local community knowledge and resources (Khasnabis et al 2010). CBR typically takes a rights based approach to promote access to healthcare, education and community participation (Grandisson et al 2016, Khasnabis et al 2010) and is underlined by conceptual frameworks such as the social model of disability and the International Classification of Functioning, Disability and Health (ICF) (Biggeri et al 2014).

Development initiatives in newly industrialised countries have historically been initiated by international organisations working outside of the communities they aim to serve (Khasnabis et al 2010). These 'top down' programmes have been criticised in the past for their limited impact, largely due to failing to address local needs in a manner consistent with local values or sustainable by local resources (Kuipers and Allen 2004, O'Toole 1987, Shakespeare and Officer 2014). In contrast, CBR is an example of a 'grass roots' or 'bottom-up' approach that requires a combined effort of individuals with disabilities, disability advocacy groups, governments, and service agencies within a country being actively involved at all stages of programme development, implementation and monitoring (Biggeri et al 2014, Iemmi et al 2015, International Labour Organisation et al 2004, Khasnabis et al 2010). CBR draws on a community's knowledge to directly inform the development of new services or initiatives. As a result CBR should result in sustainable and culturally appropriate services and supports for people with disabilities (Deepak et al 2014, Iemmi et al 2015, Yuenwah 2012).

Nevertheless, CBR is not without challenges. The skills and resources needed to run a CBR project may be limited, resulting in overseas 'experts' being recruited to fill perceived gaps (Mpofu 2001, Thomas and Thomas 1999). There is also limited evidence supporting the effectiveness of CBR, most of which is case-study based – focusing on individual projects in specific places (eg Balasubramanian et al 2012, Biggeri et al 2014, Nuri et al 2012). Generalised or long-term benefits of CBR have yet to be demonstrated (Bowers et al 2015, Madden et al 2013).

Generation of such evidence is challenging due to the diversity of contexts and situations in which people from different nations live and function. Concepts of health are culturally mediated (Durie 1994, Fitzgerald 1992, Hughes 2008) adding to the difficulty with comparing or combining evaluations of CBR projects.

The study described in this paper arose following the experiences of the first author, a New Zealand European (RW) working as a physiotherapist in a rehabilitation service for a Pacific Island nation, specifically Te Vaerua Community Rehabilitation Inc. (aka. Te Vaerua) in the Cook Islands, and her questioning of differences in understandings of rehabilitation. Te Vaerua was first established in 2007 and is based in Rarotonga. It operates within the concepts and philosophy of CBR, providing rehabilitation and support to people with disabilities throughout the Cook Islands. The Cook Islands is a Pacific Island nation comprised of 15 small, isolated islands spread across a vast ocean area, with a population of 17,800 (Ministry of Finance and Economic Management 2012). The Cook Islands has a protectorate agreement with New Zealand meaning that Cook Islands residents are eligible for Auckland-based tertiary medical services, including rehabilitation. Te Vaerua works alongside existing primary and secondary health services providing physiotherapy, adaptive equipment, home visits and clinic-based rehabilitation. To date it has employed "Western" physiotherapists, mainly from New Zealand. The aim of this research was to explore how rehabilitation was valued and should be provided in a Cook Islands setting, and thus to support Te Vaerua to further develop their services. The research also aimed to generate guidance for "Western" therapists working in the region regarding how rehabilitation should be conceptualised and provided.

METHOD

Study design

Participatory action research (PAR) is a cyclical process of data collection, analysis, implementation and re-evaluation that occurs within a democratic framework of involvement. PAR holds that practical solutions, changes or 'actions' that benefit study participants are an integral part of the research process (McIntyre 2008).

PAR involves a progression of choices which influence direction, processes and outcome (Bradbury and Reason 2008). These choices are based on a transparent process of collaborative decision making with study participants, which emerge throughout the research process (Maiter et al 2008, McTaggart 1991). PAR is a valuable approach for cross cultural projects as it allows the community itself to identify and define all aspects of the research process. This embeds the research within the participants' cultural context and understandings, ensuring the research is meaningful to the participants (Maiter et al 2008, McTaggart 1991, Roberts 2013). Within PAR the researcher is equally a participant, and needs to be self-reflexive about the influence and interpretation that their positioning effects (McIntyre 2008, Somekh 2005). This study holds a constructivist paradigm, which includes the view that there are multiple social realities and gives context for cultural safety to be incorporated into the methodology.

Initial consultation

During initial consultation with the first author (RW), the Te Vaerua board members indicated their wish to use research to improve their provision of rehabilitation services in the Cook Islands. A preliminary research proposal was submitted to the board via email in January 2013, and the proposal was reviewed and altered by the board prior to development of the method or submission of ethical review of the study. A timeframe for planned data collection was agreed during which time the primary author (RW) was to also provide physiotherapy services for Te Vaerua. Prior to the start of the research the study was reviewed and approved by the University of Otago Rehabilitation Human Ethics Committee (13/185) and the Health Research Committee of the Cook Islands National Research Council.

Participant recruitment and initial study set up

PAR requires engagement with local people to create meaningful research which directly benefits the participants' community. Unlike more traditional forms of research, decisions regarding who should be involved in a study and the direction the study should take are directed far more by the study participants themselves than by the researcher (Frisby et al 2005, McIntyre 2008). In this study, the community in question was Te Vaerua, which included both those who provided and those who benefited from the service. Initially, participants were recruited by self-selection, with board members offered the opportunity to be part of the research process. All participants were given an information sheet and a memorandum of understanding as part of the consent process. Seven board members attended an initial meeting. These current board members included men and women, Cook Islanders and Europeans resident in the Cook Islands with differing lengths of time involved in the development and implementation of Te Vaerua.

Through action cycle meetings, other participants were identified who could contribute to discussions of expectations and understandings of rehabilitation – ie snowball sampling (Sadler et al 2010). These participants included funders from the Cook Islands Ministry of Internal Affairs and rehabilitation staff members. Identified individuals were approached to seek their opinions and involvement. In addition to the board members, two participants representing service funders and four participants representing health providers (an occupational therapist, an equipment maintenance manager, a family support volunteer, and a physiotherapist) were recruited. The researcher was also embedded in the health provider participant group as a second clinical physiotherapist at the time of data collection. During one early meeting with the board consideration was also given to recruiting patients and community members for the study, but these connections needed to be mediated by Te Vaerua and did not eventuate.

Data collection

Following the PAR action cycle and the preference of the participants involved, data collection evolved over a three month period to include focus groups, semi structured interviews and ethnographic observations of board meetings as well as informal dialogue with therapists and patients (see Table 1).

Table 1: Summary of participant groups and types of data collected

Participants	Board members (n=7)	Funders (n=2)	Therapists (n=4)
Data collected	Board meetings observed (x3 meeting) Focus groups (x2 meetings) Interviews (with 4 individuals over 5 interviews)	Interview (x1 meeting with funders)	Focus groups (x3 meetings)

Three types of study data were gathered: 1) audio-recordings and transcriptions of meetings and interviews, 2) member-checked summary sheets of interviews and meetings, and 3) personal observations and reflections recorded in written and audio journals (see Figure 1). The researcher diary also gave opportunity for reflexivity, and provided context for discussion of cultural influences on data interpretation with the co-investigators and study participants. In addition, use of a (non-participant) Cook Islands Māori physiotherapist as a 'critical friend' (Adams-Smith 2002) gave further perspective valuable to researcher positioning.

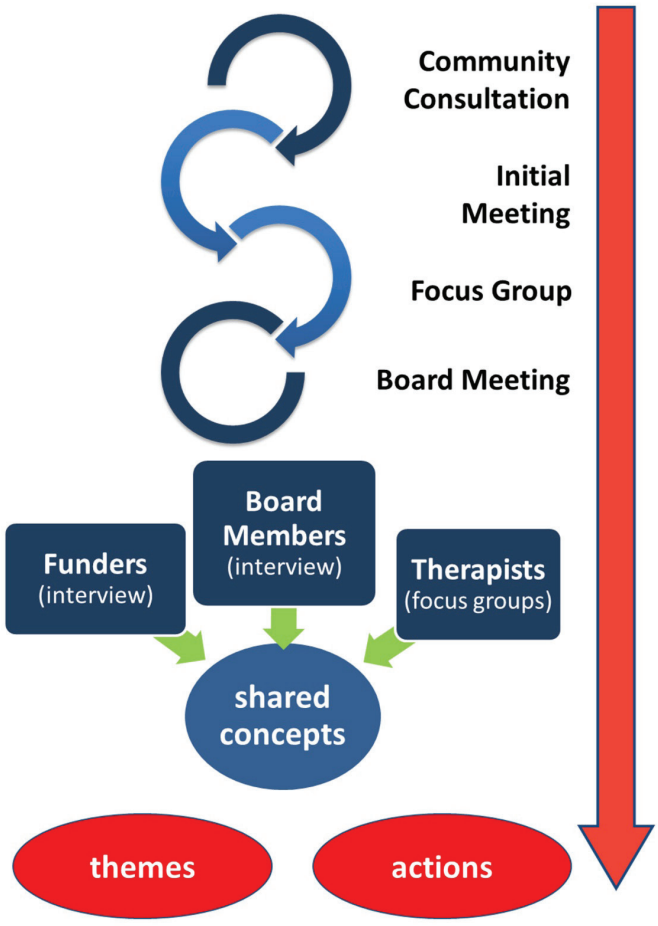

Figure 1: Overview of participant recruitment and data collection process

All discussions, focus groups, and interviews centred on key questions that were identified in the initial meeting with the Te Vaerua Board members. These were:

- What is the ideal rehabilitation service for Te Vaerua?
- What gaps exist in the current service?
- What are Te Vaerua's core values and services, and what things are most important?

All data collection (meetings and interviews) was conducted in English. All participants were fluent in English. Te Vaerua, board meetings and clinical meetings were normally undertaken predominately in English.

Data analysis

Analysis consisted of thematic analysis of concepts arising from the data (Spencer et al 2003). PAR involves ongoing, iterative cycles of investigating, actions, outcomes, and learnings. Analysis is shared with participants during the action cycle as part of the process of reconsideration and change. During data analysis each audio-recording was listened to alongside the verified summary sheet and transcription, with initial coding conducted by the first author (RW). Peer-coding and discussion of the interview transcripts by other members of the research team (WL, FG, and NC) was used to enrich the analysis and strengthen its trustworthiness. Initial themes emerging from the transcripts were documented and discussed with participants to ensure transparency and integrity of thematic extraction. These discussions with participants also helped the process of data analysis remain consistent with the objective of PAR, which is in part about partnership in knowledge creation. However, while the participants in this study were involved in discussion of emerging themes, they chose not to be involved specifically in data coding. Instead, preliminary findings were presented back to the participant group at a board meeting for verification, where they were judged to be representative of the community's views.

RESULTS

Overview of findings

The central concept that emerged from this study was the Cook Islands phrase 'Ko te iti tangata te mea maata', which translates as 'people are the most important thing'. This concept was viewed as key to all service provision and service objectives of Te Vaerua, and linked the wellbeing of the community to the wellbeing of each individual within it.

All participants felt that rehabilitation was important, and board members were passionate about having a rehabilitation service on the islands. Te Vaerua members were involved in the organisation primarily to fulfil a drive to provide a service to the community rather than as having a specific interest in health or rehabilitative care per se. None expressed a clinical perspective on what rehabilitation should be like or what specific services should be offered. Rather, a vision of what

successful rehabilitation would achieve within the community was expressed, and formulation of what and how clinical service would be delivered was left to the discretion and expertise of the employed therapists – the overseas 'experts'.

> At the end of the day, the people driving it, you know, there is a purpose, and the purpose is always the people. (Board Member, P1)

Participants expressed the view, which they grounded in a Christian worldview, that each person is unique; worthy and valued despite disability or status. They also expressed a shared view of their responsibility to the community in easing the burden of others. An interconnectedness of people was evident throughout these discussions. Provision of services therefore needed to align with the needs of people on the Cook Islands, and in particular, people who were less privileged or required assistance.

> For me that is what Te Vaerua is. Te Vaerua's purpose is to make Cook Islanders' lives better (Board Member, P2).

Three key themes emerged from this central concept: 1) that rehabilitation be available, ie locally present, accessible, and pragmatically useful for the people who require it, 2) that rehabilitation have 'heart', ie be built on interpersonal relationships and involve a shared responsibility between individuals in a community, expressed as a cultural expectation of giving and providing support, and 3) that rehabilitation provide hope by offering the possibility of a better life (see Table 2).

Rehabilitation is available

The concept of the availability of rehabilitation on Rarotonga was closely associated with family wellbeing and with the accessibility of services for members of the community. Furthermore, for rehabilitation services to be available, they had to be locally-based, visible, practical, and strategic.

It emerged that following a major medical event, it was common for families to take their family member to New Zealand for rehabilitation. Whole families often then emigrated or were split between countries for the duration of medical need:

> What happens is Te Vaerua enabling Cook Islanders to get treatment at home, here. It is enabling families to stay together because in the past, if, say my dad had a stroke, and then he had to go to NZ to get the treatment that he needed, then, I would have to take my dad there, I would have to take my family there, you know, we would leave and then we would never come home (Board Member, P1).

Emigration created a burden on family members – both those remaining in the islands, and those in New Zealand who were expected to support the visiting patients. At a community level, the economic burden of serious illness and disability also therefore included the loss of working families from the Cook Islands. As a result, the importance of rehabilitation being available locally was more about families and communities staying together and about minimising family stress than it was about providing any particular therapy.

Strategically, associated with the availability of rehabilitation was an awareness of the importance of visibility of services to health funders, patients, the Ministry of Health, and the community as a whole. It was understood that Te Vaerua had to be seen as successful by external people and parties in their wider community in order to gain funding, referrals and the community support required to function effectively. Visibility was enhanced by the use of Te Vaerua's clinic as a physical 'place' on the island, which gave the service a physical presence on the Cook Islands and provided a flagship for the good work they did.

Another form of visibility was apparent in the prescribing and issuing of adaptive equipment, which was viewed as tangible evidence of usefulness of rehabilitation.

> People expect equipment. When we are seen as providing equipment, we are providing something. It's a visible thing (Therapist, P5).

Giving therapeutic equipment was valued highly by all participants, who linked equipment with improvement in function, while also providing visibility of rehabilitation occurring. Adaptive equipment (such as wheelchairs, toilet frames) was also a tangible gift (ie a visible way of giving) which was deemed to be culturally important in all community relationships.

> Without equipment there is no independence (Therapist, P9)

Discussion was held around the perceived low expectation by patients for physical improvement. It was strongly felt that this was linked to lack of awareness about the possible outcomes of rehabilitation due to the previous lack of any rehabilitation service. In contrast, cultural factors such as a reluctance to ask for assistance or stoicism regarding illness events were considered to be minor reasons for low expectations of improvement. Increasing the visibility of rehabilitation and the work of Te Vaerua was viewed as key to changing these perspectives on disability and the possible life that people may live with impairments.

> I think there has been a low expectation. I think that people do want to improve, once they realise that someone is actually going to help them. You know, there is a low expectation about getting better, but when someone actually goes and sees them, and says 'we can actually improve on these areas' then they want it – they want to improve (Therapist, P9).

Rehabilitation has heart

The theme of giving was paramount to understanding rehabilitation, with 'having the right attitude and heart' (Board Member, P1) being vitally important to provision of quality services. This theme was presented in interlinked ideas of relationship and generosity. Personal, high-trust relationships between the patient, their family, and the individual therapist were considered vital to successful rehabilitation.

> I think that relationship is a really important part of any health professional role. The links that you make with people that can be the main – if you don't have the relationship, there isn't going to be a good outcome (Therapist P5).

How therapists were viewed by the community depended on how able they were to establish trusted relationships with patients, families and referrers. Taking time to establish an initial relationship; being culturally aware, such as removing shoes outside the house; smiling; use of Māori language; maintaining confidentiality; accepting food and presence in the wider community (such as children in local schools, attendance at church) were important factors that were given as examples of ways relationships could be strengthened.

Relationship building was not only considered important on an individual level – it also related to the service as a whole. People were considered more likely to engage with a service that was seen to be part of the community for an extended time, rather than a short term project.

> Once they realise that you are there, for the long run, that you are going to be a constant, being there, then they will commit (Funder, P6).

An equally important aspect of Cook Islands Māori tradition is the concept of 'manaaki ki te tangata' (being generous towards others), where 'manaaki' speaks of looking after or care, but also of respect and kindness. From a Cook Islands perspective, generosity is viewed as an exchange of gifts rather than as one party being the philanthropic benefactor. The fundamental concept of generosity underlies the relational heart of rehabilitation provided by Te Vaerua. Indeed, the term Te Vaerua was translated by participants in the study as meaning 'a spirit of giving without expecting return'.

Rehabilitation gives hope

Hope was a major theme regarding rehabilitation expressed by Te Vaerua, with hope considered a vital part of rehabilitation. Participants in this study referred to hope for the recovery of the individual, their family, and their community, but also to the importance of giving hope to people with disabilities in the community by creating opportunities and expectations through changing the perceptions of society.

Hope was expressed in a number of ways: early intervention in order to support families acutely, provision of tangible services such as equipment, visibility in the community to aid accessibility, provision of rehabilitation on Rarotonga (rather than New Zealand), prompt responses to community referrals, and the sharing of positive outcomes by way of case studies or the employment of people with disabilities.

> I needed somebody to show me the possibility. Perfect. And that is it – it is the hope, the possibility of being better than what you are right now after this accident (Board member, P8).

Table 2: Overview of themes related to the concept of rehabilitation in Te Vaerua

Central concept: Ko te iti tangata te mea maata. "People are the most important thing"	
Main themes	**Subordinate themes**
Rehabilitation is available	Rehabilitation is: • Local (ie based in Rarotonga) • Visible (ie to the community; to funders) • Practical (ie everyday solutions for everyday needs; solution focused) • Strategic (ie forward thinking; building on existing linkages)
Rehabilitation has 'heart'	Rehabilitation is: • Relational (ie interpersonal skill are more vital than clinical skills; personal stories and self-sharing is valued) • Generous (manaaki ki te tangata - be generous)
Rehabilitation gives hope	Rehabilitation: • Reduces family burden • Shows possibilities and build awareness

Actions occurring as part of the study

Outcomes and action points arising from this research were an intrinsic and ongoing part of service delivery, and implementation extended past the involvement of the research timeframe, overlapping with non-research activities implemented by Te Vaerua. One action arising from this study was presentation of the preliminary findings to the Ministry of Health to support Te Vaerua's objective of enhancing their visibility. Other ideas arising from the study were considered valuable but were not prioritised to be implemented, or were completed by members of Te Vaerua outside of the participant group and outside of the timeframe of the study. No participant was present in every discussion or focus group, which limited follow through of suggested actions arising from some discussions. An example of this was identification of the data collection as a priority activity for the organisation. Data

collection was considered highly important for: 1) identifying the extent of rehabilitation need on the islands, 2) long term strategic planning to better meet identified needs, 3) providing service delivery feedback to funders, and 4) validating how Te Vaerua was adding value to people's lives. Te Vaerua identified that improved links with other healthcare providers in the Cook Islands would improve data collection and should assist overall provision of services to people with disabilities. However, this action was not implemented within the timeframe of the study.

DISCUSSION

Findings indicate that rehabilitation in the Cook Islands is an expression of the value of people and communities. Te Vaerua is primarily concerned with the wellbeing of the individuals and families within the community, and views rehabilitation as a valuable form of support. Strong relationships at all levels of service function, between individuals and with the wider community, are seen as vital to offering rehabilitation. The result of successful relationships is rehabilitation that offers pragmatic solutions and gives hope to families.

Past research suggests that ideas of relationship building and offering hope are not foreign concepts to "Western" healthcare provision where hope is considered an important factor for long term outcomes and a source of motivation and support for individuals and families through recovery (Bright 2011, Bright et al 2011, Levack et al 2009). Similarly, relationships or therapeutic alliances are seen to have a positive influence on rehabilitation outcomes (Fadyl et al 2011, Hall et al 2010, Muller et al 2015). However, in "Western" rehabilitation literature, both relationships and hope tend to take a back seat to the more commonly voiced goal of gaining personal independence, and are seldom seen as fundamental to the framework of service provision.

Findings from this study support the notion that CBR is a useful framework for rehabilitation services in emerging nations – one which allows expression of rehabilitation to reflect local and cultural values. Contracted specialists in nations like the Cook Islands need to explore their own culturally embedded understandings and reflect on how these might influence practice (Papps and Ramsden 1996), and ways to make these explicit rather than assumed for those they partner with. As well as being mindful of cultural safety, contracted specialists should also be aware of local expectations when working with or establishing rehabilitation services. The study findings indicate that it may not be sufficient to simply 'ask' locals what they would want rehabilitation services to provide as culturally embedded understandings must be recognised before they can be articulated. It is therefore important that studies or projects which set out to gain a perspective of what an emerging rehabilitation service should be like within a setting do not simply ask participants for their opinion. Reflexive, critical understanding is at the heart of cultural safety, and provides a basis for development and discussion of shared understanding (Richardson 2004, Wepa 2015).

In this study there was no single understanding or expectation of what rehabilitation should be like among Te Vaerua board members and other stakeholders; instead there was a reliance on the 'expert' understandings of "Western" health professionals to guide service development. Given the differences in cultural understandings of what is valued in rehabilitation that were revealed by this study, "Western" health professionals' development of services is problematic. The emphasis on relationships in providing rehabilitation services has implications for short-term and externally-funded projects. Time and activities to establish relationships should be included within project timeframes in order to achieve desired outcomes.

This study looked at values and meanings of rehabilitation held by one CBR provider in the Cook Islands. These findings may not be transferrable to other countries in the wider Pacific region. However given the value Pacific Island nations place on culture and strong relationships, the experiences reported in this paper should be pertinent to health professionals working to develop and deliver services in the Pacific.

While PAR appears to be a valid option for cross cultural research in the Pacific, particularly for CBR projects which have alignment of ideology, time limitations, participant availability and gaining a shared vision for the research are significant challenges that researchers face using these methods. Other publications have suggested that member participation is an uncontrollable but vital factor for both PAR and CBR (Kuipers et al 2008). Greenwood et al (1993) stated that it is impossible to "impose participation on research processes" (p.175) and therefore PAR is an emergent and organic process. The snowball sampling used in this study and other commitments of participants meant that no participant was involved throughout the full research journey in all aspects of the study. This slowed implementation of agreed or suggested actions.

Another limitation of this particular study is that no data were directly gathered from service users. Although patient and community viewpoints were identified by participants as valuable, there was no clear avenue for allowing this data collection to occur within the timeframe of the study, or in the role of the researcher as it was initially agreed. A study of longer duration, that provided more time for relationship building with potential study participants, may have allowed this to occur more successfully. This is an important, but challenging, area of work for future studies. One particular study method that might be of use in future studies in this regard is PhotoVoice (Wang and Burris 1997). PhotoVoice is a PAR method that involves photography, social action, and collaborative story-telling to create social change. It has been successfully used to explore health and disability issues from community perspectives in other developing economies around the world (Adekeye et al 2014, Lal et al 2012, Whitzman et al 2013). It is likely to also add value to understandings of disability and rehabilitation in the Pacific region.

CONCLUSION

The themes identified in this study provide insights into the provision of rehabilitation in the Cook Islands. While the beliefs and values of the Te Vaerua group are their own, and are not necessarily applicable to all settings, these findings provide guidance for the development of other rehabilitation services in similar settings, such as other Pacific Island nations,

or to "Western" therapists providing services in this region. Funding of PAR research is inherently valuable (economically and qualitatively) in poorly resourced countries when the PAR process itself creates the changes required. Exploration of values and expectations of rehabilitation would be useful for other small Pacific nations as they embark on CBR projects in their communities.

KEY POINTS

1. Concepts of cultural safety underpin success of implementing rehabilitation services in cross cultural settings.
2. Strong relationships between providers and the local community are essential to successfully implement PAR and CBR.
3. Rehabilitation in the Cook Islands sits within a broader social context towards enhancing community, family and economic engagement.

PERMISSIONS

This study was reviewed and approved by the University of Otago Rehabilitation Human Ethics Committee (13/185) and the Health Research Committee of the Cook Islands National Research Council. Informed consent was gained from participants.

DISCLOSURES

No funding was gained for this study, which formed part of the requirements of a Masters in Rehabilitation for the primary author. No conflicts of interest are present.

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Physiotherapy management of patients undergoing lumbar spinal surgery: a survey of Australian physiotherapists

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ABSTRACT

Physiotherapists are commonly involved in the management of patients immediately before and after spinal surgery, however there is currently little known about what constitutes physiotherapy intervention in the hospital setting. This research aimed to describe the current physiotherapy practice in Australia for the peri-operative management of adults undergoing lumbar spinal surgery. A telephone survey was conducted using a structured questionnaire format. All Australian hospitals that admit one or more patients per week for lumbar spinal surgery were invited to take part in the survey. Sixty-four interviews were conducted (response rate 79%). All participating hospitals provided a physiotherapy service for patients undergoing lumbar spinal surgery, with the majority commencing the day following surgery. Physiotherapy intervention consistently included mobility and functional task training, exercise prescription and provision of an educational handout. However, there was considerable variability in the type of exercises prescribed, the advice given regarding post-operative movement and activity restrictions, the use of outcome measurement tools, and referral to inpatient and outpatient physiotherapy services. This survey provides physiotherapists and rehabilitation service providers with information regarding current clinical practice, and identifies the key focus areas for future research into the effectiveness of specific physiotherapy interventions.

Gilmore S, McClelland J, Davidson M (2016) Physiotherapy management of patients undergoing lumbar spinal surgery: a survey of Australian physiotherapists*. New Zealand Journal of Physiotherapy 44(2): 105-112. doi: 10.15619/NZJP/44.2.06.*

Key words: Physiotherapy, Survey, Spinal fusion, Discectomy, Laminectomy

INTRODUCTION

Physiotherapists are commonly involved in the management of patients in the peri-operative period, immediately before and after spinal surgery (Rushton et al 2014, Williamson et al 2007). Research carried out in the United Kingdom has found that the focus of peri-operative physiotherapy is typically on the provision of information related to the surgery and ensuring patient readiness for safe discharge. However, the timing of intervention, the number of sessions with a physiotherapist, and the specific interventions provided are all highly variable (Rushton et al 2014, Williamson et al 2007).

While there is a growing body of evidence that rehabilitation interventions commenced four to six weeks following surgery improve patient outcomes, there is little research to guide physiotherapists in designing effective rehabilitation programmes in the peri-operative period (Gilmore et al 2015, Oosterhuis et al 2014). The rate of spinal fusion surgery in Australia increased by 175% between 1997 and 2006 (Harris and Dao 2009). A similar increase of 137% was demonstrated in the United States between 1999 and 2008, with an associated 3.3-fold increase in total hospital charges and a 7.9-fold increase in the total national bill for spinal fusion surgery (Rajee et al 2008). As a result, it is becoming increasingly important for physiotherapists to have access to high quality research that assists with the development of clinically effective and cost effective interventions that optimise patient outcome.

There is currently little known about physiotherapy services provided to patients undergoing spinal surgery in Australian hospitals, including the percentage of hospitals that routinely provide pre and post-operative physiotherapy, and the specific interventions provided. To ensure future research is focused on physiotherapy goals and interventions commonly provided in the clinical setting, an understanding of current physiotherapy practice within Australian hospitals is required.

This research aimed to describe the current peri-operative physiotherapy management of adults undergoing lumbar spinal surgery in Australia. The specific research questions addressed are: a) What constitutes current physiotherapy practice in the pre-operative and post-operative inpatient setting, for the management of adults undergoing lumbar spinal surgery in Australia? b) Is there variation in physiotherapy practice between the different types of lumbar surgery? c) How do

individual surgeons' protocols and preferences influence current physiotherapy practice? d) How prevalent is the use of standardised outcome measures, and which measures are most commonly used?

METHODS

Design

A telephone survey using a structured questionnaire format was employed (Appendix 1). The survey was designed to gain a broad, descriptive overview of physiotherapy interventions within a 20 to 30 minute interview. Direct, closed ended questions with pre-determined response categories were based on previous surveys investigating the management of lumbar spinal surgery patients in the UK (McGregor et al 2006, Williamson et al 2007). The survey was piloted on three members of the target population prior to use (Gideon 2012) with minor alterations made to the response categories and structure of the questionnaire. The questionnaire consisted of two sections – General Information (hospital and physiotherapist demographics), and Physiotherapy Intervention. The Physiotherapy Intervention section was divided into seven sub-sections – provision of physiotherapy service, timing and frequency of physiotherapy, advice and education, mobility and functional tasks, exercise, physiotherapy following discharge from the acute setting, and outcome measurement. For each sub-section, participants were asked if physiotherapy intervention varied based on surgical procedure (micro-discectomy, discectomy, laminectomy or fusion) or individual surgeon preferences. If variation existed the sub-section was completed for each variation. A single interviewer conducted all interviews. This study was approved by the La Trobe University Human Ethics Research Committee (FHEC13/146).

Participants

All Australian hospitals that admit one or more patients per week for lumbar spinal surgery were invited to take part in the survey. Hospitals with a neurosurgical and/or orthopaedic service were identified using the MyHospitals website (accessed May 2013). An information package was posted to the physiotherapy department of each hospital. Contact with the hospital physiotherapy department was then made by telephone to determine eligibility, and to obtain the contact details of the senior physiotherapist responsible for the management of patients undergoing lumbar spinal surgery. Up to four attempts were made to contact the appropriate physiotherapist at each hospital. All participants gave informed consent prior to taking part in the survey.

Data analysis

Data were entered into an excel spreadsheet and were analysed using descriptive statistics. Data were analysed for each surgical procedure (laminectomy, micro-discectomy, discectomy, fusion). As laminectomy surgery was the only surgical procedure conducted at all of the participating hospitals, the results of physiotherapy interventions before and after laminectomy surgery are reported, with data for other procedures reported only where physiotherapy service/intervention varied on the basis of procedure. Where within hospital variation in physiotherapy intervention based on individual surgeon preferences was present, each variation has been treated as an additional response. The total numbers reported (N) have been adjusted to reflect the presence of within-hospital variation in intervention.

RESULTS

Participants

A total of 81 hospitals that admitted patients for lumbar spinal surgery were identified and 64 telephone interviews were conducted (79% response rate) between August and December 2013. Of the 17 hospitals that did not participate, two declined. Initial telephone contact was made with the appropriate physiotherapist at two hospitals who were unable to be subsequently contacted to complete the survey. The appropriate physiotherapist was unable to be contacted at the remaining 13 hospitals. Of the 17 hospitals that did not participate three (18%) were publicly funded.

The demographics of the participating hospitals and physiotherapists are described in Table 1. All 64 hospitals admitted patients for laminectomy surgery. Ninety five percent (61/64) admitted patients for fusion surgery, 91% (58/64) for discectomy surgery and 89% (57/64) for micro-discectomy surgery. More than one surgeon performed lumbar spinal surgery at 84% (54/64) of the participating hospitals. Either the structure of the physiotherapy service or the content of the physiotherapy intervention varied based on individual surgeon preferences at just over half (54%, 29/54) of those hospitals.

Table 1: Hospital and physiotherapist demographics (n=64)

Hospital Demographics	n (%)
Funding	
Public	31 (48%)
Private	33 (52%)
Weekly admissions for lumbar surgery	
1-10	47 (73%)
>10	17 (27%)
Surgical procedures undertaken	
Micro-discectomy	57 (89%)
Discectomy	58 (91%)
Laminectomy	64 (100%)
Fusion	61 (95%)
Physiotherapist Demographics	
Employment arrangement	
Employed directly by hospital	52 (81%)
External physiotherapy service	12 (19%)
Gender	
Female	41 (64%)
Male	23 (36%)
Mean years of experience	
Physiotherapist	12 (SD 8.80; range 3-40)
Lumbar spinal surgery	8 (SD 5.48; range 1-25)

Notes: SD, standard deviation.

The overall results of this survey demonstrated very little variation in patient management based on the surgical procedure. Minor differences were reported in the provision of service pre-operatively with patients undergoing lumbar fusions, and post-operatively with undergoing micro-discectomy surgery. The physiotherapy interventions provided also did not differ based on surgical procedure, with only minor differences in exercise prescription. Detailed results are described below.

Pre-operative physiotherapy

A pre-operative physiotherapy service was provided at 39% (25/64) of the hospitals either in a pre-admission clinic (46%, 12/25) or following admission to hospital (54%, 14/25) (Figure 1). All patients undergoing all lumbar spinal surgery procedures were seen pre-operatively by a physiotherapist at 11% (7/64) of hospitals, with an additional two hospitals providing a pre-operative physiotherapy service only to patients undergoing lumbar fusion surgery. Where a pre-operative physiotherapy service was not provided or only some patients were seen prior to surgery, the most common reason was a lack of opportunity due to the patient preadmission or admission process.

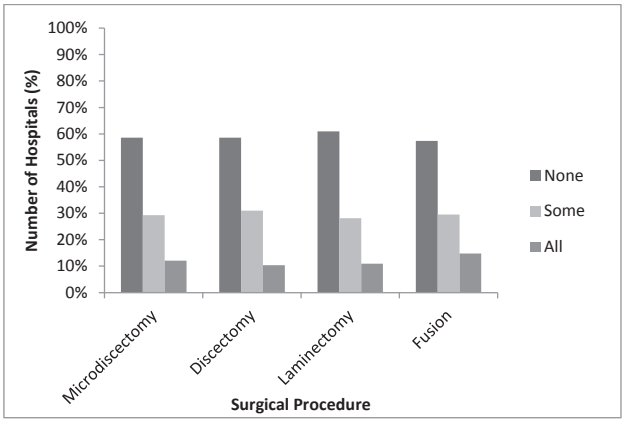

Figure 1: Provision of pre-operative physiotherapy service

The predominant focus of pre-operative physiotherapy was on patient education. Of the hospitals that provided a pre-operative service, 36% (9/25) assessed patient mobility and 12% (3/25) included demonstration of the post-operative exercise programme. No hospitals provided pre-operative exercise or rehabilitation programmes.

Post-operative physiotherapy

All hospitals provided physiotherapy intervention following laminectomy, discectomy and fusion surgery. Two respondents reported patients were not routinely seen following micro-discectomy surgery – in one case patients were seen on a referral only basis, and in the other patients did not receive any physiotherapy intervention due to surgeon preferences.

The timing and frequency of physiotherapy intervention is described in Table 2. At more than 97% of the hospitals, physiotherapy commenced the day following laminectomy, discectomy and fusion surgery, while seven hospitals (12%, 7/57) provided an initial physiotherapy contact on the day of surgery for patients undergoing a micro-discectomy. Patients were most commonly seen once per day (80%, 51/64), while the total number of treatment sessions provided varied between the four surgical procedures. Although physiotherapy generally commenced the day following surgery, 23% (15/66) allowed patients to mobilise the day of surgery following laminectomy, discectomy or fusion surgery, and just under half (41%, 24/59) allowed patients to mobilise on the day of micro-discectomy surgery.

Table 2. Post-operative physiotherapy service

		Microdiscectomy (n=57)		Discectomy (n=58)		Laminectomy (n=64)		Fusion (n=61)	
Initial physiotherapy contact	DOS	7	(12%)	2	(3%)	2	(3%)	1	(2%)
	D1	50	(88%)	56	(97%)	62	(97%)	60	(98%)
Contacts per day	One	47	(82%)	46	(79%)	51	(80%)	48	(79%)
	Two	10	(18%)	12	(21%)	13	(20%)	12	(20%)
	Three+	-		-		-		1	(2%)
Total no. of contacts	One/two	45[a]	(76%)	23[b]	(38%)	17[c]	(26%)	8[d]	(13%)
	Three/four	9[a]	(15%)	25[b]	(42%)	31[c]	(47%)	29[d]	(45%)
	Five/six	3[a]	(5%)	6[b]	(10%)	11[c]	(17%)	13[d]	(20%)
	Seven+	2[a]	(3%)	6[b]	(10%)	7[c]	(11%)	14[d]	(22%)
First allowed to mobilise as per surgical protocol	DOS	24[a]	(41%)	12[b]	(20%)	15[c]	(23%)	13[e]	(19%)
	D1	35[a]	(59%)	47[b]	(78%)	50[c]	(73%)	49[e]	(73%)
	D2	-		1[b]	(2%)	1[c]	(2%)	4[e]	(6%)
	D3+	-		-		-		1[e]	(1%)

Notes: Total numbers include variations in surgical preferences where reported, [a]n=59; [b]n=60; [c]n=66; [d]n=64; [e]n=67; DOS, day of surgery; D1, first post-operative day; D2, second post-operative day; D3, third post-operative day.

Advice and education

The majority of hospitals provided patients with a written handout (85%, 55/65). No respondents reported providing education in any additional format such as video or online resources.

Advice regarding post-operative restrictions varied between hospitals (Figure 2). Variation in post-operative restrictions within hospitals related to individual surgeon preferences rather than the surgical procedure being undertaken. Most respondents (82%, 60/73) reported patients were advised to avoid lifting, with a mean weight restriction of 2.7kg (SD 1.50; range 0.5-5). Fifty-eight percent (43/74) of respondents advised patients to restrict sitting in the post-operative period, with the mean maximum advised sitting time being 25 minutes (SD 15.6; range 0-60).

Figure 2: Post-operative restrictions

Mobility and functional tasks

All participating hospitals provided post-operative education and training in bed and chair transfers and ambulation, and most (86%, 55/64) routinely practised ambulating on stairs prior to discharge. A small number of respondents reported that post-operative physiotherapy included practising picking up objects from the floor (5%, 3/64), transfers on and off the floor (5%, 3/64) and on and off the toilet (3%, 2/64), and ambulating outdoors (2%, 1/64).

Exercise prescription

Post-operative exercises were prescribed at 88% (56/64) of the hospitals. A total of 56 different exercises were described which were subsequently grouped into seven exercise categories: core stability, spinal range of motion (ROM), stretches, strengthening (lower limb and trunk), neural mobilisation, lower limb circulation, and respiratory exercises. A complete list of the exercises described has been provided in Table 3.

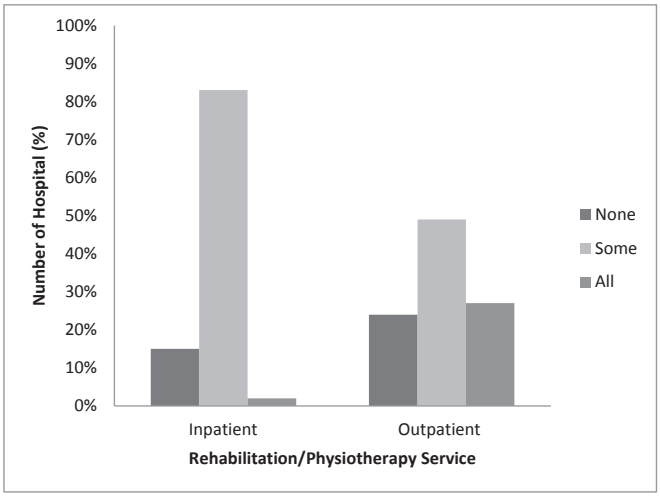

Figure 3: Referral to inpatient and outpatient physiotherapy/rehabilitation services

Table 3: Exercise prescription

	Microdiscectomy n*=50	Discectomy n*=50	Laminectomy n*=56	Fusion n*=53
Core Stabilisation:				
TA activation (CL)	45 (90%)	44 (88%)	50 (89%)	47 (89%)
Pelvic floor activation	8 (16%)	9 (18%)	9 (16%)	8 (15%)
TA activation (st)	4 (8%)	3 (6%)	4 (7%)	4 (8%)
TA activation (sit)	4 (8%)	3 (6%)	4 (7%)	3 (6%)
Hip abduction (CL)	1 (2%)	-	1 (2%)	1 (2%)
TA activation (sit to st)	1 (2%)	-	1 (2%)	1 (2%)
LL circulation:				
Ankle pumps	19 (38%)	22 (44%)	25 (45%)	26 (49%)
Static quadriceps	14 (28%)	18 (36%)	19 (34%)	21 (40%)
Hip/knee flexion	9 (18%)	11 (22%)	11 (20%)	11 (21%)
Static gluteals	5 (10%)	8 (16%)	8 (14%)	9 (17%)
Strengthening:				
Mini squats	10 (20%)	11 (22%)	11 (20%)	10 (19%)
Heel raises (st)	9 (18%)	8 (16%)	10 (18%)	9 (17%)
Hip abduction (st)	7 (14%)	7 (14%)	7 (13%)	8 (15%)
Bridging	6 (12%)	5 (10%)	7 (13%)	6 (11%)
Hip flexion (st)	6 (12%)	5 (10%)	6 (11%)	7 (13%)
Hip extension (st)	4 (8%)	4 (8%)	4 (7%)	4 (8%)
Hip abduction (SL)	4 (8%)	4 (8%)	4 (7%)	4 (8%)
Inner range quads	3 (6%)	3 (6%)	4 (7%)	3 (6%)
Marching on spot	3 (6%)	3 (6%)	3 (5%)	3 (6%)
Squats	2 (4%)	2 (4%)	2 (4%)	3 (6%)
Step ups	2 (4%)	2 (4%)	2 (4%)	2 (4%)
Mini lunge	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Hip flexion (sit)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Knee extension (sit)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Hip adduction (sit)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Sit to stand	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Static abdominal contraction	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Hip extension (prone)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Pulsing abdominal contraction	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Static trunk extension	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Side stepping	-	1 (2%)	1 (2%)	1 (2%)
Spinal ROM:				
Lumbar rotation (supine)	16 (32%)	16 (32%)	18 (32%)	14 (26%)
Hip flexion (supine)	10 (20%)	9 (18%)	11 (20%)	11 (21%)
Pelvic tilt (supine)	7 (14%)	8 (16%)	9 (16%)	8 (15%)
Pelvic tilt (st)	2 (4%)	1 (2%)	2 (4%)	1 (2%)
Pelvic tilt with hip flex (supine)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Pelvic tilt against wall	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Pelvic tilt (sit)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Side flexion (sit)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Neural mobilisation:				
Straight leg raise	4 (8%)	4 (8%)	5 (9%)	5 (9%)
Hip flex with knee flex/ext (supine)	3 (6%)	4 (8%)	4 (7%)	4 (8%)
Ankle df with C ext/pf with C flex (sit)	3 (6%)	3 (6%)	3 (5%)	3 (6%)
Hip flex, knee ext, ankle df (st)	2 (4%)	2 (4%)	2 (4%)	2 (4%)
Femoral glide (SL)	1 (2%)	2 (4%)	2 (4%)	2 (4%)
Supine chin to chest	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Hip and knee flex (st)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Heel over step with ankle pf/df (st)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Active assisted hip ROM (supine)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Hip ROM (st)	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Modified slump	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Respiratory exercises:				
Deep breathing exercises	8 (16%)	10 (20%)	11 (20%)	12 (23%)
Tri-flow	2 (4%)	2 (4%)	2 (4%)	3 (6%)
Stretching:				
Calf stretch	1 (2%)	1 (2%)	1 (2%)	2 (4%)
Psoas major stretch	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Prone lie	1 (2%)	1 (2%)	1 (2%)	1 (2%)
Heel to opposite knee (supine)	1 (2%)	-	1 (2%)	1 (2%)

Notes: * n, number of hospitals where physiotherapy intervention routinely included a post-operative exercise programme; TA, Transverse abdominus; CL, crook lie; st, standing; SL, side lie; LL, Lower limb; flex, flexion; ext, extension; df, dorsiflexion; pf, plantarflexion; ROM, range of motion.

Of the 56 physiotherapy services that routinely prescribed a post-operative exercise programme 88% (49/56) included exercise to target core stabilisation, 45% (25/56) included lower limb circulation exercise, 45% (25/56) included strengthening exercise and 39% (22/56) included exercise to improve spinal ROM. Fourteen respondents (25%) reported including neural mobilisation, 18% (10/56) included respiratory exercises and 5% (3/56) included stretching. There was little variation in the type of exercise prescribed based on the surgical procedure.

Outcome measurement

Patients were assessed using an outcome measurement tool at 83% (53/64) of the hospitals. Of the respondents that reported using at least one outcome measure, 96% (51/53) reported assessing pain using a visual analogue or numeric pain rating scale, while only one hospital (2%) reported using a scale designed to assess disability (Table 4).

Table 4: Outcome measurement

Outcome measurement tool	Reported use
VAS/NPRS	96% (51/53)
Straight leg raise	38% (20/53)
Spinal range of motion	9% (5/53)
10m walk test	6% (3/53)
Oswestry Disability Index	2% (1/53)

Notes: VAS, Visual analogue scale; NPRS, Numeric pain rating scale.

Referral to inpatient and outpatient physiotherapy/ rehabilitation services

Most respondents (83%, 55/66) referred patients to an inpatient rehabilitation unit some of the time (Figure 3), with patient need (ie ongoing rehabilitation goals) being the main factor influencing this decision.

Half of the respondents (49%, 33/67) referred patients to outpatient physiotherapy/rehabilitation some of the time (Figure 3). Patient need was again the main factor influencing this decision. Of the respondents that referred patients to outpatient physiotherapy 27% (14/51) advised to commence physiotherapy within the first two weeks post-operatively, 54% (28/51) advised patients to commence physiotherapy between two and six weeks, and 19% (10/51) advised to commence physiotherapy seven or more weeks following surgery.

DISCUSSION

This survey describes the current physiotherapy management of adults undergoing lumbar spinal surgery in Australian Hospitals. As a total population survey with a high response rate (79%), the results of this survey are likely to be a fairly accurate reflection of physiotherapy management of this patient population.

Physiotherapy service

All hospitals provided a post-operative physiotherapy service, with minimal difference between the hospitals in the timing and frequency of the service provided. This finding is comparable to the results of previous surveys investigating physiotherapy practice following spinal surgery in the United Kingdom (Rushton et al 2014, Williamson et al 2007).

Less than half of the hospitals surveyed provided a pre-operative physiotherapy service, and none of those provided a formal pre-operative rehabilitation programme. The scope of the questionnaire used in this survey does not allow for further interpretation of this observation, however there is some evidence to suggest that pre-operative rehabilitation may improve post-operative outcome (Nielsen et al 2010). Further investigation of the effect of pre-operative rehabilitation, and how to provide this service within the Australian healthcare system is warranted.

Physiotherapy intervention

The overall emphasis of physiotherapy intervention was consistent across the hospitals with a focus on patient education and post-operative mobility. All hospitals provided mobility and functional task training as part of the routine post-operative rehabilitation programme. Physiotherapy intervention included exercise prescription and the provision of educational handouts at most hospitals, however there was variability in the individual exercises prescribed and the advice given regarding movement and activity restrictions. These findings are again comparable to United Kingdom physiotherapy practice following lumbar discectomy (Williamson et al 2007) and lumbar fusion (Rushton et al 2014).

Despite the common focus on patient mobility, initial mobilisation was often delayed from the day of surgery, until the initial physiotherapy contact the day following surgery. While no research has investigated the relationship between mobilisation and patient recovery following spinal surgery, there is evidence to suggest that mobilising on the day of surgery improves both patient outcomes and length of stay in other inpatient surgical populations (Issac et al 2005, Kaneda et al 2007, Larsen et al 2008). It is therefore possible that starting a rehabilitation programme on the day of surgery, with a focus on patient mobility, may reduce the time to achieve functional milestones and reduce overall length of stay.

Core stabilisation exercise was the most common category of exercise prescribed, with transverse abdominus activation the most frequently prescribed exercise. Two recent systematic reviews concluded that core stabilisation exercises may reduce pain and disability in patients with sub-acute, chronic or recurrent low back pain (Brumitt et al 2013, Bystrom et al 2013), however, it is not known whether similar outcomes may be expected in the post spinal surgery population. With the exception of core stabilisation exercise, there was little agreement between the hospitals in the types of exercise prescribed. This lack of consistency likely reflects the limited evidence available to guide physiotherapists in both designing exercise programmes and timing the commencement of the exercise programme. It is also likely that exercise prescription was influenced by post-operative movement restrictions, which varied considerably between the hospitals.

Almost half the hospitals that routinely prescribed a post-operative exercise programme included lower limb circulation exercises, and 18% included respiratory exercises. Evidence suggests that patient mobilisation is adequate to prevent deep

vein thrombosis following spinal surgery (Takahashi et al 2012), supported by similar findings in other post surgical populations (Chandrasekaran et al 2009, Pearse et al 2007). In addition, patient mobilisation has been shown to prevent post-operative pulmonary complications without the need for additional exercises (Denehy et al 2003, Silva 2013). As this survey demonstrates, the majority of patients mobilise either the day of or the day following surgery, therefore including these exercises in routine post-operative management may be unnecessary and warrants further evaluation.

Referral to outpatient physiotherapy following discharge was variable. While three quarters of hospitals reported referring patients to an outpatient physiotherapy service, only a third of these routinely referred all patients. Evidence suggests that rehabilitation commencing in the sub-acute phase following lumbar disc surgery improves patient outcome (Oosterhuis et al 2014) therefore further evaluation of referral to outpatient physiotherapy, including patient selection and access to outpatient physiotherapy services, is required. In addition, where no referral to outpatient physiotherapy occurs, intervention provided by the inpatient physiotherapist may have a positive influence on return to work and normal activity. This highlights the need for further research investigating the impact of physiotherapy interventions provided in the inpatient setting on long term patient outcome.

Variation between surgical procedures

Within each hospital, there was little difference in physiotherapy interventions provided across the different surgical procedures. This result likely reflects the focus of intervention being on mobility tasks, which are to be similar irrespective of the surgical procedure. It does, however, raise the question of whether interventions that are targeted to the specific surgical procedure may be more effective at optimising patient outcome within these groups.

Influence of individual surgeon preferences on physiotherapy practice

Just over half of the hospitals with more than one spinal surgeon reported variation in physiotherapy intervention based on differences in surgeon preferences, with the main difference being in the post-operative advice provided to patients regarding movement and activity restriction. These results are consistent with previous surveys conducted with both physiotherapists (Williamson et al 2007) and spinal surgeons (McGregor et al 2006, Rushton et al 2015) in the United Kingdom.

Post-operative movement and activity restrictions are likely to influence the type of exercises prescribed in the post-operative period, education regarding mobility and functional tasks, and the advice given regarding return to work and usual activity. Patients were most commonly advised to restrict movement and activity for four to six weeks post-operatively, potentially delaying active rehabilitation and return to work during this period and leading to additional financial and social burden. Results from one study indicated there was no detrimental effect on patient outcome by having no post-operative restrictions following lumbar discectomy (Carragee et al 1999). While a proportion of the variation in post-operative advice is likely due to the criteria individual surgeons use to determine candidacy for surgery, further research is required to evaluate the necessity of post-operative restrictions and the impact they have on patient outcome in the short and long term.

Outcome measurement

Almost all hospitals reported assessing pain with only a very small number assessing physical function, however the correlation between pain and physical function following spinal surgery has been shown to be limited (DeVine et al 2011). In addition, only one hospital reported using an outcome measurement tool to assess disability despite an increasing focus on assessing disability and recovery of function in the clinical setting.

Current international guidelines for the management of low back pain recommend referral to a specialist anywhere between four weeks and two years after the onset of back pain, and only following a trial of conservative management (Koes et al 2010). It is therefore likely that the majority of patients undergoing lumbar spinal surgery have been living with considerable functional limitation for some time. The use of appropriate outcome measures assessing physical function pre and post-operatively would provide valuable information to guide return to work and other activities of daily living during the rehabilitation period.

Clinical relevance

The information collected from this survey provides a description of current physiotherapy practice in Australian hospitals. While there is consensus that this patient population benefits from physiotherapy intervention in this setting, there is considerable variation in the physiotherapy interventions provided, an observation consistent with United Kingdom physiotherapy practice following lumbar discectomy (Williamson et al 2007) and lumbar fusion (Rushton et al 2014). This finding likely reflects the limited research available to guide clinicians working in the acute hospital setting. This information should therefore be used to inform clinicians about current practice, but not be regarded as "gold standard". Further research is required to develop clear rehabilitation guidelines to facilitate optimal outcome for patients undergoing lumbar spinal surgery.

Study limitations

Using a structured questionnaire format with predominantly closed questions and pre-determined response categories allowed for the collection of data across a range of categories within a short timeframe. However, it also limited participant responses with minimal opportunity to elaborate on answers provided. Several areas of current practice requiring further analysis have been identified, including referral processes to outpatient physiotherapy services and the use of outcome measures in standard practice. Additional information regarding the influence of pre-operative diagnosis and symptoms, patient age, and co-morbidities on the choice of interventions provided may also have allowed for a more in depth analysis of data.

Publicly and privately funded hospitals were equally represented in the responding hospitals, while most (82%) of the non-responding hospitals were privately funded. It is possible that data from the non-responding hospitals may have influenced the results of this survey, however due to the variability in responses received it is likely that the overall conclusions of this study would remain unchanged.

CONCLUSION

This survey demonstrates considerable variability in physiotherapy management of patients following lumbar spinal surgery, which likely reflects the paucity of research investigating the relationship between peri-operative physiotherapy intervention and patient outcome. This survey provides physiotherapists and health service managers with information regarding current clinical practice, and identifies the key focus areas for future research into the effectiveness of physiotherapy interventions for people undergoing spinal surgery.

KEY POINTS

1. Almost all patients undergoing lumbar spinal surgery in Australia are seen by a physiotherapist during their hospital admission, with the overall goals of physiotherapy intervention focusing on patient education, post-operative mobility and exercise prescription.
2. Physiotherapy intervention does not vary based on the type of surgical procedure undertaken.
3. Surgeon specific protocols guide post-operative restrictions, and therefore influence the structure and timing of the physiotherapy rehabilitation programme.
4. There is limited use of outcome measurement tools to assess physical function in the acute setting following lumbar spinal surgery.

DISCLOSURES

The authors declare that no financial support was obtained to undertake this study. The authors report no conflicts of interes

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Inclusion of trigger point dry-needling in a multimodal physical therapy program for postoperative shoulder pain: a randomised controlled trial.

Arias-Buria JL, Valero-Alcaide R, Cleland JA, Salom-Moreno J, Ortega-Santiago R, Atin-Arratibel MA, et al (2015) Inclusion of trigger point dry needling in a multimodal physical therapy program for postoperative shoulder pain: a randomised controlled trial. Journal of Manipulative and Physiological Therapeutics 38(3): 197-87. doi: 10.1016/j.jmpt.2014.11.007. (Abstract prepared by Rose Twaddle)

OBJECTIVE

To compare the effect of dry-needling and multimodal physiotherapy versus physiotherapy alone in individuals who have undergone rotator cuff repair or proximal humeral fracture repair with the proximal humeral internal locking system.

METHODS

Randomised controlled trial of 20 patients (mean age 58 SD 12 years) who were experiencing post-surgical shoulder pain. Included participants were those who self-referred to a rehabilitation centre over the one month selection period. Potential participants were excluded if they were not found to have any active muscular trigger points, had sustained multiple fractures, undergone previous surgery, presented with cervical radiculopathy/myelopathy, had a diagnosis of fibromyalgia, had attended physiotherapy within the previous year; were fearful of needles, or had any contraindication to dry-needling. Participants were assigned to one of two groups, physiotherapy alone, or physiotherapy and dry-needling. They each attended five treatment sessions which comprised passive mobilisation, and soft tissue and scar tissue massage, delivered by a blinded practitioner; the final two sessions incorporated strength and proprioceptive-based exercises within the pain-free range. For the dry-needling group, this was applied once in the first intervention session. Treatment effect was measured using the Constant-Murley Score, prior to any intervention and one week following the final session; this score measures range of motion, strength, activities of daily living, and pain.

RESULTS

Participants assigned to the dry-needling group experienced significantly greater improvements in strength (28%, $p<0.05$) and activities of daily living (37.5%, $p<0.001$) than those who received physiotherapy alone. Although no between-group differences were found a statistically significant improvement in pain and range of motion for both groups was observed.

CONCLUSION

Participants with post-operative shoulder pain demonstrated significant improvements in strength, range of motion, pain and overall function following physiotherapy input, particularly if dry-needling was included within the first 6 months of the rehabilitation period.

COMMENTARY

The authors of this randomised clinical trial evaluate and argue the effectiveness of dry needling used as an adjunct to a pre-existing multimodal approach to post-surgical shoulder rehabilitation.

When analysing the characteristics of participants included in this study they are likely to be a true reflection of patients one would come across in a rehabilitative setting within Australasia. In a recent study, of those patients who presented to various public rehabilitation centres in New South Wales, Australia for upper limb rehabilitation, 8.1% were post-surgical and their average age was 61.5 ± 15.7 years, with 72% of these older than 55 years (Roberts and Li 2014). In the present study, the mean age of participants was 58 years, which parallels that reported by Roberts and Li (2014), supporting the clinical applicability of these findings. However, Roberts and Li (2014) found that patients seeking post-surgical rehabilitation required an average of 10.3 sessions, which is over twice that delivered in the study by Arias-Buria et al (2015). An objective increase in range of motion correlated directly to the number of sessions the patient received and therefore, it would be interesting to specifically review the outcomes of dry-needling should the number of sessions reflect more closely what is used in the clinical setting.

In the current study, the intervention was provided at least 5.4 months post-surgery which, according to recent literature on rotator cuff repair, is associated with long term improvements that are as significant as those that occur when therapy is started immediately (Ross et al 2014). Therefore, it appears intervention timing was optimal, for the rotator cuff repair participants at least. In terms of the intervention itself, Arias-Buria et al (2015) have included best practice guidelines according to a Cochrane review on physiotherapy management of shoulder pain (Green et al 2003). This review concluded that exercise prescription was beneficial, and that outcomes were improved if mobilisation was included in conjunction with exercise. Unfortunately, neither the review nor the current study specified which exercises were used.

Post-operatively, myofascial trigger points may form in response to injury, overload or microtrauma (Kietrys et al 2013). Achieving a localised twitch response is imperative if using dry-needling, although in this study the reported improvements are only for range of motion and pain. Arias-Buria et al (2015) report strength and functional benefits are the only objective measures influenced by a twitch response. Clinically, these findings would appear to support the notion that dry-needling is a favorable adjunct to a multimodal intervention, but that alone, the clinical benefits of this treatment approach are still debatable.

Finally, with regard to outcome measures, the Constant-Murley Score is a clinically relevant, patient-centred measure; not only does it include strength and range of motion objectives that are relevant to post-operative shoulder pain, it also incorporates functional and pain-related subjective measures that will continue to drive the treatment pathway. The Constant-Murley Score has been shown to have excellent intra- and inter-tester reliability (Roy et al 2010) and so is a useful assessment tool to employ in the clinic.

Arias-Buria et al (2015) have shown that dry-needling is a beneficial adjunct to a multimodal approach for post-operative shoulder rehabilitation. Due to the invasive nature of the dry-needling component of the intervention it was not possible to conduct a double-blind study; however, the clinician undertaking assessment of the outcome methods was blinded to the treatment group allocation. A detailed description of the intervention would be useful so that a similar treatment plan could be replicated within a clinical setting.

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Rethinking Rehabilitation Theory and Practice.

K McPherson; B Gibson; A Leplege, 2015, CRC Press Taylor and Francis Group, ISBN 9781482249200

The excellent foreword for this text, by Professor Derek Wade, Oxford UK rightly introduces the book with the statement that 'This unusual book should be essential reading for all people involved in rehabilitation.' It is refreshingly different from other rehabilitation texts and does, as the title states, make you 'rethink' your practice. I read it initially like a novel, and unlike most work-related texts, it was a page-turner.

The book has three sections, each containing four to five chapters. Each chapter is approximately a journal article in length, which makes it very accessible and readable. Sections cover 'rethinking the past and re-envisioning the future'; and 'philosophy in action and rethinking rehabilitation delivery, research, teaching and policy'. Across the sections a broad range of topics is covered, for example, conceptualising disability; child development; brain injury; outcome measurement; indigenous perspective and rethinking practitioner behaviour and its influence on rehabilitation outcome. The chapter authors are from a multi-disciplinary background including allied health, nursing, medicine and psychology, and different geographic perspectives are included, with a large New Zealand author and editor contribution making it even more relevant for New Zealand therapists.

The format of each chapter is similar, presenting an historical perspective and current thinking and then challenging the reader with a 'rethinking' discussion, but not necessarily giving 'an answer' to the challenges presented. This style lends itself well for discussion of individual chapters within a multi-disciplinary group or in-service format, as there are multiple discussion points and controversies within each chapter.

From a personal perspective, with an interest in child rehabilitation, Chapter 4 on Rethinking 'Normal Development' in Children's Rehabilitation (by Barbara Gibson, Gail Teachman and Yani Hamdani) asked us to re-evaluate our over-reliance on 'normal development' as the key concept children need to follow. There is discussion around some of the negative implications this concept can have on children with disabilities and their families. My take home message from this chapter was about letting children enjoy the 'here and now of their daily lives' rather than pushing them through developmental milestones, and then being open to and advocating for potential alternative ways of, for example, moving or communicating.

Chapter 10 on 'Rethinking the relationship between disability studies and rehabilitation' by Susan Guenther-Mahipaul presents an excellent thought-provoking personal and academic view on the role of disability studies to provide '… an important and necessary lens through which to rethink disability and rehabilitation.' The author discusses examples of how our rehabilitation practice can potentially stigmatise and oppress individuals with disability and definitely leaves you questioning and reflecting on your own practice and on ways to change this.

The influence of the health framework of International Classification of Function, Disability and Health (WHO, 2001) may mean that therapists working in rehabilitation consider they are already orientated towards function, family and participation in their rehabilitation perspective. However, this book will make you 'rethink' further, potentially about issues you had not considered in your practice, which can only benefit the people we work with. Both new and experienced therapists in all physiotherapy settings would enjoy and gain value from reading this text. I challenge New Zealand Journal of Physiotherapy readers to find a copy of the book, select and read any chapter and come away rethinking your own practice.

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