

NEW ZEALAND JOURNAL OF PHYSIOTHERAPY

- Disability and physical activity in youth with disabilities
- Musculoskeletal physiotherapy within a community health centre
- Musculoskeletal physiotherapy outpatient services in a high deprivation area
- Rehabilitation post paediatric cardiac transplant
- Immediate effects of sensory discrimination for chronic low back pain
- Hydrotherapy exercise programmes in patients with chronic heart failure



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Kōmiri Aotearoa

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Disability and physical activity in youth with disabilities: establishing healthy behaviours to last a lifetime

Engaging people with disabilities in active and inclusive physical activity has long been a concern for health professionals and educators in different parts of the world (Rimmer and Rowland 2008, Shields et al 2012, Verschuren et al 2012). Adverse health conditions such as obesity are related to inactivity which has become a world-wide public health crisis and often disproportionately affects people with disabilities as compared to non-disabled populations (Centers for Disease Control and Prevention 2014, Bandini et al 2005, McDonald 2002, Rimmer et al 2007, Rimmer et al 2010). In the most recent New Zealand Disability Survey (Statistics New Zealand 2013) approximately 24 percent of the population was identified as having a disability, defined as “being limited in their ability to carry out everyday activities by at least one impairment type”. The survey also provided evidence that the incidence of disability in the population increases with age. This statistic underscores the importance of promoting healthy behaviours such as physical activity in youth with disabilities who may be more likely to continue engaging in these activities throughout their lives. Establishing healthy behaviours early in life is key to maximizing the likelihood of continued long-term participation.

When investigating options for physical activity that are accessible to youth with disabilities, several factors become important to consider, including motivation, accessibility and social inclusion. Ensuring that the activity is engaging and interesting to the youth is a critical first step in physical activity initiation. If they are not interested in the activity, it is likely they will not want to perform it, and it is even less likely that they would continue the activity independently at a later time. Ensuring that the activity is accessible is another important step in promoting the activity for long-term use. Accessibility can include physical accessibility (i.e., activities that can be performed in adapted forms by people with different functional abilities) as well as programmatic factors (i.e., determining whether the activity is offered in community-based settings in an accessible form). Financial factors, such as whether the activity is affordable for the individual is yet another consideration. Social inclusion is especially important for long-term maintenance of physical activity, since peer support can help to motivate and sustain participation. Youth with disabilities may feel isolated because of traditional physical activity barriers, and social inclusion may therefore make the difference between the youth choosing to participate or sit alone on the sidelines.

One broad illustration of the types of factors involved in promoting physical activity among youth with disabilities can be found in Rowland et al (2015). This article describes a conceptual model that addresses physical activity barriers and accessibility issues that are influenced by domains from the World Health Organization’s International Classification of Functioning, Disability and Health (ICF) (World Health Organization 2015). Specifically, this model focuses on active video gaming (AVG) as a solution to potential physical activity

barriers that are categorized within the “impairments” and “activity and participation” domains and the contextual factors involving the “person” and the “environment”. Health-related outcomes are an important part of this model as well. Traditionally, physical activity accessibility has been limited for youth with physical disabilities, given this population’s generally low cardiovascular endurance and physical limitations, such as decreased motor control, range of motion, muscle strength, ambulatory status, and balance (Rimmer et al 2007, Rowland and Rimmer 2012). Many AVGs may be used by youth with balance problems, limited lower extremity movement, or poor motor control (Wiemeyer 2015). Other AVG adaptations may include changes made to game controllers or options for seated play while performing moderate to vigorous exercise in homes or community environments. Age, gender, and cultural considerations represent personal factors that may play a role in game selection and potential satisfaction. Therefore, relevant health-related outcomes may include physical activity motivation leading to long-term adherence. Health benefits include increased functional independence, cardiovascular endurance, leading to decreased chronic disease and secondary condition risks (Deutsch et al 2008, Howcroft et al 2012, Li et al 2009, O’Donovan et al 2014, Robert et al 2013, Rowland and Rimmer 2012). Social inclusion may also be increased and represent activity and participation outcomes potentially affected by AVG play.

Although AVGs are just one type of accessible physical activity for youth with disabilities, many opportunities exist for health professionals and educators to become leaders in the integration of health promotion and fitness strategies for these youth (Rowland et al 2015). For example, the American Physical Therapy Association’s Section on Pediatrics convened a task force to examine the scope of paediatric physiotherapy practice in health promotion and fitness for youth with disabilities. This task force concluded that physiotherapists should play an active role in designing and implementing accessible fitness and health promotion programmes for youth with disabilities. Specifically, the task force stated that these programmes are important to promote active, healthy lifestyles and reduce co-morbidities associated with sedentary behaviours and unhealthy weight, which are often seen in youth with disabilities.

In conclusion, identifying accessible, engaging exercise options for youth with disabilities is a worthwhile cause that has the potential to promote healthy lifestyle choices for youth with disabilities who often have few physical activity options. Let’s work together to promote healthy behaviours to last a lifetime.

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Obituary Bryan Paynter

Bryan Paynter was Editor of the NZJP from 1987 until 1996, and appropriately due to his passion for the correct use of the English language, remained as copy editor until his death in April this year. He was widely read and had a vast knowledge of English literature evident by the frequent use of succinct quotes to reinforce his point.

It is timely to reflect on some of the key themes he discussed during his time as editor. He was a great believer in the journal, which he saw as a permanent medium for communication and debate between professional people, regularly encouraging physiotherapists to submit to the journal and engage in debate on topics that had been published. The lack of contributions was an ongoing concern to him as was the inability of submitters to adhere to the guidelines for submission – an ongoing issue for the current editorial committee!

During the period of time he was writing New Zealand physiotherapists were still governed by the Physiotherapy Act 1949, the Health Practitioners Competence Assurance (HPCA) Act not coming into effect until 2003. There was robust debate in the journal on what health care professionals, especially physiotherapists, were. Bryan expressed concern that the very broad definition that existed allowed other groups promoting “alternative” therapies to move into areas previously thought the domain of physiotherapy and this left the public vulnerable to misinformation:

“People sincerely seeking appropriate therapeutic assistance are entitled to be able to distinguish between the genuine and spurious, especially since a vocal and not necessarily unintelligent minority are ever eager to promulgate the supposed virtues of the bizarre and the unorthodox” (Paynter 1987).

He embraced the advent of university-based education for physiotherapists on the basis that a university education “depends not so much on presenting facts, but on stimulating those undertaking it how to find them out” (Paynter 1990). He hoped that university-based education would lead to a growth in physiotherapy research by physiotherapists, and he was right. The NZJP has benefited from the continuing increase in physiotherapy research which is frequently submitted to the journal for publication.

He was very aware, however, of the need for physiotherapists, despite the knowledge they had acquired, to be compassionate caring professionals taking time to listen to their patients, even if it involved a long and seemingly irrelevant history. As he wisely stated:

“Being listened to can itself be a major part of the therapeutic programme, and if the patient feels the need to discuss not only symptoms, but the circumstances in which they occurred, we have to accept it.” (Paynter 1987).

He also emphasised the need for physiotherapists, despite their scientific knowledge, to ensure that the information they gave to their patients was presented in language they could understand and that treatment outcomes focused on problems relevant to the patient. His example remains relevant today:

“It is possibly very scientific to note that the patient (Caucasian, female, 75, widow, post fracture @ humerus) has only 85 degrees of shoulder abduction. What goes beyond the observation and measurement is that Mrs Slattery cannot yet do her hair, do up her bra strap, hang up the washing ... nor is there anyone at home to help her.” (Paynter 1994).

In his final editorial he reiterated his hope that the journal would become a vehicle for professional communication and reflecting on his time as editor stated: “I am not certain that this wish was fulfilled to the extent I would have desired” (Paynter 1995).

Times change and there are many new forums for people to share professional knowledge, yet the journal continues, supported by a healthy number of contributions. The decision in 2003 to make the NZJP open access and consequently freely available on the Physiotherapy New Zealand website has meant it is now more widely accessed and read. Hopefully it continues to be a vehicle for professional debate within New Zealand and beyond. I am sure Bryan would agree: “Ignorance is the curse of God; knowledge is the wing wherewith we fly to heaven” (Shakespeare 1590).

And to end, a few notes sent to the Editor from Bryan: “They need a course in distinguishing ‘practice’ (noun) and ‘practise’ (verb). But they are not alone there!”; “I had to sprinkle a few commas about in both papers to nullify some possible ambiguities.”; “A few minor infelicities only!”

Janet Copeland

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Musculoskeletal physiotherapy provided within a community health centre improves access

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ABSTRACT

This study assessed whether the provision of a musculoskeletal physiotherapy service within a Community Health Centre situated in a high deprivation area would change access rates. Retrospective data were collected from the health records of all patients referred for outpatient musculoskeletal physiotherapy at the Health Centre and at the city's primary hospital. Age, sex, ethnicity, deprivation level at first consult, and overall appointment attendance rates from the Hospital service in 2009 were compared with data from 2010 to April 2012 for the two service sites. An increase in patients identifying themselves as Māori (>120%) and Pacific Island (>130%) attending their first physiotherapy consult was found. Difference in sex, age, ethnicity and deprivation level between patients attending the two sites was significant (p-value <0.001). Patients who attended their first consultation predominantly identified themselves as European (Hospital; 69-71% and Health Centre; 20-22%) and as Māori (Hospital; 13% and Health Centre; 32-34%) respectively. Over 80% of the Health Centre's attendees lived in a high deprivation area compared to less than 60% of patients attending the Hospital service. The placement of fully funded physiotherapy services within a high deprivation area improved access particularly for minority ethnic groups living in New Zealand.

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Key words: Physiotherapy, Health care access, Primary health care, Musculoskeletal

INTRODUCTION

Disparities in access to health care result in poorer health outcomes for groups of individuals living within a population (Ajwani et al 2003). While the definition of access varies, it is a concept which considers an individual's ability to identify their own health needs and have those needs fulfilled by the ability to seek and use a service (Levesque et al 2013). Individuals from ethnic minority groups, older adults, and people with disabilities are less likely to access or find it harder to access health care (Barnes et al 2012, Braveman and Gruskin 2003, Brown et al 2000, Jansen et al 2008, Lasser et al 2006) because the service characteristics are not considered "affordable, approachable, appropriate, acceptable, or available" (Levesque et al 2013 p 5).

Individuals belonging to marginalised populations, that is those considered to be, and/or those who perceive themselves to be unimportant (Cambridge Dictionaries Online 2015), often present with higher rates of chronic diseases and health problems, and suffer high disease-specific mortality rates (Ajwani et al 2003, Brown et al 2000, Lasser et al 2006). From a New Zealand context it is evident that a reduced health status exists for people identifying themselves as being of

Māori and Pacific Island ethnic origin compared to Europeans¹ and for those living in a geographical area determined to be high deprivation² (Ajwani et al 2003, Baxter 2002, Ministry of Health 2012, Westbrooke et al 2001). Ethnic disparities in the areas of accidents and unintentional injuries, cardiovascular disease, respiratory disease and lifestyle disease are of particular relevance to physiotherapy (Ratima et al 2006). For example, people identifying as Māori are 1.4 times more likely to have chronic pain and 1.3 times more likely to have arthritis, after adjusting for age and sex differences (Ministry of Health 2012). They also have twice the rate of injury related health loss from transport related incidents such as motor vehicle accidents (Ministry of Health and Accident Compensation Corporation 2013) and a higher workplace injury claim rate (190 per 1,000 full time equivalents compared to 130 for people identifying as European) (Cram 2007). These are the sorts of problems that would be routinely seen by musculoskeletal physiotherapists.

- 1 Statistics New Zealand 2013 Census data use the level 1 term of European ethnicity to group New Zealand Europeans, Europeans (Scandinavians, Western and Eastern Europeans), Americans, Canadians, South Africans when not classified elsewhere, Afrikaners, and Zimbabweans.
- 2 Deprivation in New Zealand is determined by eight sequentially weighted dimensions: communication, income (benefit or below an income threshold), employment status, qualifications, home ownership, level of support needed, living space, and access to transport (Atkinson et al 2014).

While data determining the access of musculoskeletal outpatient physiotherapy in New Zealand is limited, the Accident Compensation Corporation (ACC) injury claim rate for people identifying as Māori is significantly lower than for the general population. Therefore for accident related injuries at least, this group is unlikely to benefit from all possibly relevant health services (Cram 2007).

The Primary Health Care Strategy, implemented in February 2001 by the then government, aimed to reduce health inequalities and improve the health of New Zealanders (Ministry of Health 2011b). Its purpose was to create an overall framework for the organisation and delivery of primary health care (King 2001). This framework shifted primary health care from an independent practitioner centred model to an interdisciplinary and community governed model.

An important component of the Health Care Strategy was the establishment of Primary Health Organisations (PHOs). These community-governed non-profit organisations were intended to aid mitigation of significant financial, cultural and geographical barriers to accessing primary care to ensure adequate health care access for enrolled populations (Ministry of Health 2011a). Theoretically, those in greatest need of health care would have easier access to health care services (King 2001).

Ethnic proportions vary across New Zealand. In the city where this study was performed, the proportion of people identifying as Māori, Pacific Island, and Middle Eastern, Latin American, and African (MELAA) is above the national average in all three groups (Statistics New Zealand 2014). Furthermore, some areas within this city report proportions of over 26% and 21% for people identifying as Māori and Pacific Island respectively (Statistics New Zealand 2014). These same geographical areas are also categorised as areas of high deprivation (Atkinson et al 2014).

Due to anecdotal evidence of disparities in musculoskeletal physiotherapy outpatient access between specific ethnic groups in this city, the local District Health Board (DHB) approached a Community Health Centre (operated by a PHO and located in an area of high deprivation) in 2008 with the aim of developing an initiative to integrate an experienced physiotherapist into the existing Community Health Centre team. The initiative, funded by the DHB, provided a service comparable with the service provided at the city's main hospital. This initiative had several aims, two of which were: 1) provide a primary care musculoskeletal physiotherapy service and 2) improve access to musculoskeletal physiotherapy outpatient services so that they aligned with the demographics of the area. In November 2009, the Health Centre physiotherapy service commenced.

At present, there is a paucity of published New Zealand research reporting on ethnic disparities with respect to musculoskeletal physiotherapy services and initiatives to ameliorate them (Nelson 2002, Ratima et al 2006). The purpose of this study was to determine if a DHB funded service provided within a Community Health Centre was successful in positively changing access to musculoskeletal outpatient physiotherapy services. More specifically, the aims were to retrospectively explore patient attendance records to determine: 1) if a DHB funded musculoskeletal physiotherapy service within the Community Health Centre changed access to musculoskeletal outpatient physiotherapy services overall and by clinic location (Hospital

and Health Centre), and 2) if the patients who attended the respective clinics were representative of local community demographics.

METHOD

Data Source

Retrospective data were collected from patient health records of all patients referred for outpatient musculoskeletal physiotherapy at the Community Health Centre and Hospital clinic. Data from patients attending the Hospital musculoskeletal physiotherapy outpatients' service in 2009 and patient data from January 2010 to April 2012 from the Hospital and the Health Centre were collected. Variables of interest were age, ethnicity, sex, deprivation level at first consult, and overall appointment attendance rates from the hospital service. This study was a collaborative project between Hutt Valley District Health Board, Hutt Union and Community Health Services, and the University of Otago, School of Physiotherapy. Ethical approval was granted by the Central Regional Ethics Committee (CEN/12/EXP/022) of New Zealand and by the two service centres (DHB and Hutt Union and Community Health Services) prior to study commencement.

Data Analysis

Prior to analysis, all identifying data were removed to ensure anonymity. After cleaning the data, descriptive statistics were used to assess mean (SD) age, and the frequency (%) of ethnicity, sex, deprivation level at first consult, and overall attendance rate variables. Deprivation levels were categorised into quintiles. Quintiles are derived from the NZDep2006 decile score which was collapsed by adding two sequential deciles such as deciles 1 and 2 to form quintile 1 and so forth (White et al 2008). Decile 1 is the least deprived and 10 the most deprived (Atkinson et al 2014). Accordingly, quintile 5 denotes higher deprivation. Ethnicities were grouped according to Statistics New Zealand Level 1 Ethnicity Classification Coding System (Statistics New Zealand 2009).

Overall attendance rate was defined as the number of treatment sessions a patient successfully attended in relation to the total number of treatment appointments made and was calculated for each patient. Non-attendance was defined as any booked appointment that was not attended regardless of whether this was due to a cancellation or was a missed appointment.

Data analysis was carried out using Microsoft Excel 2010 and the Open Source Epidemiologic Statistics for Public Health (Version 2.3.1) (OpenEpi) software package. A number of correlates associated with decreased access to care, including socioeconomic status, age and ethnicity (Cumming et al 2007) were analysed for both the Health Centre and Hospital populations.

Wilcoxin Signed Rank Tests were used to determine if there was a change in the total number of Māori and Pacific Island patients attending their first DHB funded physiotherapy consult. Independent samples t-tests were used to determine if there was any statistical difference between the age of participants attending the two clinics (Hospital and Health Centre) at first consult. All categorical variables were analysed using chi-squared tests or Fisher's Exact Test to determine statistical significance. Statistical significance was considered reached with p-values of <0.05.

Table 1: Characteristics of patients attending their first consultation at either the Hospital or Health Centre 2009 – 2012

| | 2009 Jan-Dec | | 2010 Jan-Dec | | <i>p</i> -value | 2011 Jan-Dec | | <i>p</i> -value | 2012 Jan-Apr | | <i>p</i> -value |
|--------------------|--------------|-----------|--------------|--------|-----------------|--------------|---------|-----------------|--------------|--------|-----------------|
| | Hospital | HC | Hospital | HC | | Hospital | HC | | Hospital | HC | |
| Total patients | 2972 | 318 | 2953 | | | 358 | 3000 | | 129 | 1364 | |
| Age Mean (SD) | 48.8 (20) | 44.4 (16) | 49.3 (20) | <0.001 | 44.7 (16) | 48.5 (20) | <0.001 | 44.5 (16) | 49.8 (19) | <0.001 | |
| Sex Freq (%) | | | | <0.001 | | | < 0.001 | | | 0.26 | |
| Male | 960 (32) | 162 (51) | 924 (31) | | 165 (46) | 926 (31) | | 51 (40) | 472 (35) | | |
| Female | 2012 (68) | 156 (49) | 2029 (69) | | 193 (54) | 2074 (69) | | 78 (60) | 892 (65) | | |
| Quintile Freq (%) | | | | <0.001 | | | <0.001 | | | <0.001 | |
| 1 | 492 (17) | 13 (4) | 497 (17) | | 9 (3) | 493 (16) | | 4 (3) | 212 (16) | | |
| 2 | 266 (9) | 6 (2) | 236 (8) | | 2 (1) | 229 (8) | | 5 (4) | 115 (8) | | |
| 3 | 576 (19) | 23 (7) | 595 (20) | | 31 (9) | 587 (20) | | 9 (7) | 252 (18) | | |
| 4 | 1027 (35) | 48 (15) | 1055 (36) | | 65 (18) | 1091 (36) | | 12 (9) | 457 (34) | | |
| 5 | 612 (21) | 224 (70) | 570 (19) | | 235 (66) | 600 (20) | | 95 (74) | 328 (24) | | |
| Unknown | 0 (0) | 4 (1) | 0 (0) | | 16 (4) | 0 (0) | | 4 (3) | 0 (0) | | |
| Ethnicity Freq (%) | | | | <0.001 | | | <0.001 | | | <0.001 | |
| European | 2122 (71) | 65 (20) | 2150 (73) | | 78 (22) | 2156 (72) | | 28 (22) | 934 (69) | | |
| Māori | 376 (13) | 107 (3) | 332 (11) | | 101 (28) | 378 (13) | | 41 (32) | 171 (13) | | |
| Pacific | 179 (6) | 86 (27) | 194 (7) | | 113 (32) | 190 (6) | | 31 (24) | 97 (7) | | |
| Asian | 183 (6) | 14 (4) | 196 (7) | | 22 (6) | 204 (7) | | 8 (6) | 105 (8) | | |
| MELAA | 54 (2) | 41 (13) | 51 (2) | | 32 (9) | 46 (2) | | 16 (12) | 41 (3) | | |
| Other | 0 (0) | 5 (2) | 0 (0) | | 11 (3) | 0 (0) | | 5 (4) | 0 (0) | | |
| Residual | 59 (2) | 0 (0) | 30 (1) | | 0 (0) | 26 (1) | | 0 (0) | 16 (1) | | |

Note: Freq, Frequency; Jan, January; Dec, December; Apr, April; HC, Health Centre; MELAA, Middle Eastern, Latin American, African

RESULTS

Table 1 outlines the demographic composition of the sample population at the Health Centre and Hospital between 2009 and April 2012. There was a 132%, a 127%, and a 124% increase in the number of patients identifying as Māori and a 144%, a 159%, and a 131% increase in the number of patients identifying as Pacific Island attending their first DHB funded physiotherapy consult. This was not found to be significant. However, significant differences were found between the Health Centre and Hospital for the variables of sex, age, quintile and ethnicity in 2010, 2011, and 2012.

A significant difference ($p < 0.001$) was found for sex distribution between the Health Centre and Hospital in 2010 and 2011. The Hospital had a consistently higher proportion of female patients than males for all years, while the Health Centre had a relatively equal distribution of males and females over the three years.

The mean age of patients remained consistent over the three years at both locations. The Hospital had a higher mean age compared to the Health Centre for 2010 to 2012 ($p < 0.001$).

A significant difference ($p < 0.001$) in the quintile distribution for the Health Centre and Hospital was also identified. Over 80% of

patients at the Health Centre were categorised as quintile five, compared to a more heterogeneous quintile distribution at the hospital.

A significant difference between the ethnic distributions of the Health Centre and Hospital was found for all years. The highest proportion of patients at the Hospital consistently identified as NZ European (2009: 71.4%; 2010: 72.8%; 2011: 71.9%, 2012: 68.5%). Conversely, the Health Centre results showed that patients identifying as Māori and Pacific Island formed the largest proportion of the patients seen (2010: 34% and 27%; 2011: 32% and 28%; 2012: 24% and 32% respectively). In addition, the Health Centre had higher proportions of patients identifying as MELAA compared to the hospital over all three years.

In 2009, a total of 2,972 patients attended their DHB funded initial musculoskeletal physiotherapy outpatients consult (Hospital only). This increased to 3271 and 3358 for the full years of 2010 and 2011 respectively (attendance at Hospital and Health Centre combined). All patients had the opportunity to access either clinic and, in some instances, both services were accessed by the same patient.

Table 2 shows the booking and attendance data for the Health Centre and Hospital, and represents the total number

of appointments (initial consult and follow-ups) made. Over 50,065 appointments were made between January 2009 and April 2012; 47,285 of these were booked at the Hospital while 2,780 were booked at the Health Centre (January 2010 and April 2012). In total 8,860 individual patient appointments were made from 2009 to April 2012. While the total number of appointments increased year on year (2009: 13,072; 2010: 15,367; 2011: 15,909) there was no significant change in the overall attendance rates for all appointments made over all years at both locations.

January 2009 and April 2012. Specifically, the study assessed if the implementation of a physiotherapy clinic strategically placed within the 'local' Community Health Centre resulted in a change in access statistics and whether the patient population became representative of local community demographics. Our results indicate that the Health Centre caters for a lower socioeconomic patient population, and more people identifying as Māori and Pacific Island (who have a lower mean age) compared to patients attending the Hospital. Following the implementation of the new physiotherapy service, there was, across both

Table 2: Attendance data for the Hospital and Health Centre 2009 - 2012

| | Hospital appointments | Health Centre appointments | Total appointments | p-value |
|--------------|-----------------------|----------------------------|--------------------|---------|
| Year | | | | |
| 2009 Jan-Dec | | | | |
| Booked | 13,072 | | 13,072 | |
| Attended | 11,444 | | 11,444 | |
| Not attended | 1,628 | | 1,628 | |
| 2010 Jan-Dec | | | | |
| Booked | 14,090 | 1,277 | 15,367 | |
| Attended | 12,389 (88) | 1,003 (79) | 13,392 | |
| Not attended | 1,701 (12) | 274 (21) | 1,975 | 0.09 |
| 2011 Jan-Dec | | | | |
| Booked | 14,799 | 1,110 | 15,909 | |
| Attended | 12,771 (86) | 853 (77) | 13,624 | |
| Not attended | 2,028 (14) | 257 (23) | 2,285 | 0.10 |
| 2012 Jan-Apr | | | | |
| Booked | 5,324 | 393 | 5,717 | |
| Attended | 4,612 (87) | 310 (79) | 4,922 | |
| Not attended | 712 (13) | 83 (21) | 795 | 0.13 |

Note: All figures are reported as Frequency (%) except for total values. Jan, January; Dec, December; Apr, April.

Table 3 represents the number of appointments (initial consult and follow-ups) attended and not attended at the Health Centre and Hospital by ethnic group. European patients contributed to the majority of attended appointments at the Hospital for all years (59-64%). At the Health Centre, the highest percentage of attendance was for patients identifying as Māori, followed by Pacific Island and European ethnicities. Significant differences were found over all three years between both clinics.

Non-attendance proportions remained fairly consistent at both clinics for all years (Table 3). At the Hospital, the highest non-attending rate was found amongst patients identifying as European patients followed by Māori patients. The Health Centre data showed the greatest proportions of patients not attending appointments were Māori and Pacific ethnicities. Compared to the Hospital, the Health Centre had a higher rate of non-attendance amongst the MELAA population.

DISCUSSION

This study aimed to compare the characteristics of patients attending musculoskeletal physiotherapy at two DHB funded musculoskeletal physiotherapy outpatient clinics between

services, a consistent increase of initial consults attended from 2009 to 2011, over a 100% increase in the number of patients of Māori and Pacific Island ethnicity attending their initial consult, and a significant increase in the number of patients who live in a high deprivation area attending their initial consult. Furthermore, the ethnic proportion of patients attending physiotherapy at the Health Centre became more aligned to local demographics (Statistics New Zealand 2006, Statistics New Zealand 2014). No previous research, to the authors' knowledge, has reported the outcomes of incorporating a DHB funded physiotherapy service into a primary care practice located in a deprived area in New Zealand.

A link exists between the provision of community health services and increased rates of receiving care (Bindman et al 1995). That is, the largest documented increase in the use of primary health care has been by the least deprived populations and Māori are under-represented compared with non-Māori in this instance (Cumming et al 2007). Following the introduction of the Community Health Centre physiotherapy service, not only did the ethnic distribution of physiotherapy attendance by patients identifying as Māori and Pacific Island become more consistent

Table 3: Total attended and not-attended appointments at the Hospital and the Health Centre 2009 – 2012 by ethnicity

| | 2009 Jan-Dec | | 2010 Jan-Dec | | <i>p</i> -value | 2011 Jan-Dec | | <i>p</i> -value | 2012 Jan-Apr | | <i>p</i> -value |
|--------------------|--------------|------------|--------------|----------|-----------------|--------------|----------|-----------------|--------------|---------|-----------------|
| | Hospital | Hospital | HC | Hospital | | HC | Hospital | | HC | | |
| Total attended | 11,443 | 12,389 | 1,003 | | | 12,771 | 853 | | 4,612 | 310 | |
| Ethnicity Freq (%) | <0.001 | | | <0.001 | | | <0.001 | | | | |
| European | 8,741 (76) | 9,529 (77) | 244 (24) | | | 9,703 (76) | 215 (25) | | 3,244 (70) | 53 (17) | |
| Māori | 1,026 (9) | 1,059 (9) | 299 (30) | | | 1,122 (9) | 192 (23) | | 499 (11) | 97 (31) | |
| Pacific | 547 (5) | 711 (6) | 247 (25) | | | 649 (5) | 265 (31) | | 281 (6) | 79 (25) | |
| Asian | 749 (7) | 819 (7) | 53 (5) | | | 986 (8) | 59 (7) | | 358 (8) | 26 (8) | |
| MELAA | 194 (2) | 179 (1) | 136 (14) | | | 198 (2) | 82 (10) | | 172 (4) | 41 (13) | |
| Other | 0 (0) | 0 (0) | 24 (2) | | | 0 (0) | 40 (5) | | 0 (0) | 14 (4) | |
| Residual | 187 (2) | 92 (1) | 0 (0) | | | 113 (1) | 0 (0) | | 58 (1) | 0 (0) | |
| Total not-attended | 1,628 | 1,701 | 274 | | | 2028 | 257 | | 712 | 83 | |
| Ethnicity Freq (%) | <0.001 | | | <0.001 | | | <0.001 | | | | |
| European | 1,002 (62) | 1,081 (64) | 59 (21) | | | 1,256 (62) | 41 (16) | | 417 (59) | 15 (18) | |
| Māori | 282 (17) | 294 (17) | 99 (36) | | | 385 (19) | 78 (30) | | 152 (21) | 28 (34) | |
| Pacific | 155 (10) | 192 (11) | 66 (24) | | | 215 (11) | 88 (34) | | 80 (11) | 19 (23) | |
| Asian | 109 (7) | 86 (5) | 8 (3) | | | 119 (6) | 13 (5) | | 41 (6) | 7 (8) | |
| MELAA | 53 (3) | 40 (2) | 36 (13) | | | 49 (2) | 28 (11) | | 13 (2) | 8 (10) | |
| Other | 0 (0) | 0 (0) | 6 (2) | | | 0 (0) | 9 (4) | | 0 (0) | 6 (7) | |
| Residual | 27 (2) | 8 (1) | 0 (0) | | | 4 (0) | 0 (0) | | 9 (1) | 0 (0) | |

Note: Freq, Frequency; Jan, January; Dec, December; Apr, April; HC, Health Centre; MELAA, Middle Eastern, Latin American, African

with the suburb the Health Centre is geographically located within, but other minority ethnic populations also became more consistent. For example, 2006 and 2014 Census data show that in this particular geographical area over 26% of people identify as Māori, 21% Pacific Islander, and 10% MELAA.

In contrast, the demographics of patients attending the hospital were not consistent with the city's overall demographics. The city's population is comprised of European (> 64%), Māori (>17%), Pacific Islander (>11%) and Asian (>9%) people (Statistics New Zealand 2006, Statistics New Zealand 2014). Previous research has shown that attending services which require transport can limit access to services, especially in low income groups (Listl et al 2014, Mbada et al 2013, Winkley et al 2014). Although it is simply conjecture with regards to the population involved in this research, these results suggest that people are more likely to attend a physiotherapy clinic which is located in close proximity to their physical address.

Our results also showed that there was a significantly higher mean age of patients accessing the Hospital compared to the Health Centre. This age differential is not unexpected. Māori have a lower life expectancy of about seven years compared to non-Māori (Statistics New Zealand 2004) and a higher proportion of Māori patients accessed the Health Centre.

No significant differences were found when comparing total attendance and non-attendance data between the two clinics

over the research period. However, when attendance based on ethnic grouping was analysed, significant differences were identified. One key finding was that the Hospital had a higher proportion of patients identifying as Māori not-attending compared to the proportion of Māori accessing the service. This was noticeable for all years studied. Conversely, the Health Centre had similar attendance and non-attendance rates representative of the proportion of patients making appointments. Improvements in the overall attendance rate may be due to the location of the new service, however, it could also be related to other factor(s).

The introduction of the physiotherapy clinic within the strategically located Health Centre resulted in significantly more deprived (quintile five) patients making physiotherapy appointments at the Health Centre and receiving DHB funded care. Although the Hospital physiotherapy service is also DHB funded and thus free of charge, travel costs involved and additional time requirements for travel may have been factors in non-attendance, particularly for patients living in an area categorised as high deprivation. Maniapoto and Gribben (2005) also found that the addition of Māori health facilities into a high needs community increased the access to health services. These authors hypothesised that addressing barriers such as cost, lack of transport, cultural acceptability, community specific needs, and the location of the clinic supplemented the success of the clinic (Maniapoto and Gribben 2005).

Physiotherapists infrequently work within interprofessional primary health care teams in New Zealand (Stewart and Haswell 2013). Within primary health care, community governed organisations are more likely to recruit a variety of health disciplines while independent practices are less likely to employ a variety of health care practitioners or ethnicities (Crompton et al 2005). The creation of PHOs facilitated the inclusion of multiple health care professionals into health care practices and encouraged diversity (Ministry of Health 2011a). The interprofessional nature of the Health Centre involved in this study reflects the structure of a typical community based, non-profit organisation described by Crompton et al (2005). All the health professionals who work at the Health Centre make a conscious effort to work as an interdisciplinary team and will frequently 'door knock' on other clinicians' doors to ask advice or to introduce a patient they intend to refer. These sorts of interactions may have helped to break down some of the cultural and language barriers described by Maniapoto and Gribben (2005)

The physiotherapists who worked at the Health Centre during the period of this research were British and completed their undergraduate training in England. Both physiotherapists had worked with various minority groups previously and had demonstrated cultural competency to a sufficient extent to gain New Zealand Physiotherapy Board Registration. However, our results may have been different if the physiotherapists working in the Health Centre had been of an ethnicity similar to the minority groups living in this area. The magnitude and direction of change, if any, the physiotherapists' ethnicity had on our results is unable to be determined from this research.

This study has a number of limitations. We used a retrospective design. It is possible that the data collected were incomplete and contained inaccuracies and this may have biased our results. While there was a constant increase in appointments made over the time span of this study, it is not known whether these 'new' patients were previously receiving care from other physiotherapy service providers, or if results comprise of patients accessing physiotherapy for the first time and therefore represent a true increase in physiotherapy access. In addition, despite a large number of total patients (8,860) and individual appointments (50,065), there was a considerable difference in sample size between the Health Centre and Hospital due to the number of full time equivalent staff working at the two sites. Approximately two and a half full time equivalent physiotherapists were on site at the Hospital during the data collection time frame compared to one physiotherapist employed part time (50%) at the Health Centre. Consequently, attendance proportions were used to compare factors between the two locations. Further, some results are drawn from only two full years of physiotherapy service provision as data for 2012 were only collected up till the end of April. This made it difficult to ascertain significant findings between the two clinics.

Health disparities which exist between different groups are multi-factorial (Braveman and Gruskin 2003). The existence of financial, organisational and cultural barriers places an increasing burden on those who are already socially disadvantaged with respect to their health and negatively affects access (Braveman and Gruskin 2003). Some of the known barriers to access are inconvenient opening hours of clinics, limiting in particular people employed in lower income occupational roles who can ill afford the time off work and

who frequently work long hours (Jansen et al 2008). Travel time related to the distance of the clinic in addition to the cost of transport, which might include parking fees are also acknowledged barriers, and these barriers fall most heavily on low-income groups (Jansen et al 2008). Language and cultural obstacles (Bindman et al 1995, Jansen et al 2008, Whitehead 1992) and a frequent lack of awareness amongst minority groups of the health care services that are available are also barriers (Braveman and Gruskin 2003, Whitehead 1992). It is possible that the Health Centre mitigated some or all of these factors. Future research should identify why the addition of a physiotherapy service into the Health Centre specifically increased the number of Māori (and other minority ethnicities), and those living within a high deprivation area, accessing DHB funded physiotherapy services. Funding to continue data collection and analysis over a greater length of time would be useful for identifying the long term effects of DHB funded community based physiotherapy services on musculoskeletal and general health outcomes.

CONCLUSION

A DHB funded musculoskeletal outpatient physiotherapy service was incorporated into an interdisciplinary primary health care team located within a Community Health Centre with the aim of improving physiotherapy access for minority populations. A significant increase in the number of minority group and lower socioeconomic patients receiving DHB funded physiotherapy treatment resulted and has potentially mitigated several barriers to access. However, further research is required to confirm which barriers remain and what, if anything, can be done to further improve access to this service.

KEY POINTS

- The inclusion of DHB funded musculoskeletal physiotherapy services within a Community Health Centre located within a geographical area defined as high deprivation can significantly improve access for minority groups.
- Convenience, a decrease in financial and travel costs, and inclusion of physiotherapy within an already established interprofessional team may have mitigated barriers to access.
- Further research is required to determine why this service was successful.

PERMISSIONS

Ethics - Ethical approval was granted by the Central Regional Ethics Committee (CEN/12/EXP/022) of New Zealand.

DISCLOSURES

No funding was obtained for this study.

I declare on behalf of myself and the other authors that we know of no competing interests (financial, professional or personal) which may be perceived to interfere with or bias any stage of the writing or publication process. This includes, but is not restricted to, any factors that may influence full and objective presentation of the article, peer review and editorial decisions.

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What factors affect attendance at musculoskeletal physiotherapy outpatient services for patients from a high deprivation area in New Zealand?

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ABSTRACT

Barriers to accessing health services in New Zealand may manifest in inequalities. This study explored barriers and facilitators to accessing a District Health Board funded musculoskeletal physiotherapy outpatient service situated in two different geographical locations. Participants were purposely and then systematically selected from attendance records, were aged 18 years and older, had failed to attend one or more physiotherapy musculoskeletal outpatient sessions at either location, and lived in a geographical area considered high deprivation. Semi-structured interviews were audio-recorded, transcribed, and analysed using the General Inductive Approach. Seventeen participants with diverse ethnic backgrounds aged between 22 and 67 years were recruited. Four barriers ('Placing value on the unknown', 'Divergent health beliefs', 'Appropriateness of physiotherapy', 'Waiting times') and three facilitators ('Convenience', 'Privacy', 'Physiotherapy works') were identified. No barrier was identified as being more problematic at either clinic site. Participants believed physiotherapy was beneficial. However, uncertainty regarding the aims of physiotherapy affected participants' ability to value its worth and affected attendance. Convenience of location influenced attendance of people living in a high deprivation area.

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Keywords: Health inequalities, Physiotherapy, Barriers to access

INTRODUCTION

Health inequalities exist within all countries irrespective of the country's development, economic and social status (Adler et al 1993, Blakely et al 2011, Bleich et al 2012, Marmot 2003, Ruger and Kim 2006). New Zealand, which ranks towards the top of the United Nation's human development index, also has marginalised populations with poor health (Ajwani et al 2003, Alcorn 2011, Baker et al 2012, Blakely et al 2011, King et al 2009, Ratima et al 2006). This population of people consists of less privileged groups, such as older adults, women, minority ethnic and religious groups, people with disability, people who live rurally and people who live in areas of high deprivation (Braveman and Gruskin 2003).

Many factors contribute to health status. In fact, health care provision contributes only about 15% towards health status (Lurie and Dubowitz 2007). To be explicit, inequalities in health status are typically the result of societal inequalities (Marmot 2005). Determinants of socioeconomic status are multi factorial: ethnicity, sexual orientation, disability, geographical location, poor nutrition, relatively lower income, poorer economic and education opportunities, poorer housing conditions, access to social support, and greater exposure to environmental risks have

all been cited (Adler and Rehkopf 2008, Fiscella et al 2000, King et al 2009). Nevertheless, limitations in accessing health care services do contribute to health inequality (Lurie and Dubowitz 2007) and in New Zealand there are access discrepancies between groups at primary and secondary levels of care (Baxter 2002, Westbrooke et al 2001).

Access refers to the actual receiving of health care as well as the navigation through the health care system (Lis Ellison-Loschmann and Pearce 2006) and describes the relationship between the patient and the healthcare system. Barriers to access are likely to arise from one of three sources: financial (including cost of care and/or insurance); structural (relating to institutional and organisational barriers); and cognitive (lack of knowledge, and communication barriers) (Carrillo et al 2011). The latter two barriers are central to health literacy.

The Ministry of Health has adopted this definition of health literacy: "the degree to which individuals have the 'capacity' to obtain, process and understand basic health information and services in order to make informed and appropriate health decisions" (Kickbusch et al 2005 p 8). While it includes how an individual navigates and interacts with New Zealand's complex health system, it also involves other skills such as: understanding of health

messages, expectations about one's own health and of the health system, and ability to communicate with health professionals. In fact, an individual's subjective sense of their own social worth affects health and health care access (Scambler 2012).

In 2008, a District Health Board (DHB) in the lower North Island developed an initiative to integrate an experienced physiotherapist into a Community Health Centre (the Health Centre). Until this time, a disproportionately low number of people identifying as Māori or Pacific Island for the geographical area, had been attending musculoskeletal physiotherapy outpatient services. Furthermore, up to 18% of scheduled appointments were not being attended (Perry et al 2015). The initiative was deemed successful as there was an increase in people from lower socioeconomic and minority groups accessing DHB funded physiotherapy services (Perry et al 2015). However, the percentage of attended appointments remained unchanged (Perry et al 2015). Therefore, it was not clear why the service had made a difference. Furthermore it was unclear what the perceived barriers and facilitators were for people who were referred to and attended the outpatient physiotherapy services at either the Hospital or the Health Centre. The aim of this research was to explore barriers and facilitators for attendance at musculoskeletal outpatient physiotherapy services by patients who had not attended one or more appointments at either the Hospital or the Health Centre and to explore if any of the barriers or facilitators were more pertinent at either site.

METHODS

The study received ethical approval from the University of Otago Ethics Committee (12/311) and from the Hutt Valley District Health Board (HVDHB) and Hutt Union and Community Health Services.

Participant recruitment

Participants were selected from a data set of 315 patients obtained from the DHB attendance records. People on this data list were purposefully selected as they were aged 18 years and older, had failed to attend one or more physiotherapy musculoskeletal outpatient sessions at either physiotherapy clinic between December 2009 and January 2013 (inclusive), and were living within a quintile 5 geographical area. Quintile 5 is considered to house the most socioeconomically deprived New Zealanders as defined by the NZDep2013 (Atkinson et al 2014).

Every tenth person on the attendance record was telephoned to ask if they would be willing to participate. If there was no reply, the next person on the list was telephoned and so on until the data were saturated. Face to face interviews were conducted at a time and in a place of convenience for each individual participant. All participants received written and verbal information about the study and gave informed written consent.

Data collection

Thirty patients were telephoned, eighteen contacted and seventeen were interviewed. The contacted participant who declined was unable to fit into the time scheduled for interviews as he was going on an extended holiday. All participants were given the opportunity to have family/whānau and/or support person(s) present. The interviewer (SH) was competent in Tikanga Māori. Interpreter services were available but were declined when offered. Interviews were semi-structured and did not follow a specific order of questioning. However, four main lines of questioning were followed via open questions. These were: 1) the referral process including who referred them, why they were referred, and how long it took to get an appointment; 2) which site they had treatment at, and what influenced this

decision; 3) challenges in attending appointments; and 4) what influenced the decisions to attend or not attend the first appointment and any subsequent appointments. The time spent on each question depended on its relevance to that participant. At the start of the interview, during introductions, SH advised participants she was not a physiotherapist. All interviews were recorded with an Olympus DS-55 digital voice recorder and transcribed anonymously by a contracted transcriber.

Data Analysis

The analysis used the framework of the General Inductive Analysis (Thomas 2006). This approach is appropriate when the research question is predominantly evaluative (Thomas 2006). The General Inductive Approach is interpretive as multiple viewpoints are considered with respect to the objectives of the research. These objectives frame the research questions and analysis but theories are allowed to emerge from the data so that unanticipated important events or concepts can be incorporated into the results (Thomas 2006).

Analysis began after the completion of the first interview. SH and MP read all transcribed interviews and independently developed a framework to encapsulate the data. The framework was developed with line by line analysis (where all categories and contradictions were noted). The framework was constantly cross referenced back to original data and modified by the analysis of each subsequent interview. NVivo 9 (QSR 2011) was used to assist thematic organisation of data. A full discussion and interrogation of the categories was completed by SH and MP together to reduce overlap and categories superfluous to the framework (redundancy). A summary of findings was discussed informally with the Professional Leader of Physiotherapy at the DHB. Feedback from this consultation resulted in further interrogation and refinement of the categories and a model consisting of six themes was proposed.

Quotations were carefully selected to illustrate the theme being presented and either embedded within the main body of text or presented as short stand-alone paragraphs. In the quotations, the use of an ellipsis (...) indicates the removal of some text which does not alter the meaning of the quote, and brackets [] indicate the addition of some text to clarify meaning. The number in brackets after each quotation refers to the participant who provided this piece of data.

RESULTS

The age of the 17 recruited participants ranged between 22 and 67 years; mean (SD) of 45.8 (13.0) years. Their ethnic backgrounds were diverse and some participants identified with more than one ethnicity: Cook Islands (1); Iraqi (2); Māori (7); New Zealand European (2); Niuean (1); Samoan (2); South African (1); Sudanese (1); and Tongan (2). Of the 17 participants, seven participants had never attended physiotherapy before and a further five had received physiotherapy previously but not in New Zealand. Eight participants did not attend their first consultation and four of these participants did not subsequently re-schedule. Interviews lasted between 3 minutes and 12 seconds and 14 minutes and 10 seconds. All interviews were conducted in the participant's home.

The interview process broadly asked participants about their experiences of attending musculoskeletal outpatient physiotherapy at either the Hospital or Health Centre. This open style provided the opportunity for a natural descriptive story which, when analysed, resulted in three barriers and three facilitators being identified. Except for the use of curtailed

cubicles at the Hospital compared to private rooms at the Health Centre, none were identified as being more pertinent for either the Health Centre or the Hospital. All facilitators identified were reported for both sites equally. Furthermore, no participants (initially) recalled missing any appointment or not attending a session, "I went to every single one" (P5).

Barriers to attendance at physiotherapy

Placing value on the unknown

The first visit for some participants was intimidating as they did not have a clear picture of what to expect from physiotherapy, what they might be expected to do, and how they would feel afterwards. They were facing the unknown,

"A little bit apprehensive. I was more apprehensive at, um, how the leg [would be sore afterwards], and what kind of exercises we were going to do" (P4).

For others, while they were not apprehensive, their previous lack of experience of physiotherapy meant they could not evaluate the worth of physiotherapy and therefore "can't be bothered" (P12),

"People just, you know, seem to go 'oh, physio, oh, it's, that's boring,' you know. And when I first went...I was listening to everyone else...But when I went there, I said 'oh, nah, it's good', cause they're, you know, you're using bike...you're doing different things all the time. And I, I, I enjoyed the first one. And it felt, I felt good after it. I felt very good" (P6).

Participants acknowledged that they had thought "it'll get fixed by itself" (P6), but suggested that "getting educated" (P17) allowed them to make more informed judgements as to the perceived benefits and costs of attending treatment especially following an injury,

"We [Māori] would normally leave it for the last minute... we wouldn't necessarily know that we had to go and get it ACC'd, and all that sort of stuff, and may need physio, you know...I suppose since working in the hospital, and getting educated... and being educated by my coaches and that, I think the minute now I injure myself, I will go straight away and get it looked at, I won't let it linger" (P17).

Perceived value continued to influence attendance on subsequent visits as well. When other aspects of life such as work were considered more of a priority than attendance at a follow up session, it was easy to 'forget' an appointment,

"Ah, why? Cause I'm busy working, and forgot about it" (P10).

For others, better explanations leading to better understanding of 'best evidence' practice would have been helpful to make value judgements,

"I think they need to give us more information on what's available...I benefitted from the hydro pool sessions but they didn't come forward with that soon enough" (P4).

Divergent health beliefs

Several patients had not realised they would contribute towards their own rehabilitation goals or need to actively participate in their treatment. When treatment choices did not align with patient expectations, including who was responsible for undertaking the treatment, disappointment and dissatisfaction ensued,

"I had to ah, rehabilitate myself, you know, do exercises and all" (P12).

Other participants had such severe symptoms they chose not to attend because they believed physiotherapy would make it worse. They thought their specialist or general practitioner had mistakenly referred them to physiotherapy. In their opinion, they believed their referrer had misunderstood the complexity or severity of their condition and not realised that physiotherapy was inappropriate for their particular condition,

"Cause you're already in pain, and they're [specialist] giving you physiotherapy. It's just not worth the pain and the aggravation, to go and get something that may or may not help you" (P1).

This was compounded when participants believed that their problem was serious, too serious for physiotherapy,

"I mean the exercises, maybe it help others, but not help me. Because it is very serious problem. I think I need a serious, a serious treatment" (P9).

Appropriateness of physiotherapy

For some participants, physiotherapy was deemed inappropriate by their referrer and without informing their physiotherapist, the participants stopped attending. This typically arose because of an inaccurate initial diagnosis by the referrer. For example, one participant had been receiving treatment following a motor vehicle accident and discontinued when further investigations revealed,

"Fracture in my hip. Yeah. And still I'm suffering" (P9).

For others, the presence of other more serious health issues meant that physiotherapy was no longer a priority and attendance at other health clinics to address the more pressing health issue was considered appropriate,

"I think it would have been, might have been the transition time where I had some health issues. Where I was, I think, well that's my excuse" (P17).

Waiting times

The most straightforward and consistent barrier about attendance was the waiting time which was problematic at both sites,

"Ten, ten minutes, fifteen minutes. I don't mind waiting...I think I used to wait for half an hour, but they don't do your appointments on time, it's never happened. It's never happened on time. Every other appointment was never on time" (P15).

However, participants were cognisant of potential reasons for their physiotherapist being late. They provided excuses such as,

"It was like at the end of the day, it isn't their fault" (P3).

They were even more understanding if they thought the wait was due to another patient having a serious condition which required more time than anticipated,

"It's just some people need longer than others" (P11).

Ultimately though, participants believed that they had no choice but to wait because,

"You want them to help you for what, the problem you are having, yes. You need to be present" (P2).

Facilitators to attending physiotherapy

Convenience

While many of the participants felt that the service received was "no different" (P5) at either clinic site, a considerable number of participants mentioned that they chose services at the location of "convenience" (P17) to themselves. Those living closest to the Hospital cited good transport, likewise those living closest to the Health Centre (Pomare) cited the same. It was quicker and easier to go somewhere closer to home,

"Well, just hopping on a bus, going as far as Pomare [the Health Centre] was quicker than going all the way to the hospital" (P3).

Similarly, with parking most participants suggested that at both locations the parking was “fantas[ti]c. It was just outside” (P4). When facilities were close it was easier for physiotherapy to “fit in with [participants’] lifestyle” (P17).

Privacy

Several participants discussed privacy, particularly related to the use of curtained cubicles at the Hospital and the perception that others might listen in or inadvertently look in. However, for one participant this was especially important because of her religious beliefs. Respect of her privacy made attending the Health Centre more appealing and determined where she chose to attend,

“Because when you’re at the hospital, you’re in a room with other people, and the only thing that separates you is curtains. But in, at Pomare [the Health Centre], you’re in a room, on your own, with a therapist. So, yeah. It was just more private” (P3).

Physiotherapy works

In spite of not necessarily understanding what physiotherapy entailed prior to attending, many participants found physiotherapy helpful, “It was good. It worked” (P6) and enthusiastically endorsed it for others,

“I totally recommend it, if you need the physio, um, if you don’t want to go and think you don’t need it, and it isn’t going to help you, it’s going to help you. It does help” (P3).

A good rapport developed between the physiotherapists and most of the participants. Most trusted their physiotherapist and felt that a good result was achieved,

“The physiotherapist, she was really, she was very good” (P2).

They felt comfortable repeatedly asking questions and would do so until they comprehended what was going on despite potential language barriers,

“Even if I don’t understand anything, I will keep nagging, nagging, nagging, until I understand” (P9).

They appreciated their treatment being individualised and being listened to. For example, one participant with a very heavy manual occupation appreciated being taught strategies to manage the working environment,

“Sort of teaching me, like in relation to work, how I should be doing different things- lifting things, yeah...he asks, and I show him exactly what I have to do, you know, even right down to scrubbing the floor. He shows me, you know, how to do that properly without getting sore” (P13).

DISCUSSION

This qualitative research explored the reasons patients living within a high deprivation area had not attended Hutt Valley DHB funded musculoskeletal outpatient physiotherapy services at one of two geographical locations (the Health Centre and the Hospital) and facilitators for attendance. Regardless of which clinic/site patients chose to attend (or not attend) there was limited understanding of what physiotherapy might entail and its aims or intended purpose with respect to their condition. Physiotherapy was not prioritised over other activities or commitments. However, participants typically developed a good relationship with their physiotherapists and found physiotherapy helpful. Convenience facilitated attendance and which physiotherapy outpatient service patients attended.

Some participants failed to attend the first session due to apprehension or uncertainty. They did not know what to expect and they lacked confidence regarding what would happen

in the session. They were not sure what physiotherapy was. Researchers have found similar feelings in those wait listed to attend pulmonary rehabilitation classes (Lewis et al 2014). Similarly, a lack of awareness and limited understanding of the service remit or aims affected attendance rates in a free cardiovascular drop in clinic in the United Kingdom (Burgess et al 2014) and in migrants attending a health care centre in the United States (Harari et al 2008). However, uncertainty regarding individual musculoskeletal appointments has rarely been reported in physiotherapy literature.

It is perhaps unsurprising that the lay person might be uncertain as to the role or aims of physiotherapy. The World Confederation for Physical Therapy (2015) defines physiotherapy as “services to people and populations to develop, maintain and restore maximum movement and functional ability throughout the lifespan”. While this definition is expansive it is possibly not enlightening to the lay person. There is also uncertainty regarding identity from within the physiotherapy profession (Jull and Moore 2013, Nicholls and Gibson 2010). A predominantly biomechanical view of the body and its management is now changing to more inclusive concepts of the individual’s (psychological, spiritual, social, physical) ability to move, or interact, or participate in activities (and environments) of importance to the individual (Nicholls and Gibson 2010). A unified approach to determining our physiotherapy identity, in language easily understood by the public, is essential but is perhaps still a long way off when the use of alternative titles exists internationally, weakening our “global identity” (Lowe 2004 p 1055) and enhancing public confusion (Lowe 2014).

While the profession itself is still in debate as to its identity, a cohesive marketing strategy will be difficult to implement. Nevertheless, if we are going to compete within the health workforce, providing and monitoring the effectiveness of information (marketing) regarding the scope of physiotherapy is essential. Our research explored the barriers and facilitators to attendance in people living in an area classified as high deprivation and which has a larger number of minority ethnic groups with the proportions of these ethnic groups higher than national proportions. We found the participants were uncertain as to the role of physiotherapy. Therefore, developing partnerships with ‘local’ Iwi and other ethnic groups, appropriate promotion within a high deprivation area and at large relevant cultural events, and the initiation or enhancement of collaborative practice particularly within primary health care may be required. Moreover, unless general practitioners and nurses working in primary healthcare in particular, endorse physiotherapy when referring patients, uncertainty of its purpose is likely to prevail (Doesburg 2012, Sheppard 1994). However, this would likely require the development of trust and respect, via interprofessional education at under and post-graduate level, with these professions “learning from, with and about each other to improve collaboration and the quality of care” (Centre for the Advancement of Interprofessional Education 2002).

The Health Centre was successful as the proportion of people in minority ethnic groups attending physiotherapy significantly improved (Perry et al 2015). The Health Centre operated within a strong collaborative practice ethos whereby patient pathways would be determined collaboratively and health professionals would not hesitate to seek advice outside their expertise for patients from others in the health team. Doesburg et al (2012) hypothesised that when the General Practitioners at the Health Centre personally introduced patients they intended to refer to the physiotherapist, they inherently endorsed physiotherapy, helping to make the initiative successful. While our data did

not find evidence to support the particular hypothesis that collaborative practice was a facilitator for attendance at the Health Centre, it likewise did not negate it.

It was evident from our research that physiotherapy was valued but could easily be replaced by other competing factors. Negative feedback primarily centred on: passive versus active treatment, what would happen in the session and what the treatment options were, and knowledge about the effectiveness of physiotherapy. These types of issues can arise due to a mismatch between expectations due to previous experiences (in New Zealand and overseas), culture, and health paradigms. Research in various health settings and in interactions with different health professionals has found, for example, that Māori men might prefer to “tough it out” (Williams et al 2003 p 75) rather than seek medical care (Williams et al 2003), and that Somalian people traditionally have cultural health beliefs related to authority and hierarchy of power where the health profession treats and cures (Gurnah et al 2011). In other cultures, a distrust of authority can affect attendance (Akter et al 2014) while in others, the need for treatment at all can cause shame and affect attendance (Winkley et al 2014). Furthermore, research by Akter et al (2014) and Listl et al (2014) has indicated people with a lower socioeconomic status tend to lead a more chaotic life, one where health is not valued or is deemed of little importance so that health care is not considered necessary.

Being aware of different health beliefs makes it easier to understand why some patients might not value physiotherapy or might be disappointed with the prescription of a home exercise programme. But these are not the only factors to consider. We know that over 1.5 million New Zealanders have poor health literacy (Ministry of Health 2010). A concerted effort to improve health literacy around the role of physiotherapy, especially in minority or migrant populations in New Zealand, might alter expectations, enable the worth or value of physiotherapy to be evaluated more critically, or allow for individuals to adopt co-existing health paradigms.

Convenience was found to be a factor for attendance (not non-attendance). Participants chose their preferred location by ease of parking, number of buses required and consequently cost, and duration of trip. These factors have previously been reported to strongly influence attendance within the health sector (Listl et al 2014, Mbada et al 2013, Winkley et al 2014) but not with respect to physiotherapy attendance in New Zealand.

This study did not find any strong feelings of discrimination or stigmatisation by the participants. Previous research has shown that individuals from different cultural or ethnic backgrounds, in addition to those living in lower socioeconomic areas, perceive that they are subjected to overt, intentional discrimination but also to subtle, perhaps unintentional or subconscious, discrimination (Bhatia and Wallace 2007, Chauhan et al 2010, Gurnah et al 2011, Terraza-Núñez et al 2010, Terry et al 2011, Williams and Jackson 2005). Language barriers have also been cited in the literature as a reason for health inequities, (Abdullahi et al 2009, Terraza-Núñez et al 2010), however this was not discussed as a reason for non-attendance in the current study. Indeed, once people attended physiotherapy, the relationship usually developed to an extent that participants felt they could repeatedly ask questions.

The patient provider relationship is dependent on the ability of patients and health providers to develop rapport. Positive relationships occur when health providers are culturally aware, make few preconceived assumptions about the patient they are treating, actively listen, and have an open attitude (Bhatia and Wallace 2007).

The ability to communicate effectively is Competency Four of the New Zealand Physiotherapy Registration Board's nine competencies (Physiotherapy Board of New Zealand 2009). Skills considered prerequisites to practice under this competency include elements such as “Identifying appropriate methods of communication”, “Identify[ing] the main/preferred language” and “Demonstrate[ing] empathy and respect” (Physiotherapy Board of New Zealand 2009). The participants' experiences provide positive evidence of this competency being widely demonstrated.

However, the right to dignity and respect, and being aware of others' health beliefs and incorporating these into management (Competencies Eight and Nine) may be inadvertently and subconsciously neglected. For example, privacy was identified as an important consideration by a female Iraqi participant. She preferred the clinic site because of the private room (versus curtained cubicles). International research has indicated that for some cultures or religious groups, exposure of the skin during assessment and treatment can make patients uncomfortable and affect attendance (Reitmanova and Gustafson 2008, Terry et al 2011). The use of a private room removed the perceived threat of other people listening in, lessened the threat of inadvertent exposure and made the patient feel safe.

Methodological considerations

Many factors contribute to inequalities of access to physiotherapy in New Zealand. Those from minority populations, from a lower socioeconomic group, and with low health literacy are usually at risk. This study deliberately recruited participants from a quintile 5 (high deprivation) area in New Zealand, known for its larger number of minority ethnic groups and with ethnic proportions of these groups higher than national proportions. The ethnicities of the participants recruited reflect this population and this is a strength of our research.

A number of methodological strategies were used to enhance the robustness of the results. An on-going iterative process was undertaken. Data analysis was initiated after the first interview to ensure that the nature and the phrasing of the questions elicited data which answered the research question. The experience gained from earlier interviews was used to improve the phrasing of questions to enhance participant understanding for subsequent interviews. The four primary questions remained the same. On-going analysis also meant that it was possible to determine that no new findings had emerged after the fifteenth, sixteenth and seventeenth interviews, and therefore no further interviews were conducted. Independent parallel coding of the results followed by discussion with reference back to the original transcripts to enhance interpretation occurred. Furthermore, discussion around the interpretation of the results occurred with physiotherapists involved in treating patients at both treatment locations. All participants were offered a summary of the results and asked to provide feedback. Finally, individual participants' data was used to support key findings.

We also used two sampling strategies to recruit the participants involved in this study. We initially employed purposeful sampling at two levels (Creswell 2007): site (geographical area of high deprivation) and at the participant level (those who had failed to attend one or more appointments). From within this pool, we then employed a systematic sampling approach. When no recurring pattern or order exists, as was the case in the data file used in our research, systematic sampling can be considered equivalent to random sampling (Portney and Watkins 2000). However, this method is susceptible to error or bias as natural periodicities can exist within the sampling frame and result in people with certain

characteristics being excluded or only certain people included (Hulley et al 2001). This is therefore a limitation of our research.

This study does not presume to be representative of any particular group of people's views. Furthermore, the interpretations presented here reflect the researchers' interpretations of the participants' reasons for (non-) attendance. All the researchers involved in this project have intimate experience of (non-) attending hospital appointments. Their experiences were either as a consumer of public health services and/or as a health professional in the public health system.

It can be difficult to illicit reasons for the non-attendance of any health service. People can be reluctant to confide as they fear the ramifications of information being disclosed (Milne et al 2014). The participants in this study did not initially recall missing any appointments. It was important that we maintained the participants' goodwill and co-operation and therefore we did not directly challenge participants' attendance beliefs. During recruitment participants were carefully briefed on the research aims with a phrase such as, "The physiotherapy team at Hutt Valley District Health Board are interested as to why people may not attend appointments. We would value your opinions on reasons why people might or might not choose to attend". Participants suggested that this was an important topic but did not directly relate the non-attendance specifically to themselves.

The interviews were not long in duration and this may be due to participants being reluctant to confide or to a language barrier. While none of the participants requested the translator service, English was a second language for nine of the participants. Despite the brevity of the interviews, reasons for missing appointments, in particular, became apparent.

Implications

Some of the barriers found in our research are relatively 'easy' to change. The addition of supported satellite physiotherapy clinics into areas of high socioeconomic deprivation removes the inconvenience and cost of travel. The use of an appointment reminder text message service may help to negate forgetfulness.

Other barriers to attendance are more complex. Ratima et al (2008) suggest that cultural competency is demonstrated by continual reflection of the influence of individual belief systems and values on clinical practice. Likewise, developing an awareness of other people's health paradigms and beliefs is an on-going process. Many hospitals have private rooms available for patients who are likely to require a more sensitive approach to the gathering of the history and/or a more intimate physical examination, for example people seeking help with incontinence. While therapist safety must also be a consideration, physiotherapists might wish to reflect further upon which patients are 'invited' to use a private room as others, for example those with particular religious beliefs, might value the privacy of these rooms for other equally valid reasons. Physiotherapists could also aim to minimise an individual's anxiety, due to a limited knowledge of the role of physiotherapy or mismatched expectations, by further developing their awareness of different health beliefs. However, enabling balanced value judgements about the value of physiotherapy by informing people, particularly individuals from minority groups, of the aims and benefits of physiotherapy and how these are achieved requires a cohesive marketing effort involving the physiotherapy profession supported by the wider healthcare system. A professional identity which is easily explained would facilitate this process.

CONCLUSIONS

In conclusion, participants believed that physiotherapy was beneficial. However, uncertainty regarding the aims of physiotherapy affected participants' ability to value its worth and

consequently affected attendance. A strong professional identity in conjunction with strategic marketing might improve health literacy and facilitate physiotherapy outpatient attendance.

KEY POINTS

- The addition of DHB funded musculoskeletal physiotherapy satellite clinics into areas of high socioeconomic deprivation removes the inconvenience and cost of travel and facilitates attendance.
- The development of a good rapport between the physiotherapist and the patient facilitated the confidence to ask questions.
- Patients with limited experience or knowledge of physiotherapy were nervous about attending physiotherapy.
- A mismatch between physiotherapist and patient expectations led to other activities being valued more than physiotherapy.
- A strong professional identity strategically marketed to minority ethnic groups and those living in areas classified as high deprivation may facilitate attendance.

PERMISSIONS

Ethics - Ethical approval was granted by the The University of Otago Ethics Committee (12/311) and from Hutt Valley District Health Board (HVDHB).

DISCLOSURES

The research was funded by a University of Otago Research grant (UORG).

I declare on behalf of myself and the other authors that we know of no competing interests (financial, professional or personal) which may be perceived to interfere with or bias any stage of the writing or publication process. This includes, but is not restricted to, any factors that may influence full and objective presentation of the article, peer review and editorial decisions.

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Rehabilitation post paediatric cardiac transplant: a case report

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ABSTRACT

The purpose of this case report is to present the outpatient cardiac transplant rehabilitation of a paediatric patient in New Zealand. Currently there is little evidence in the field of rehabilitation post paediatric cardiac transplant. After reviewing the literature and contacting internationally renowned centres, a novel rehabilitation programme was instigated at Starship Hospital (Auckland) for this cardiac transplant recipient (Jack), specific to his needs as a child. Outcomes measures that assessed aerobic capacity, balance, and strength were used to monitor progress. In addition, child appropriate assessments were conducted reviewing gross motor skills specific to both patient age and stage of development. This programme resulted in quantifiable improvements in outcomes across all areas, but more importantly allowed Jack to acquire new skills not present pre-transplant, that he could use in the playground.

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INTRODUCTION

Cardiac transplant is a long established treatment strategy for children with severe forms of congenital cardiac disease and cardiomyopathy (Conway and Dipchand 2010). December 2012 marked 25 years of heart transplantation in New Zealand (Auckland DHB 2012), with the first paediatric heart transplant in 2002 being performed on an eight-year old. On average, there is only one paediatric heart transplant per year compared with 10-14 per year in adults.

End stage heart disease has a significant effect on the body; specifically it can cause skeletal muscle myopathy (Quivers 2008). The myopathy does not immediately improve post-transplant as the presence of immunosuppressants, such as corticosteroids and cyclosporines, can further impair skeletal muscle (Biring et al 1998). Furthermore, exercise performance remains low in the paediatric cardiac transplant recipient when compared to their peers (Davis et al 2006). The etiology for this decreased exercise capacity is further compounded by reduced chronotropic responsiveness (Dipchand et al 2009) and reduced cardiac output (Pastore et al 2001). There is an emerging body of evidence that supports the implementation of cardiac rehabilitation post-cardiac transplant to improve exercise capacity (Deliva et al 2012, Patel et al 2008). An editorial by Pahl (2012) unequivocally supports supervised exercise programmes post-transplant and recommends annual graded exercise testing and revision of exercise prescription as needed.

Cardiac rehabilitation post-transplant is an established treatment (Constanzo et al 2010). There is a plethora of research supporting post-transplant rehabilitation in adults. Current literature supports the implementation of rehabilitation post-cardiac transplant for paediatric recipients (Banks 2012, Chui 2012, Fricker 2002, Pahl 2000, Pahl 2012, Quivers 2008), however there have been only two studies (Deliva 2012, Patel 2008) that have looked at the impact of paediatric-specific rehabilitation programmes. This case report highlights the clinical complexities of implementing such a rehabilitation programme in the post-cardiac transplant paediatric population.

CASE REPORT

History

A six-year-old boy (for the purposes of anonymity, here referred to as "Jack") with a history of complex congenital cardiac disease underwent a successful cardiac transplant at Starship Hospital (Auckland, New Zealand). He was extubated day three post-operatively and reviewed by a physiotherapist for airway clearance and early mobility. Jack made excellent progress post-operatively and was discharged 12 days following transplant. Traditionally cardiac rehabilitation post-transplant has been conducted by the adult physiotherapy department at Greenlane Hospital, however due to Jack's age and size, his post-transplant rehabilitation was completed at the physiotherapy department at Starship Children's Hospital (Auckland, New Zealand).

Baseline Physiotherapy Assessment

Prior to discharge from hospital, Jack was able to mobilise over 100m independently, climb a small flight of stairs with the use of a handrail, and wash, dress and feed himself unaided.

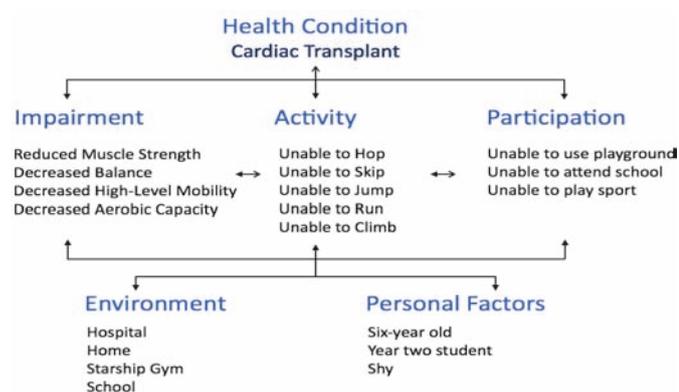
Based on observations from the family and information gathered by the Movement Assessment Battery for Children (Movement ABC) checklist (Henderson and Sudgen 1992), Jack's main difficulties were identified. The Movement ABC checklist comprises five sections related to the child either stationary or moving in an environment that is either stable or changing. It also takes into account behavioural problems related to motor difficulties. Items are individually assessed to provide a total score of 40, with a high score indicating a high level of difficulty. Each child is asked to complete 8 tasks in the areas of manual dexterity, ball skills, and static and dynamic balance. The scores from each of the areas are then added to come up with a total score. A total score is converted to a percentile. Scores less than the 5th percentile indicate a definite motor problem, and scores between the 5th and 15th percentiles indicate a borderline problem. Any score greater than the 15th percentile indicates that movement skills are within normal limits for the child's age.

Age appropriate activities for a typically developing six-year-old include sitting to stand from a low seat, getting on and

off the floor, kneeling and half kneeling, running, jumping, skipping, hopping and ball skills. Jack had difficulty with all of these and more. His main difficulties were with gross motor tasks including jumping over obstacles, using fixed apparatus such as a climbing frame, and running to catch an approaching ball. The Movement ABC checklist also identified that Jack was timid or fearful of more challenging activities leading to an underestimation of his own ability. It is important to note here that Jack had never had the opportunity to learn many of these activities due to his physical condition pre-transplant. Unfortunately due to Jack's health at the time, his ability to perform gross motor skills was not able to be formally assessed prior to transplant.

The International Classification of Functioning, Disability and Health model (ICF) was utilised to define Jack's ability and participation within the context of his environment (WHO 2002). Consideration of Jack as an individual and the influences of his health condition were also explored (see Figure 1).

Figure 1: Defining Jack's abilities and participation within the context of his environment (using the International Classification of Functioning, Disability and Health model)



Outcome Measures

Jack was assessed with several outcome measures prior to the programme, at the end of the programme, and at a six-week post programme follow up appointment. In addition to the Movement ABC (described above), several outcome measures were used to establish Jack's strength, balance, high-level mobility, and exercise capacity.

Manual Muscle Testing (Clarkson et al 2000) was used to measure strength; it has been validated for use in both a paediatric and an adult population (Rider et al 2010). For balance, the Paediatric Balance Scale (Franjoine et al 2003) and the HiMat (Williams 2006) were used. The Paediatric Balance Scale has been adapted from the adult version, the Berg Balance, and found to be a valid and reliable method of assessing balance in children. The HiMat is a dynamic balance and high-level mobility assessment tool which assesses walking forwards and backwards, running over an obstacle, bounding, and mobilising up and down stairs.

The six minute walk test (6MWT) (American Thoracic Society 2002) and then subsequently the incremental shuttle walk test (ISWT) (Singh 1992) were used to assess exercise capacity. The 6MWT has been shown to be a valid and reliable measure

of exercise capacity in children (Geiger 2007, Li 2005, Moalla 2005). As Jack was unmotivated by the 6MWT, the 12-point ISWT was used. The ISWT has been shown to be a safe and valid measure for peak VO_2 in the paediatric cardiac population (Lewis 2001). The ISWT is a symptom-limited maximal test that is externally paced and has incremental increases in speed. The test allows for running which the 6MWT does not. Both the 6MWT and ISWT have been validated in the paediatric population (Bartels et al 2013, Selvadurai et al 2003).

Treatment

To decide on the optimal type of physiotherapy programme to provide for Jack, the literature was searched. The current available paediatric literature tends to examine exercise capacity and cardiopulmonary function rather than describe specific protocols or guidelines for rehabilitation post-transplant. Two studies have assessed post paediatric cardiac transplant rehabilitation programmes (Deliva et al 2012, Patel et al 2008). Both studies demonstrated improvements in aerobic fitness and strength after either home based or hospital attended rehabilitation programmes, but failed to provide specific guidance.

As the literature was found to be emergent and sparse in this area, three overseas centres recognised for their clinical excellence in the field of paediatric transplant rehabilitation were contacted for advice. Toronto Sick Kids in Canada, the Royal Children's Hospital in Australia, and the Great Ormond Street Hospital in the United Kingdom were approached. All three centres responded providing advice, protocols and guidelines. The hospitals' programmes ranged in duration from 8 to 12 weeks with 3-4 gym sessions per week plus a home exercise programme. Gym sessions consisted of aerobic and strength training in older children (>6 years) and gross motor activities for younger children (< 6 years). The advice from Toronto Sick Kids was based on the findings of their published paper (Deliva et al 2012) which demonstrated improved health related fitness in children post cardiac transplant. In addition to their advice, each centre was further contacted to complete a benchmark questionnaire, designed by the author, to establish basic demographic data for their patient groups along with specific information regarding outcome measures and intervention frequency, intensity, time and type.

From this literature search and the recommendations received from overseas centres, we were able to formulate an evidence informed rehabilitation regime for Jack. Jack attended the gym for three one hour sessions per week for 12 weeks. The format of these sessions consisted of a warm up, functional and impairment based activities, aerobic activities and then a cool down. The warm up, cool down and other activities used changed at every treatment. Because Jack is a six-year-old boy, these sessions were individualised to his interests, ensuring maximal participation and effort.

The programme first addressed Jack's specific body structure and functional limitations, namely, muscle strengthening, and improving exercise capacity and balance. Subsequent treatment focused more on Jack's goals. To facilitate Jack's engagement with the programme, exercise activities were chosen that were fun and functional. For example, skittles were played in varying positions, such as half kneeling, kneeling or standing, and an obstacle course was used, choosing obstacles that promoted

strength, gross motor function and balance. The Nintendo Wii® (Nintendo, Redmond, Washington) was used as a warm-up activity. Other activities included “shuttles”, “bear walks”, “crab crawls”, or “bunny hops”. “Wheelbarrow” exercises were used for improving upper limb strength and aerobic fitness, and “hopscotch” for working on the power capacity of his muscles and improving skill based hopping.

Any activity completed in the gym was then added to Jack’s home exercise programme. Jack completed his home exercise programme on the days he was not in the gym, with rest days typically on the weekend or whenever his parents felt he required them. Jack’s home exercise programme incorporated four to five activities which were updated and progressed weekly. Of note, the whole family ended up completing the exercises including Jack’s parents and grandparents.

In addition to improving his previous learnt activities and skills, other age appropriate skills that Jack had previously never been able to do, such as hopping, skipping and jumping, were taught and progressed appropriately.

RESULTS

Results from the three measurement time points for the Manual Muscle Testing, Paediatric Balance Scale, the HiMat, 6MWT and ISWT are shown in Table 1.

Table 1: Results of the strength, balance and exercise capacity tests

| Measurement | Start of Programme | End of Programme | 6 week follow-up |
|--------------------------------|--------------------|------------------|------------------|
| Manual Muscle Test (/5) | 3 UL, 4 LL | 5 UL & LL | 5 UL & LL |
| Paediatric Balance Scale (/56) | 52 | 56 | 56 |
| HiMat (/54) | 17 | 20 | 27 |
| 6MWT | 310m | NC | NC |
| ISWT | 410m | 530m | 660m |
| (approximate speed) | (1.52 m/s) | (1.69 m/s) | (1.86 m/s) |

Note: UL, upper limb; LL, lower limb; NC, not completed; 6MWT, six minute walk test; ISWT, incremental shuttle walk test

At the start of the programme Jack had a total Movement ABC score of 18.6 (out of 40) and was ranked on the 1st percentile. At the end of the programme Jack’s total Movement ABC score had reduced to 6 and he was ranked on the 36th percentile. At follow-up six weeks later, Jack had a total score of 4.5, placing him on the 49th percentile.

Jack demonstrated significant improvement in both his body structure and function limitations and in his activity limitations. At his six week follow-up appointment, his mother commented on his teacher’s report, saying he was constantly ‘on the go’ and able to keep up with his peers both in physical education sessions and on the playground. Further formal rehabilitation and assessment were deemed unnecessary and his family was encouraged to make contact with Starship Therapy if there were concerns with his development or exercise capacity in the future.

DISCUSSION

Jack made good recovery post cardiac surgery. Not only did his measures of strength, balance and exercise capacity improve, but at his six week follow up appointment Jack was assessed as having gross motor skills on the 49th percentile for well, typically developing six-year-olds. He was able to participate in physical education at school as well as engage with other children on the playground.

The literature is sparse in this area so it is difficult to compare Jack’s results to those published previously. Both Deliva 2012 and Patel 2008 compared strength, flexibility and exercise tolerance pre- and post-intervention in children receiving cardiac or lung transplants, however Jack only just fits within the demographics of patients studied (Deliva: 6-16, Patel: 7-18). Furthermore, each study used different assessments to measure these outcomes. Deliva (2012) used the 6-minute walk test, dynamometry and goniometry, whilst Patel (2008) used the standard Bruce protocol and dynamometry. Neither dynamometry nor goniometry was felt to be clinically relevant for Jack because they were not a functional measure of his ability. The standard Bruce protocol was not used as this would have to be performed in a specialised unit and was thus not clinically available. The 6-minute walk test (as per Deliva (2012)) was only used once post-operatively because Jack found it too easy and refused further assessment. Subsequently the incremental shuttle walk test was used as a measure of exercise tolerance. Therefore, it is difficult to compare Jack’s results with the published literature. However both Deliva (2012) and Patel (2008) demonstrated significant increases in overall exercise tolerance post- intervention, which was in line with Jack’s results.

Due to the small number of paediatric cardiac transplants performed in New Zealand, recipients have historically received their post-operative outpatient rehabilitation via the adult service. However, due to Jack’s age, stage of development and size it was felt that age related rehabilitation in a child friendly environment would benefit him. Therefore the case was put forward for Jack to receive his rehabilitation at Starship Hospital. As there was little published evidence to then guide paediatric post-operative rehabilitation, contacting other internationally prominent paediatric centres to gather information related to their rehabilitation programmes became the next step in ensuring that the programme developed for Jack was as evidence informed as it could be.

CONCLUSION

This case report highlights the need for evidence informed practice to achieve optimum patient care. Favourable outcomes were achieved in this case from conducting a post-operative rehabilitation programme based on the best available evidence in conjunction with expert advice from internationally renowned centres. This case report lends to the growing evidence of the importance of treating the paediatric transplant recipient using a child appropriate programme and environment.

KEY POINTS

- Rehabilitation post paediatric cardiac transplant results in improved exercise capacity, strength, balance and gross motor skill acquisition.
- Where literature is emergent and thus insufficient to guide practice, benchmarking with internationally renowned centres helps to inform practice.
- Post paediatric cardiac transplant rehabilitation programmes should be age and environment appropriate.

ADDRESS FOR CORRESPONDENCE

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Immediate effects of sensory discrimination for chronic low back pain: a case series

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ABSTRACT

Can a brief tactile intervention associated with brain remapping improve pain and spinal movement in patients with chronic low back pain? A convenience sample of patients with chronic low back pain completed various pre-intervention measurements including low back pain (Numeric Pain Rating Scale), fear-avoidance (Fear Avoidance Beliefs Questionnaire), disability (Oswestry Disability Index) and spinal flexion (fingertip-to-floor). A 5-minute localisation of tactile stimuli treatment was administered to the low back, followed by immediate post-intervention measurement of pain and spinal flexion. Sixteen patients (female = 12; mean age 48.2 years) with chronic low back pain (median duration 10 years) presented with a mean low back pain of 5.56 out of 10, moderate disability (mean Oswestry Disability Index 34.38%) and high fear-avoidance associated with physical activity (average 17.25). Immediately following treatment, the group's mean pain rating for low back pain decreased by 1.91, while forward flexion improved by 4.82 cm. The results from the case series indicate that following a brief tactile discrimination intervention, patients with chronic low back pain exceeded minimal detectable change for forward flexion. Being able to improve movement, without using physical movement, may provide an added benefit for patients with chronic low back pain afraid to move.

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Key Words: Chronic lumbar pain, Sensory, Brain, Tactile, Pre-habilitation

INTRODUCTION

Various epidemiological studies have shown an increase in the prevalence of chronic low back pain (CLBP) (Goldberg and McGee 2011, Johannes et al 2010, Parthan et al 2006, van Hecke et al 2013). Current best-evidence suggests a combination of education, movement and pharmacological agents is effective in decreasing pain and disability in chronic musculoskeletal conditions, including CLBP (Busch et al 2007, Ferreira et al 2007, Goldenberg 2009, Mistiaen et al 2012, Nijs et al 2010). Therapeutically, in recent years increased activity in the field of education has culminated in the increased utilisation of, and evidence for, pain neuroscience education (Louw et al 2011, Louw et al 2014, Moseley et al 2004, Moseley 2002). In line with current best-evidence treatments utilising movement, such as aerobic exercise, are being proposed to treat patients with CLBP (Ferreira et al 2007, Mistiaen et al 2012, Nijs et al 2012). It is proposed that these treatments help patients with pain by enhancing various endogenous mechanisms (Bialosky et al 2009a, Bialosky et al 2009b, Nijs et al 2012).

The correlation between pain, range-of-motion (ROM) and function is not well understood (Moseley 2004a). It has been

shown that limited spinal movement is correlated to decreased function, with the American Medical Association (AMA) viewing loss of spinal ROM as an impairment and used for disability ratings (Archer et al 2014, Nijs et al 2013, Vlaeyen et al 1995). This loss of spinal ROM has thus become the target of various therapeutic interventions, especially in chronic pain as a means to decrease disability (Archer et al 2014, Nijs et al 2013, Vlaeyen et al 1995). One such treatment may be the reduction of pain (Moseley 2004a). Pain intensity however has shown very little correlation to fear of movement, thus questioning strategies to ease pain intensity (Vlaeyen et al 1995). Despite the limited evidence for a reduction in pain intensity improving ROM, various authors have tested treatments aimed at reducing pain issues such as pain intensity, pain-related fear and cognitions of pain to assess its effect on movements (Daly and Bialocerkowski 2009, Louw et al 2011). For example, pain neuroscience education has shown an immediate clinically meaningful improvement in spinal movements including spinal flexion, straight leg raise and cervical extension in chronic whiplash associated disorders (Moseley 2004a, Moseley et al 2004, Van Oosterwijck et al 2011). For low back patients, spinal flexion is often seen as a particularly fearful movement and often

associated with pain (Barrett et al 1999, George et al 2009, Schnebel et al 1989). This poor understanding of pain and limited ROM leaves spinal patients and clinicians in a precarious position since it is well established patients with CLBP display all three of these elements of limited ROM, high levels of pain and decreased function (Angst et al 2006, Louw et al 2011, Moseley 2004b). Adding to the complexity, emerging advances in neuroscience and brain imaging studies have shown that decreased movement of the lumbar spine leads to functional changes in the brain (Flor et al 1997, Wand et al 2011). It is well established that the physical body of a person is represented in the brain by a network of neurons, often referred to as a representation of that particular body part in the brain (Flor 2000, Penfield and Boldrey 1937, Stavrinou et al 2007, Wand et al 2011). This representation refers to the pattern of activity that is evoked when a particular body part is stimulated. The most famous area of the brain associated with representation is the primary somatosensory cortex (S1) (Flor 2000, Penfield and Boldrey 1937, Stavrinou et al 2007, Wand et al 2011). From a physiotherapy perspective it is important to understand that these neuronal representations of body parts are dynamically maintained (Flor et al 1997, Flor et al 1998, Lotze and Moseley 2007, Maihofner et al 2003, Moseley 2005a, Moseley 2008). It has been shown that patients with pain display different S1 representations than people with no pain (Flor et al 1997, Flor et al 1998, Lotze and Moseley 2007, Maihofner et al 2003, Moseley 2005a, Moseley 2008). The interesting phenomenon associated with cortical restructuring is the fact that the body maps expand or contract, in essence increasing or decreasing the body map representation in the brain. Various authors have drawn a correlation between the changes in shape and size of body maps and increased pain and disability (Flor et al 1997, Lloyd et al 2008). Although various factors have been linked to the development of this altered cortical representation of body maps in S1, it is believed that issues such as neglect and decreased use of the painful body part (Marinus et al 2011) may be a significant source of the altering of body maps (Beggs et al 2010, Flor et al 1997). Various authors have postulated that a vicious cycle may emerge between decreased movement, cortical reorganisation and increased pain (Flor 2000, Moseley et al 2012b).

Based on these neuroplastic changes, physiotherapy has focused on strategies to help normalise these altered cortical representations of body maps. One approach is graded motor imagery (GMI) (Bowering et al 2013, Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006). GMI is a collective term describing various "brain exercises" including normalising laterality (left/right discrimination of body parts), motor imagery (visualisation), mirror therapy, sensory discrimination, sensory integration and graphaesthesia (Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006). Various studies have shown that these GMI strategies are able to positively influence pain and movement (Bowering et al 2013, Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006), however in line with CLBP, the correlation remains poorly understood. Most research, however, has focused on Complex Regional Pain Syndrome (CRPS) of the extremities with little information on its potential to help patients with CLBP (Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006).

This case series aimed to further explore the relationship between pain intensity and movement. The main goal was to determine if patients with CLBP who received tactile acuity training to their lower back in the absence of movement, experience any advantageous therapeutic effect in regards to pain intensity and/or spinal flexion.

METHODS

Patients

A convenience sample of patients with CLBP currently attending physiotherapy for rehabilitation was invited to participate in the study. Four patients from each of four physiotherapy clinics in a large metropolitan area were recruited for the study. Internal review board (IRB)/Ethics approval was obtained. Upon obtaining informed consent, patient demographic data were collected. Patient intake forms, including medical history, were reviewed for any items thought to predict a higher risk of serious pathology and warrant referral for further diagnostic testing, making patients ineligible for the study. Patients were excluded if they could not read or understand the English language, were under age 18 (minor), had undergone spinal surgery, had any skin or medical condition preventing them from receiving tactile stimuli on the lower back or had specific movement-based precautions, e.g. no active spinal flexion. Patients had to present with back pain and patients presenting with leg pain only, or neurological deficit only in the lower extremity were additionally excluded.

Measurements

Patients were asked to complete various outcome measures prior to treatment intervention:

Pain: Low back pain at rest was measured using a Numeric Pain Rating Scale (NPRS), as it is commonly used in various spinal pain studies (Moseley 2003, Moseley 2005b, Moseley 2002). The minimal detectable change (MDC) for the NPRS is reported to be 2.1 (Cleland et al 2008a).

Function: Perceived disability was measured using the Oswestry Disability Index (ODI) which has good evidence for its reliability and validity as a measure of functional limitations related to LBP (Deyo et al 1998, Fritz and Irrgang 2001, Hakkinen et al 2007). A change of 5 points (10%) has been proposed as the MDC (Ostelo et al 2008).

Fear avoidance (Fear Avoidance Beliefs Questionnaire [FABQ]): The FABQ is a 16-item questionnaire that was designed to quantify fear and avoidance beliefs in individuals with LBP. The FABQ has two subscales: 1) a 7-item scale to measure fear-avoidance beliefs about work, and 2) a 4-item scale to measure fear avoidance beliefs about physical activity. Each item is scored from 0 to 6 with possible scores ranging between 0 and 24 and 0 and 42 for the physical activity and work sub-scales respectively, with higher scores representing an increase in fear-avoidance beliefs. The FABQ has demonstrated acceptable levels of reliability and validity in previous LBP studies (Cleland et al 2008b, Grotle et al 2006, Poiraudou et al 2006). Presence of avoidance behavior is associated with increased risk of prolonged disability and work loss. It is proposed that FABQ-W scores >34 and FABQ-PA >14 are associated with a higher likelihood of not returning to work (Burton et al 1999, Fritz and George 2002).

Lumbar flexion: Active trunk forward flexion, measured from the longest finger on the dominant hand to the floor (Moseley 2004a, Moseley et al 2004, Zimney et al 2014). This method was chosen as it is commonly used in pain science studies (Louw et al 2012, Moseley 2004a, Moseley et al 2004, Zimney et al 2014). MDC for active trunk forward flexion utilising this method has been reported as 4.5 cm (Ekedahl et al 2012).

Immediately following the treatment intervention, low back pain (NRS) and lumbar flexion were re-measured to determine the immediate therapeutic effect of the proposed intervention. Pre- and post-treatment measurements were performed by the therapists who provided the GMI interventions (LW, JU, KM and MW). Upon completion of the trial (pre-tests, tactile stimulation and post-test), the attending therapists continued with their usual therapy treatments based on their current plan of care.

Intervention

Various strategies have been proposed to help patients develop an increased acuity of faulty body maps, including two-point discrimination, graphaesthesia and sensory discrimination (Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006, Moseley et al 2008b). For this study, based on previous CLBP research (Luomajoki and Moseley 2011, Wand et al 2011) it was decided to use localisation of tactile stimuli. Prior to localisation, patients were provided with an explanation of the proposed treatment and aim of the study. They were shown a picture of the brain map (homunculus) and taught how, when people are in pain, the map becomes “less sharp” since it’s not being moved and it is believed that when the map is sharpened, it may help reduce their pain. By touching the back in various areas and sharpening their attention to where they were being touched with a pen, the therapy would aim to “sharpen” the map. Patients were treated in a private treatment room; their backs were exposed and they were seated in a comfortable position, allowing access to the lower back. A 9-block grid was designed and shown on a body chart to the patient. Corresponding with the patient viewing the body chart and 9-block grid, the patient was taught via tactile stimulus with the back of a pen where each block was in relation to their lower back, thus familiarizing them with the 9-block grid (Figure 1) (Luomajoki and Moseley 2011, Wand et al 2011). Subsequently, the therapist randomly stimulated the 9-blocks asking for continuous verbal feedback as to the location of the stimulus; this was done for 5 minutes in total. With a correct identification of the area, the therapist proceeded to the next block for identification. In the event of an incorrect answer, the area was re-stimulated and the therapists would teach the patient which grid was touched, in essence helping the patient develop a greater ability to identify the stimulated grid. The stimulation of the grids was at random and decided upon per discretion of the clinicians. Forward flexion and low back pain were assessed immediately after the intervention.

RESULTS

Patients

This case series comprises data from 16 patients (12 female; mean age 48.2 years) attending outpatient physiotherapy for CLBP (median duration 10 years; range 6 months – 30 years), mean LBP 5.56 out of 10 on a NPRS, moderate disability (mean ODI 34.38%) and high fear-avoidance associated with physical activity (mean 17.25). Patient demographics can be found in Table 1.

Figure 1: Localisation treatment grid

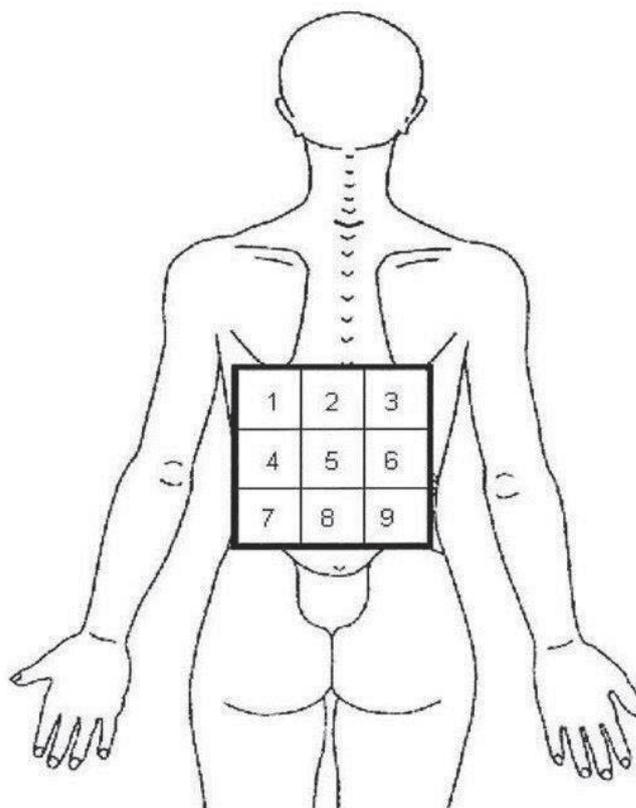


Table 1: Case series patient demographics

| Variables | Results |
|------------------------------|--|
| Age (years) | 48.19 (range 20.7 – 71.7) |
| Females (n = 12) | 75% |
| Height (meters) | 1.73 |
| Weight (kilograms) | 88.85 |
| Body Mass Index (BMI) | 30.63 |
| Duration of symptoms (years) | Mean 11.9 (range 6 months – 30 years) Median 10.0 |
| FABQ – Physical Activity | 17.25 |
| FABQ – Work | 18.38 |
| ODI | 34.38% |
| NPRS low back | 5.56 |
| Flexion (cm) | 25.73 |

Post-treatment Measurements

The immediate changes in NRS for LBP and forward flexion for each patient can be found in Figures 2 and 3. Immediately following treatment, the mean pain rating for LBP decreased by 1.91 (range 0-6), while forward flexion improved by a mean of 4.82cm (range -1 to 21).

DISCUSSION

The results from this case series show that a treatment devoid of physical movement and associated with cortical reorganisation immediately increased lumbar flexion for patients with CLBP. Movement is key in the recovery of patients with CLBP (Bray and Moseley 2011, Moseley et al 2012b). Apart from limited

Figure 2: NPRS of LBP before and after treatment. (*) indicates patients who obtained a MDC

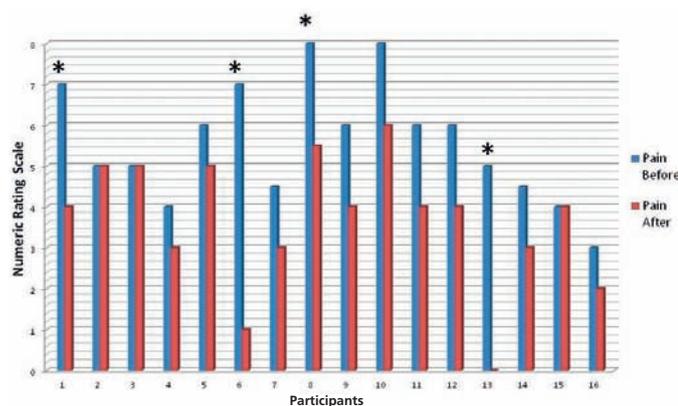
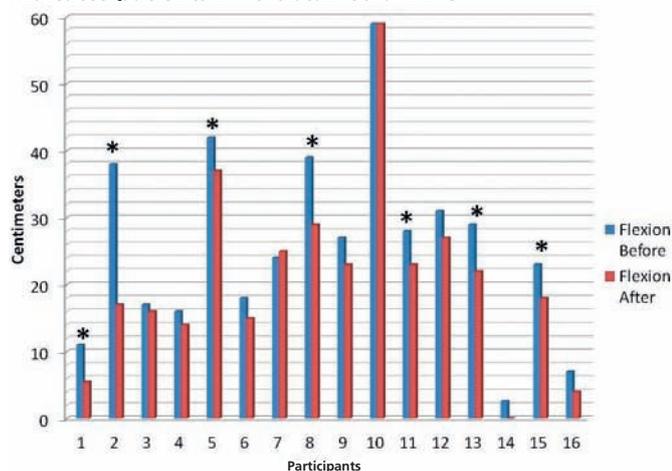


Figure 3: Lumbar flexion before and after treatment. (*) indicates patients who obtained a MDC



spinal movement being correlated to decreased function (Archer et al 2014, Nijs et al 2013, Vlaeyen et al 1995), therapeutic treatments associated with a hypoalgesic effect (aerobic exercise; manual therapy) require movement (George et al 2006, Nijs et al 2012, Vicenzino et al 1998). In some patients with CLBP, however, movement based strategies such as exercise and manual therapy in themselves may pose a threat (Louw et al 2012). If patients correlate movement to pain and vice versa, clinicians are faced with a clinical dilemma (Moseley 2007, Moseley et al 2008a). Various authors, however, have proposed a series of techniques prior to physical rehabilitation (pre-habilitation) to prepare the affected body part for rehabilitation, including visualisation, left/right discrimination and graphaesthesia (Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006, Moseley et al 2008b). It is believed that these strategies access the premotor cortex and in essence, facilitate preparation for and execution of motor cortex activation (movement) (Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006, Moseley et al 2008b, Tsao et al 2008, Tsao and Hodges 2007). The treatment provided in this case series, albeit a brief intervention, resulted in a MDC in forward flexion, similar to pain science education studies aimed at altering pain cognitions (Moseley 2004a, Moseley et al 2004, Stavrinou et al 2007). Furthermore, the findings of this case series concur with CRPS studies utilising various tactile interventions (localisation

and two-point discrimination) aimed at cortical reorganisation of affected body maps to help ease pain and disability and improve movement (Daly and Bialocerkowski 2009, Moseley 2004b, Moseley 2006, Moseley et al 2008b).

To the best of our knowledge, to date, this is the first study utilising this approach in a CLBP population. The ability to improve movement, without physical movement, especially in the early phase of rehabilitation, is important. This pre-habilitation reorganisation of an affected body map may be especially important for the more severely afflicted patients with CLBP. Pain, limited movement and function are often closely associated with high levels of fear-avoidance, which has been shown to be a significant predictor of disability and especially of an inability to return to work (Burton et al 1999, Fritz and George 2002), Louw et al 2011, Moseley 2004b). In this case series, the patients presented with a median CLBP duration of 10 years and a mean FABQ-PA score of 17.25, well over the threshold associated with a higher likelihood of not returning to work (Burton et al 1999, Fritz and George 2002). By not engaging in painful and/or fearful therapeutic movements and utilising treatments that provide an immediate positive effect on pain and movement, it may indeed facilitate a faster recovery. Future studies will need to explore if this immediate change in pain and spinal movement leads to an expedited return to function.

The case series failed to provide an overall MDC of pain ratings in patients with CLBP (1.91 versus 2.1). Care should be taken in regards to the interpretation of pain ratings in a case series with eight patients failing to produce a MDC for pain. In line with the search for the association of pain, limited ROM and function, four patients, however, did obtain such positive changes. Apart from collectively being close to MDC, it is worthy to highlight the fact that the intervention was brief (5 minutes) and only utilized one of the proposed GMI techniques ("localization"). In a clinical setting it has been proposed and taught that patients with chronic pain, including CLBP, should receive a more comprehensive GMI approach, in addition to pain science education (Moseley et al 2012a). Pain science education alone has shown immediate improvements to physical movements such as spinal flexion (Moseley 2004a, Moseley et al 2004, Stavrinou et al 2007). The pain reduction in this case series warrants further investigation into the clinical application of a GMI programme with/without pain science education in patients with CLBP.

This case series has limitations. First, by its nature, a case series does not offer a control group for comparison and the design did not allow patients to serve as their own controls. Second, the intervention was chosen arbitrarily based on previous studies, and no attempt was made to determine if such impairments were in place and in need of intervention. Additionally, no attempt was made to examine if accuracy of localisation did occur, and if it correlated to improved movement and/or reduced low back pain. The fact that the pre-tests, post-tests and treatments were performed by the same treating clinicians infer bias which cannot be ignored in the interpretation of the findings.

CONCLUSION

A brief intervention helping patients with CLBP identify the location of tactile stimuli in their lower back led to immediate changes in forward flexion. This case series provides preliminary evidence

warranting larger controlled trials of GMI for patients with CLBP or LBP in general, and whether specific sub-groupings need to be considered. Finally, the results provide a potential for clinicians to impact movement for patients with CLBP prior to a movement-based approach such as exercise and/or manual therapy.

KEY POINTS

- Treatments involving movement may increase fear and pain-related fear in patients with chronic low back pain.
- Decreased localisation of tactile stimuli is associated with chronic pain and may impact movement itself.
- Strategies aimed at improving tactile stimulus localisation may help decrease pain and improve movement.
- Cortical reorganisation strategies may provide a prehabilitation strategy to enhance movement without movement.

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PERMISSIONS

Ethics

This study was approved by the Internal Review Board (IRB)/Ethics at Southwest Baptist University. Patients provided written and verbal consent to participate in the study.

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This study won the ML Roberts prize awarded for the best 4th year undergraduate research project at the Department of Physiotherapy, Auckland University of Technology in 2014. NZJP publishes the resulting paper without external peer review.

Do hydrotherapy exercise programmes improve exercise tolerance and quality of life in patients with chronic heart failure? A systematic review

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ABSTRACT

The purpose of this study was to evaluate whether hydrotherapy programmes improve exercise tolerance and quality of life in patients with chronic heart failure. Data sources utilised were EBSCO, Scopus, Medline, PubMed, OVID, Proquest, PEDro and Cochrane Systematic Reviews databases. A systematic review of randomised controlled trials or quasi randomised controlled trials investigated hydrotherapy compared with a suitable control. Methodological quality was assessed using a modified version of the Downs and Black critical appraisal tool. Findings demonstrated that hydrotherapy was well tolerated with few adverse events reported. Two studies demonstrated hydrotherapy intervention groups significantly improved 6MWT from baseline ($p \leq 0.05$), while two studies found significantly greater improvements when compared to non-exercising ($p = 0.01$) and land based exercising ($p = 0.001$) controls. Four studies found significant gains ($p \leq 0.05$) in VO_2 peak from baseline following hydrotherapy interventions. Two studies reported significant ($p = 0.01$) intragroup improvements in total score of the Minnesota Living with Heart Failure Questionnaire in hydrotherapy intervention groups when compared with baseline and a non-exercising control respectively. In conclusion, hydrotherapy exercise programmes were well tolerated and appear to improve exercise capacity and quality of life in people with chronic heart failure but firm conclusions could not be drawn due to the poor to moderate quality of the evidence.

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INTRODUCTION

Chronic heart failure (CHF) is an inability of the heart to deliver adequate oxygen to metabolising tissues (NZ Heart Foundation 2009). This occurs as a result of changes in cardiac structure and/or function, and is most commonly caused by coronary artery disease (including myocardial infarction), valvular disease and cardiac myopathy (Carvalho and Guimaraes 2010). This has implications for patient function, as any increase in oxygen demand that occurs with an increase in activity may not be met. As a result, people with CHF often experience an increase in symptoms of breathlessness and fatigue and a resultant reduction in exercise tolerance and quality of life (Somaratne et al 2009). While there is no single diagnostic test for CHF, the New York Heart Association (NYHA) scale classifies the progression of CHF based on a patient's symptomatic status and exercise capacity (Yancy et al 2013). The stages range from stage 1 (No limitation of physical activity) through to stage 4 (Unable to carry out any physical activity without symptoms of HF or symptoms of HF at rest) (American Heart Association 2014). Exercise-based rehabilitation improves symptoms of CHF by improving peripheral haemodynamic and physiological efficiency, thus reducing cardiovascular demands (Piepoli et al 2010). Cardiac rehabilitation

programmes have been shown to reduce disease affected life years and hospital admissions in patients with CHF (Taylor et al 2014). As such, exercise based cardiac rehabilitation programmes have proven benefits on personal and likely economic levels.

Cardiovascular disease has been identified as a health priority in New Zealand, due to its significant burden on the annual healthcare budget (NZ Heart Foundation 2009). In New Zealand, there are more than five thousand patients living with CHF, resulting in 12,000 hospitalisations per year. As a result, CHF accounts for approximately 2% of total health care expenditure each year (NZ Heart Foundation 2009). Treatment of CHF typically includes a combination of pharmaceutical management and physical rehabilitation (Mant et al 2011). CHF is prevalent in the older population (Go et al 2013), with this demographic exhibiting a high proportion of physical comorbidities (Wong et al 2011). This may present challenges for medical management, and barriers to land-based exercise interventions. As such, alternative modes of exercise, such as hydrotherapy, may be useful in overcoming such barriers to land-based programmes.

Hydrotherapy has been used since the early Greco-Roman era as a treatment for ailments and illness (Bender et al 2005). In modern times, hydrotherapy has been shown to be useful in improving functional outcomes for patients with chronic neurologic and musculoskeletal conditions, including osteoarthritis (Kamioka et al 2010). However, the literature surrounding hydrotherapy for cardiac conditions is still in its infancy. To the authors' knowledge, at the time of undertaking this review, the evidence for hydrotherapy as an alternative form of exercise for patients with CHF had not been reviewed. Therefore, the aim of this study was to systematically review the literature to determine the effects of hydrotherapy programmes on exercise tolerance and quality of life in patients with CHF.

METHODS

A systematic review of the literature to ascertain the efficacy of aquatic-based exercise on exercise tolerance and health related quality of life (HRQOL) was undertaken. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was utilised in undertaking this systematic review. The PRISMA guideline was developed to improve standards of reporting meta-analyses and systematic reviews (Moher et al 2010). Undertaking a meta analysis of the data was deemed beyond the scope of this project.

Data sources and search strategy

The electronic databases of EBSCO, Scopus, Medline, PubMed, OVID, Proquest, PEDro and Cochrane Systematic Reviews were searched over a period from March 2014 to April 2014. These databases were chosen based on their inclusion of allied health and medical journals, and those that contain studies relevant to exercise-based rehabilitation. The search terms included "hydrotherapy", "immersion therapy", "aquatic exercise" and for the intervention including "heart failure". A full keyword search strategy has been included in Appendix A.

Inclusion criteria

Studies were eligible for inclusion if they were randomised controlled trials or quasi-experimental trials comparing a water-based exercise programme to a suitable control. To be eligible for inclusion, studies must have examined the effect of water-based activity on exercise tolerance and HRQOL in patients with CHF. Studies were excluded if participants did not perform any movement in water. The participants had to be human, and have a diagnosis of stable CHF, with a NYHF classification of two to three. A full list of inclusion and exclusion criteria has been included in Appendix B.

Two researchers (BG and MS) concurrently applied the inclusion and exclusion criteria to all studies that were retrieved. Both researchers participated in all stages of the screening process, including title, abstract and full text screening. Any studies that clearly did not meet the criteria were eliminated. For any studies that were not clear, the abstract and/or full text was retrieved for analysis. Both researchers agreed on all studies included in this review by consensus, without the need for mediation. Both BG and MS screened all included studies for any further appropriate studies.

Data extraction and quality assessment

Eligible studies were assessed for methodological quality using a modified version of the Downs and Black checklist (Downs and Black 1998). This checklist consists of 27 questions that can be applied to experimental or observational studies. Each question is allocated a score of 0, 1 or 2, with higher scores indicating a higher overall quality of study. The checklist has been shown to

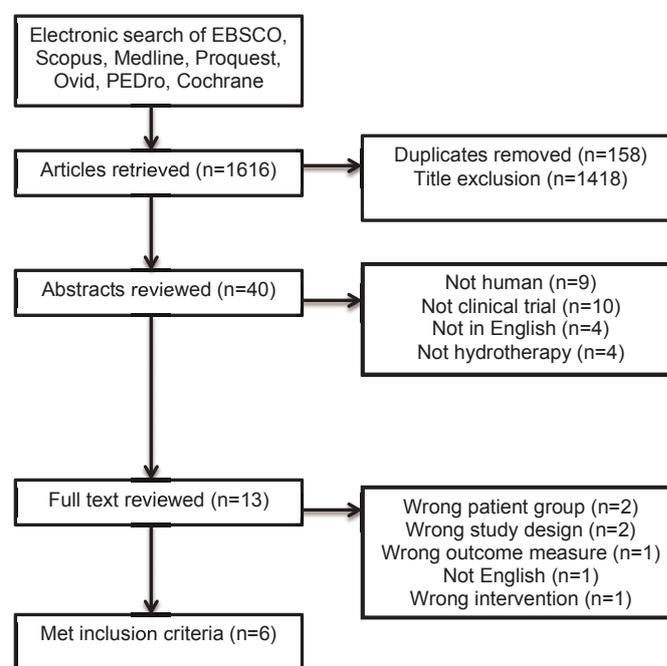
be a valid and reliable tool for the assessment of experimental trials. The checklist was applied to all studies included in this review by two assessors (BG and MS) independently. Results of both independent evaluations were compared, and any discrepancies were discussed until a consensus was reached.

RESULTS

Literature search

Database searching yielded a total of 1616 potential studies to be included in this review. Duplicates were removed (n=178) and an initial title screening resulted in the exclusion of 1438 titles. Following the abstract and full text screening process, six studies were identified to be included in the final analysis (Caminiti et al 2009, Cider et al 2003, Cider et al 2012, Mourot et al 2010, Munincino et al 2006, Teffaha et al 2011). The process of study selection, elimination and reasons for exclusion is included in Figure 1.

Figure 1: Search Strategy Flow Chart



Summary of included studies

Methodological quality assessment

The methodological quality of studies ranged from poor (9/28) to moderate (20/28). All studies failed to blind participants and assessors, and all studies failed to report an adjustment for confounding factors in their data analysis. Total scores for each of the included studies are presented in Table 1.

Study design

Of the six studies that met the inclusion criteria, four were randomised controlled trials (Caminiti et al 2009, Cider et al 2003, Cider et al 2012, Teffaha et al 2011). Two studies compared hydrotherapy to land based exercise programmes (Caminiti et al 2009, Teffaha et al 2011). Cider et al (2003, 2012) compared hydrotherapy to usual care (no increase in habitual physical activity) and two studies were feasibility studies of repeated measures design, in which the participants served as their own controls (Mourot et al 2010, Munincino et al 2006). Details of the programme, participants, intervention and control groups are outlined in Table 2.

Table 1: Checklist for measuring quality (Downs and Black 1998)

| Question | Caminiti (2009) | Teffaha (2011) | Cider (2012) | Municino (2006) | Cider (2003) | Mourot (2010) |
|--|-----------------|----------------|--------------|-----------------|--------------|---------------|
| 1. Is the aim/ hypothesis of the study clearly described? | 1 | 1 | 1 | 1 | 1 | 1 |
| 2. Are the main outcomes to be measured clearly described in the introduction or methods section? | 1 | 1 | 1 | 1 | 1 | 1 |
| 3. Are the characteristics of the patients included in the study clearly described? | 1 | 1 | 1 | 1 | 1 | 1 |
| 4. Are the interventions of the interest clearly described? | 1 | 1 | 1 | 1 | 1 | 1 |
| 5. Are the distributions of principal confounders in each group of subjects to be compared clearly described? | 0 | 0 | 1 | 0 | 0 | 0 |
| 6. Are the main findings of the study clearly described? | 1 | 1 | 1 | 1 | 1 | 1 |
| 7. Does the study provide estimates of the random variability in the data for the main outcomes? | 1 | 1 | 1 | 1 | 1 | 1 |
| 8. Have all the important adverse events that may be a consequence of the intervention been reported? | 1 | 1 | 1 | 1 | 1 | 0 |
| 9. Have the characteristics of patients lost to follow-up been described? | 1 | 1 | 1 | 1 | 1 | 0 |
| 10. Have actual probability values been reported for the main outcomes except where the probability value is less than 0.001? | 1 | 1 | 1 | 1 | 1 | 0 |
| 11. Were the subjects asked to participate in the study representative of the entire population from which they were recruited? | 0 | 0 | 0 | 0 | 0 | 0 |
| 12. Were those subjects who were prepared to participate representative of the entire population from which they were recruited? | 0 | 1 | 1 | 1 | 0 | 0 |
| 13. Were the staff, places, and facilities where the patients were treated, representative of the treatment the majority of patients received? | 1 | 1 | 0 | 1 | 0 | 0 |
| 14. Was an attempt made to blind study subjects to the intervention they received? | 0 | 0 | 0 | 0 | 0 | 0 |
| 15. Was an attempt made to blind those measuring the main outcomes of the intervention? | 0 | 0 | 0 | 0 | 0 | 0 |
| 16. If any of the results of the study were based on "data dredging", was this made clear? | 1 | 1 | 0 | 1 | 1 | 1 |
| 17. In trials and cohort studies, do the analyses adjust for different lengths of follow-up of patients, or in case-control studies, is the time period between the intervention and outcome the same for case and controls? | 1 | 0 | 0 | 0 | 0 | 0 |
| 18. Were the statistical tests used to assess the main outcomes appropriate? | 1 | 1 | 1 | 1 | 1 | 1 |
| 19. Was compliance with the intervention/s reliable? | 1 | 1 | 1 | 1 | 1 | 0 |
| 20. Were the main outcome measures used accurate (valid and reliable)? | 1 | 1 | 1 | 1 | 1 | 1 |
| 21. Were the patients in different intervention groups or were the cases and controls recruited from the same population? | 1 | 1 | 1 | 0 | 0 | 0 |
| 22. Were the study subjects in different intervention groups or were the cases and controls recruited over the same period of time? | 1 | 0 | 1 | 0 | 0 | 0 |
| 23. Were study subjects randomized into intervention groups? | 1 | 1 | 1 | 0 | 1 | 0 |
| 24. Was the randomized intervention assignment concealed from both patients and health care staff until recruitment was complete and irrevocable? | 0 | 0 | 0 | 0 | 0 | 0 |
| 25. Was there adequate adjustment for confounding in the analyses from which the main findings were drawn? | 0 | 0 | 0 | 0 | 0 | 0 |
| 26. Were losses of patients to follow-up taken into account? | 1 | 1 | 0 | 1 | 1 | 0 |
| 27. Did the study have sufficient power to detect a clinically important effect where the probability value for a difference being due to chance is less than 5%? | 1 | 0 | 0 | 0 | 1 | 0 |
| Total | 20/28 | 18/28 | 17/28 | 16/28 | 16/28 | 9/28 |

Table 2: Study Summary and Results

| Study | Participants | | Intervention | | Main Findings |
|-----------------------|--|---|--|--|--|
| | Experimental | Control | Experimental | Control | |
| Caminiti et al (2009) | n=11 M/F: 11/0 *Age: 67 (6) NYHA II = 7 NYHA III = 4 | n=10 M/F: 10/0 *Age: 69 (8) NYHA II = 6 NYHA III = 4 | 24-week programme: Combined endurance training and hydrotherapy; 1-hr, 3 x per week No intensity specified | 24 weeks - Endurance training only; 1-hr, 3 x per week for (60-70% VO _{2 max}) | Combined group significantly improved 6MWT compared to baseline and land-based controls (p<.001) |
| Cider (2003) | n=15 M/F: 11/5 *Age: 70.2 (5.2) NYHA II = 3 NYHA III = 12 | n=10 M/F: 6/3 *Age: 75 (6.4) NYHA II = 1 NYHA III = 9 | 8-week programme: 45 min, 3 x per week. Low to moderate exercise level (40-70%HRR) | Live life as usual, no increase in habitual physical activity | No significant findings from baseline or between groups for aerobic capacity outcome measures. Significantly improved MLHFQ total score, but not more than controls |
| Cider (2012) | n=10 M/F: 8/2 *Age: 65.8 (5.8) NYHA II = 5 NYHA III = 5 | n=10 M/F: 8/2 *Age: 69 (8.2) NYHA II = 3 NYHA III = 7 | 8-week programme: 45 min, 3 x per week. Low to moderate exercise level (40-75%HRR) | Live life as usual, no increase in habitual physical activity | Improved VO _{2peak} and 6MWT compared to controls (p<.01) No significant between-group differences in HRQOL outcomes |
| Mourot et al (2010) | n=24 M/F: 24/0 *Age: 53 (4) NYHA: Not reported CHF = 12 CAD = 12 | Own control | 3-week programme : Water-based gymnastic exercises, 40 min, 3-4 x per week Land-based endurance exercise (exercycle), 30 min, 4-5 x per week @ 60-70% HRR) | Own control – all participants measured pre and post-intervention | Significantly improved VO _{2peak} from baseline (p<.05) |
| Municino et al (2006) | n=18 M/F: 7/1 *Age: 63 (10) NYHA II = 9 NYHA III = 7 NYHA IV = 2 | Own control | 3-week programme: 2 x 30-50 min hydrotherapy sessions per day. Educational and psycho-behavioural support sessions 5 x per week. | Own control – all participants measured pre and post-intervention | Significant improvements in 6MWT, VO _{2peak} and MLHFQ from baseline (p<.05). |
| Teffaha et al (2011) | n= 24 M/F: 24/0 *Age: 51.7 (3.6) CHF NYHA II = 1 CHF NYHA III = 11 CAD NYHA II = 12 | n = 24 M/F: 24/0 *Age: 53.3 (4.2) CHF NYHA II = 2 CHF NYHA III = 10 CAD NYHA II = 12 | 3-week programme: 5 x per week, 35 min Endurance and water calisthenics Individualised target intensity based on initial testing | 3-week programme: 5 x per week, 35 min Land-based endurance and calisthenics Individualised target intensity based on initial testing | Hydrotherapy CHF group improved VO _{2peak} from baseline, and significantly more than land-based control (p<.05) |

Note: * Age is mean (standard deviation); M, male; F, female; NYHA, New York Heart Association; VO_{2 max}, maximal oxygen uptake; HRR, heart rate reserve; CHF, chronic heart failure; CAD, coronary artery disease; 6MWT, Six Minute Walk Test; HRQOL, Health Related Quality of Life; MLHFQ, Minnesota Living with Heart failure questionnaire; VO_{2peak}, peak oxygen uptake.

Participants

Across all studies, a total of 174 participants with CHF were investigated, of whom 18 were female. The mean age of all participants was 63.5 years. Patients were included in all studies based on a clinical diagnosis of CHF. All studies apart from Mourot et al (2010) reported NYHF classification, primarily of II-III, however one study (Municino et al 2006) included two participants of NYHA IV. All studies reported left ventricular ejection fraction (LVEF) of $\leq 45\%$. Participants were excluded if they had unstable CHF, peripheral artery disease, fear of water, any contraindications to exercise testing or disabling diseases that may have interfered with the exercise protocol.

Programme components

Duration: Programmes ranged from three to 24 weeks. Three of the six studies extended over eight or more weeks (Caminiti et al 2009, Cider et al 2003, Cider et al 2012). Three studies were conducted over three weeks (Mourot et al 2010, Municino et al 2006, Teffaha et al 2011). Exercise sessions ranged from 30 to 50 minutes, with session frequency ranging from twice weekly to two sessions daily five times per week. Details of the programme components have been outlined in Table 2.

Location/water temperature: Programmes were carried out in hospital rehabilitation pools across Europe - in Sweden (Cider et al 2003, Cider et al 2012), France (Mourot et al 2010, Teffaha et al 2011) or in Italy (Caminiti et al 2009, Municino et al 2006). Water temperature was set between 31-34 degrees Celsius for all studies.

Intensity: Intensity was reported across all studies as a target heart rate reserve (HRR) or as a percentage of VO_{2peak} . Target heart rate ranged from 40-70% HRR in three studies (Cider et al 2003, Cider et al 2012, Mourot et al 2010). Two studies measured intensity using results of oxygen consumption testing or VO_{2peak} (Municino et al 2006 a, Teffaha et al 2011). The target VO_2 in these studies ranged from 40-70% $VO_{2peak/max}$. One study (Caminiti et al 2009) did not identify specific target intensities, instead reporting that a target VO_2 was individualised to the patient based on initial testing.

Adverse events: Three patients (intervention group) across two studies were withdrawn from the programme due to: peripheral ulcer (n=1), increase in CHF symptoms (n=1) (Cider et al 2012) and the recurrence of a preexisting cardiac arrhythmia (n=1) (Cider et al 2003). No other adverse events were reported. One study failed to report adverse events (Mourot et al 2010).

Adherence: Across all studies one participant withdrew themselves from the programme due to family problems (Cider et al 2012). One study (Mourot et al 2010) failed to report adherence. One study (Teffaha et al 2011) reported two temporary withdrawals due to bronchopulmonary infection (n=1) and medication mismanagement (n=1). Both patients resumed the programme after a one-week absence, completing the programme without any complications.

Outcomes – measures of exercise tolerance

Six-minute walk test: The six-minute walk test (6MWT) was used to measure functional exercise capacity in four studies (Caminiti et al 2009, Cider et al 2003, Cider et al 2012, Municino et al 2006). Two studies (Caminiti et al 2009, Municino et al 2006) found that hydrotherapy intervention groups significantly improved their 6MWT from baseline ($p < 0.05$), with Caminiti et al (2009) finding significantly greater improvements compared to a land-based exercise group ($p = 0.001$). A third study (Cider et al 2012) found significantly improved 6MWT in a hydrotherapy intervention group compared with a usual activity control group ($p = 0.01$), which

consisted of land based participants not permitted to increase their usual level of daily physical activity. Two studies (Cider et al 2003, Municino et al 2006) recorded gains in 6MWT of 29.7m, and 118m, respectively, whilst one study (Caminiti et al 2009) recorded improvements of 150m when compared to baseline and 37m when compared to a land based exercise group. Cider et al (2012) reported significant gains in 6MWT in the hydrotherapy group versus a usual activity control group, however actual distances were not reported. A summary of these findings is provided in Table 2.

Oxygen consumption: Five studies investigated exercise tolerance by measuring peak oxygen uptake (VO_{2peak}) during a cycle ergometry test (Cider et al 2003, Cider et al 2012, Mourot et al 2010, Municino et al 2006, Teffaha et al 2011). Four studies (Cider et al 2012, Mourot et al 2010, Municino et al 2006, Teffaha et al 2011) found significant gains from baseline following hydrotherapy interventions, with one of these intervention groups improving significantly more than usual-activity controls (Cider et al 2012). Improvements in VO_{2peak} ranged from 1.0 to 2.1 mL·kg⁻¹·min⁻¹ across the five studies.

Outcomes – measures of health related quality of life

Health Related Quality of Life Questionnaires: Health related quality of life (HRQOL) was investigated in three studies using the Minnesota Living with Heart Failure Questionnaire (MLHFQ) (Cider et al 2003, Cider et al 2012, Municino et al 2006) and the SF-36 (Cider et al 2003, 2012). Anxiety and depression were measured by the Hospital Anxiety and Depression Scale in one study (Cider et al 2012). Significant within group improvements were found in two of these studies for the combined total of MLHFQ total score (Cider et al 2003, Municino et al 2006) and physical domain (Cider et al 2003). One study (Cider et al 2012) did not find any significant improvements in total MLHFQ scores compared to baseline or control. This study did find significant results following hydrotherapy intervention compared with a healthy Swedish reference population with significantly lower SF-36 scores across all domains except bodily pain ($p < 0.05$).

DISCUSSION

Hydrotherapy has been proposed as an alternative to traditional land-based exercise programmes for people with CHF, however the literature surrounding hydrotherapy as an effective intervention for this patient group is still in its infancy. Regular physical activity is advocated in patients with chronic heart failure (CHF), due to proven benefits in patient function (Selig et al 2010). Several high-quality randomised controlled trials have shown that regular exercise leads to improvements in exercise tolerance (Piepoli et al 2010, Taylor et al 2014) and quality of life (Garin et al 2009, Taylor et al 2014), as well as reducing hospital admissions and mortality rates in CHF patients of either reduced or preserved ejection fraction and NYHA class II-III when compared with no exercise controls (Taylor et al 2014). These benefits are thought to arise from peripheral adaptations, such as improved vascularity and metabolic adaptation in skeletal muscle cells, allowing for increased energy production and improved metabolic efficiency (Piepoli et al 2010). In the present systematic review, we identified six studies comparing hydrotherapy versus no exercise or land-based exercise training in people with stable CHF, with the aim of determining the effects of hydrotherapy on exercise tolerance and quality of life in this patient group.

It has been proposed that the resistance of hydrostatic pressure when moving through water may deliver a greater training stimulus than land-based exercise (Becker 2009). Therefore, it would seem reasonable to hypothesise that water-based exercise may be of significant benefit to patients with CHF due to the

added resistance of hydrostatic pressure in conjunction with the proposed haemodynamic benefits of warm-water immersion. Conversely, it has also been suggested that the immersion of patients with CHF in water may be detrimental to function, as the increase in hydrostatic pressure exerted on the body may increase the load on an already deficient cardiovascular system (Working Group on Cardiac, Rehabilitation, Exercise, Physiology, & Working Group on Heart Failure of the European Society of Cardiology). However, recent evidence has shown that static warm water immersion leads to physiological responses in patients with CHF that include acute peripheral vasodilation, a reduction in peripheral resistance, and an increase in venous return (Gabrielsen et al 2000). Svealv et al (2009) investigated the effect of an 8-week hydrotherapy programme on static physiological responses to warm water immersion in patients with chronic heart failure. These authors found that static warm water immersion results in a significant acute reduction in peripheral resistance and heart rate with significant improvements in venous return and stroke volume. However, these effects were neither significantly improved upon, nor maintained following 8 weeks of hydrotherapy exercise.

The main aim of cardiac rehabilitation programmes is to improve function, exercise tolerance and quality of life (NZ Heart Foundation 2009). Exercise tolerance is commonly measured using the 6MWT as it is a valid, reliable, functional and clinically accessible outcome measure in this population (Shoemaker et al 2012). Exercise tolerance was investigated using the 6MWT in four studies included in this systematic review (Caminiti et al 2009, Cider 2003, Cider et al 2012, Municino et al 2006). Half of the studies included in this review achieved significant 6MWT improvements from baseline scores following a hydrotherapy exercise programme (Caminiti et al 2009, Cider et al 2012, Municino et al 2006). The minimal clinically important difference (MCID) for the 6MWT for patients with CHF has been found to be 40-45m (Shoemaker et al 2012) and the improvements recorded in the studies of both Municino et al (2006) and Caminiti et al (2009) exceeded this. It should be noted that both these studies had a greater number of exercise sessions (30 sessions and 72 sessions, respectively), when compared with Cider et al (2003, 2012), which each consisted of 24 sessions.

Most studies also assessed exercise tolerance by measuring peak oxygen uptake (VO_{2peak}) during an incremental cycle ergometer test (Cider et al 2003, Cider et al 2012, Mourot et al 2010, Municino et al 2006, Teffaha et al 2011). VO_{2peak} is an important prognostic marker in patients with CHF (Myers et al 1998), given that a low VO_{2peak} in CHF patients is associated with increased mortality (Mancini et al 1991). An increase in VO_{2peak} of $2 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ is considered to be clinically relevant in patients with severe CHF (van der Meer et al 2012). The most promising results from the studies included in this review arose from Cider et al (2012), who found significant improvements in VO_{2peak} ($2.1 \text{ mL}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$) compared to baseline following 8 weeks of water-based therapy. It should be noted, however, that participants in this study had a lower VO_{2peak} at baseline compared to other studies included in this review. This may be due to the participants having combined diagnoses of CHF and type II diabetes mellitus. A combination of CHF and type II diabetes mellitus is associated with a lower VO_2 than in patients with only one of these diseases (Guazzi et al 2002). This may mean that the participants in this study had an increased capacity for improvement following hydrotherapy intervention compared to other studies.

Patients with chronic health conditions suffer reductions in HRQOL compared with age-matched norms (Lee et al 2014).

Exercise is a proven modality to significantly improve HRQOL in patients with chronic health conditions and, as such, is an important outcome to assess in any exercise intervention for chronic health conditions (Taylor et al 2014). Interestingly, only half the included studies in this review investigated HRQOL (Cider et al 2003, Cider et al 2012, Municino et al 2006). No significant differences in HRQOL between groups were found (Cider et al 2003, Cider et al 2012) but Cider (2003) and Municino (2006) found significant improvements in total scores from baseline using the disease-specific Minnesota Living with Heart Failure Questionnaire (MLHFQ). Municino et al (2006) recorded a significant reduction in median scores (from 56 to 18) after 3 weeks of water-based exercise. This is a particularly important result given that the MCID for the MLHFQ is a 5-7 point reduction on the overall score (Rector and Cohn 1992). It is important to note that this study also included a hydro-massage relaxation therapy component along with a structured and supervised lifestyle change education component to the therapy programme. Education aimed at improving self-management and lifestyle modification has been shown to improve HRQOL in patients with CHF, and is recommended as an essential component in cardiac rehabilitation (Corra et al 2005). Therefore, this added component may have promoted patient reassurance and relaxation, leading to a greater sense of well-being and markedly improved results.

Differences in programme duration and intensity may have been a contributing factor to the variance in results across all studies. It is possible that more significant results may have been elicited if some of the studies had been of a longer duration. It has been suggested that a minimum of 8-12 weeks of exercise training is required to be effective (Piepoli et al 2010); the NZ Heart Foundation (2009) recommends a cardiac rehabilitation programme over 8 weeks for patients with CHF to allow for appropriate physiological adaptations to occur. All studies included in this review which were of three weeks duration or less failed to reach MCID figures for VO_{2peak} with mean results ranging from 1.5-1.8ml/kg improvements (Mourot et al 2010, Municino et al 2006, Teffaha et al 2011) and it is possible these studies may have met the MCID for VO_{2peak} if the programmes were longer in duration.

The intensity of exercise interventions may also have affected outcomes across all studies. Many studies utilised a percentage of heart-rate reserve as a measure of intensity. This method may be problematic in patients with CHF as they are commonly on beta-blocker medications (Di Franco et al 2013). The role of beta-blockers is to reduce the effects of sympathetic nervous system activity on the myocardium, thereby reducing heart rate (Di Franco et al 2013). As such, target heart rates may have been difficult for patients to achieve, given that beta-blockers prevent significant increases in heart rate. It has been found that exertion scales such as the Borg Rating of Perceived Exertion correlate well with VO_{2peak} in patients with CHF, even in those using beta-blockers (Levinger et al 2004). Using an exertion scale may therefore be a useful tool to prescribe, monitor intensity and ensure appropriate progression of exercise in patients with CHF.

Based on the evidence found in this review, hydrotherapy appears to be a safe, accessible and well-tolerated form of exercise, with no adverse events reported across any of the included studies. Importantly, adherence was high with only one reported withdrawal across all studies. This completion rate is well above the average for cardiac rehabilitation, with up to 37% of people failing to complete programmes (Carvalho and Guimaraez 2010). This may prove to be a major benefit of hydrotherapy, as there have been many reported barriers to adhering to land based exercise programmes in patients

with CHF, including being “painful,” “tiresome” and “boring” (Conraads et al 2012). Therefore, if hydrotherapy proves to be as effective as land-based exercise and is better tolerated, it may be a mechanism for overcoming barriers, improving attendance and improving rehabilitation outcomes for people living with CHF.

CONCLUSION

In the present systematic review, we identified six studies comparing hydrotherapy versus no exercise or land-based exercise training in people with stable chronic heart failure (CHF) of NYHA II-III. There was significant variability in the reporting, components and length of the water-based interventions undertaken by each of the studies. This may account for the variability in exercise tolerance and HRQOL outcomes across all the studies. The quality of available evidence overall was of poor to moderate quality according to the Downs and Black criteria; and therefore further research of higher methodological quality is required before strong recommendations can be made regarding the effect of aquatic-based exercise on exercise tolerance and HRQOL in patients with stable CHF. Such research should include the evaluation of water-based exercise compared with equivalent land-based activities, of appropriate duration and intensity.

KEY POINTS

- Hydrotherapy appears to be a safe and well tolerated exercise intervention in patients with CHF of NYHA II-III.
- Hydrotherapy appears to improve exercise tolerance and health related quality of life in patients with CHF of NYHA II-III.
- Further high-quality research is required before strong conclusions can be drawn on the effectiveness of hydrotherapy for patients with CHF.

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APPENDIX A: Key words used in search databases

| Key words "OR" | | |
|---------------------------|---------------------|---------------------|
| Hydrotherap* | "immersion-therap*" | "water-based" |
| "Aquatic exercise" | Balenotherap* | "water gymnastic*" |
| Thalassotherapy | "water aerobic*" | Kneipp |
| "aqua therap*" | "pool therap*" | Aquatic* |
| Key words "AND" | | |
| "Heart failure" | "chronic heart" | "congestive heart" |
| "ventricular dysfunction" | CHF | "heart dysfunction" |
| "heart disease" | | |

Note: *Truncation symbol

APPENDIX B: Selection criteria for studies to be included in critique

| Study Selection Criteria |
|---|
| In English language |
| Randomised controlled trials and quasi-experimental studies |
| Outcome measures: any exercise-related and HRQOL outcome measures |
| Publication dates between year 1995-2014 |
| Subjects: Humans, >18-years-old, diagnosed with CHF |
| Intervention: Hydrotherapy |
| Study Exclusion Criteria |
| Systematic and/or literature reviews |
| Immersion only (no exercise/movement in water) |

