Water-Based Exercise Programs - Effects on Fall Risk and Physical Function in Older Adults with Lower Extremity Osteoarthritis
Perceptions of a water-based exercise programme to improve physical function and falls risk in older adults with lower extremity osteoarthritis: barriers, motivators and sustainability.

**ABSTRACT**

Falls are a major concern in the older adult population of New Zealand. While several land-based falls prevention programmes exist, these may be inappropriate for individuals with lower extremity osteoarthritis. This paper presents participants’ perceptions of a mixed methods study that investigated the effects of a twelve week aqua-aerobics programme on falls risk and physical function in older adults with lower extremity osteoarthritis. Seventeen participants (four males and thirteen females) with an average age of 78 years (range 68-89 years) attended focus group interviews. Perceived benefits included an improvement in mobility, breathing, pain levels, balance and a reduction in falls. Key to sustaining participation adherence was a motivating instructor, commitment to a structured programme and valued companionship.

The findings of this study, including insight into motivating this population to attend, should be considered by providers and potential participants of water-based exercise classes alike, to aid in creating sustainable programmes. Strong positive feedback as well as constructive criticism from participants provided the basis of recommendations which may be used to create an optimal programme to promote long-term participation, guiding those planning to implement water-based programmes.

**INTRODUCTION**

In New Zealand, approximately 30% of people over 65 years old experience a fall at least once a year, with an estimated cost to the Accident Compensation Corporation (ACC) of $100 million per year (Accident Compensation Corporation 2006, Arnold and Faulkner 2007, Johnston 2006). The risk of falling is greater in older adults with lower extremity osteoarthritis than in older adults without osteoarthritis (Arnold and Faulkner 2007). Osteoarthritis is the most common form of arthritis, presenting in almost half of all people over the age of 60 and nearly all people over the age of 80 (Arthritis New Zealand 2008). The large proportion of people affected suggests that interventions or strategies to prevent falls for this population are particularly important.

Land-based falls prevention programmes are available in New Zealand for the older adult population. However, these may be inappropriate for some individuals, potentially aggravating the symptoms associated with arthritis. Water-based exercise is an activity that may be a suitable alternative intervention for falls prevention exercise for older adults with OA. The buoyancy provided by the water places less stress on the joints, while at the same time delivering strength, balance and fitness benefits similar to land-based exercise (Bartels et al 2007). Studies investigating water-based exercise in older adults have reported increases in functional reach (Simmons and Hansen 1996), cardiorespiratory fitness, muscle strength and endurance (Ruoti et al 1994, Takeshima et al 2002), leaning balance (Lord et al 2006), and dynamic balance (Hale and Waters 2007). From our pilot study investigating the benefits and feasibility of water-based exercise to improve dynamic balance, it appeared that older adults enjoy this form of group exercise (Hale and Waters 2007).

Only a few qualitatively-based studies have explored the perceptions of older adults to community-based group exercise. One such study (Schoster et al 2005) used semi-structured telephone interviews with 51 females with joint pain (average age 67 years, range 32–90 years), who had participated in the People with Arthritis Can Exercise (PACE) programme, and who derived considerable social support from exercising in a group with others who have arthritis. Participants in these group classes said they were motivated to attend as they felt they could exercise safely at their own pace in the class and they valued the instructor. Similar sentiments were expressed by older adult participants in a focus group study of perceptions towards involvement in group Tai Chi classes (Hutton et al 2009). Understanding what older adults perceive to be facilitators and barriers to group exercise is important to inform improvement in group exercise delivery.

We recently investigated, in a randomised controlled trial, the effects of a group water-based exercise programme on falls risk and physical function in older adults with lower extremity osteoarthritis. In this study experimental group participants
were provided with a group-based twice weekly water-based exercise programme for 12 weeks (Hale et al 2012). Following completion of the water-based intervention, participants were invited to participate in focus group discussions on the benefits and delivery of the group classes. Furthermore, the researchers were conscious that following the study this free water-based programme would no longer be available for participants. The research had paid for participants’ public pool entry, the hire of the pool lanes and the audio system used to provide the classes, as well as the exercise instructor. In the focus groups, we also asked participants for their ideas of how they could continue with the water-based exercise in a beneficial yet low cost manner. This paper reports on the findings of these focus group discussions. Participants’ ideas for sustaining the programme at a low cost and what constituted a good group programme were of particular interest.

**METHOD**

**Design**

Focus groups interviews were used to explore participants’ perceptions.

**Participants and Recruitment**

This study followed the completion of the aforementioned randomised control trial investigating the effectiveness of a twelve week, twice weekly water-based exercise programme (Hale et al 2012). On completion of the twelve weeks of the water-based exercise intervention and follow-up testing, participants were invited to take part in focus group discussions.

Inclusion criteria included: over the age of 65 years (or > 55 years if the participant identified as Māori, due to ethnic disparities in health) (Blakely et al 2005), had at least one risk factor for falls as assessed by the Falls Risk Assessment Tool (FRAT) (Nandy et al 2004), a medical clearance from their general practitioner to participate, and moderately severe osteoarthritis of the lower limbs. Level of severity of OA was evaluated using the Western Ontario and McMaster Universities Osteoarthritis Index score (WOMAC) (Bellamy 2002). Participants scoring “mild” on 2 items or “moderate” on 1 item in the “PAIN” domain, and “mild” difficulty in 4 items or “moderate” difficulty in 2 items in the “PHYSICAL FUNCTION” domain, were included (Goggins et al 2005). Participants were excluded if they were unable to ambulate independently; had a chronic medical condition that would limit participation in moderate intensity exercise; had severe cognitive limitations (as determined by the telephone Mini-Mental State Examination) (Newkirk et al 2004); had a hip or knee replacement in the past six months; or were already participating in an exercise programme aimed at improving strength and balance.

Twenty-nine participants who had completed the water-based exercise programme were mailed information and invitations to participate in the focus group study. Interested participants signed and returned included consent forms. Volunteers were contacted by telephone to answer any questions regarding the study and to arrange the focus groups. Ethical approval was gained from the University Ethics Committee (reference number 08/008).

**Data Collection**

Data were collected via four focus groups (FG1, FG2, FG3 and FG5). A fifth focus group was arranged but as only one participant attended, this session was conducted as a semi-structured interview with that individual (FG4). The focus groups were formed based on participant availability and ranged in size from three to five participants. A semi-structured, open-ended approach was used; discussion was guided by but not restricted to pre-set questions. Focus groups were conducted at the School of Physiotherapy, taking between 45-90 minutes. To ensure consistency the same researcher facilitated all focus groups and engaged and encouraged the participants, using a few open-ended questions and verbal prompts, to discuss the water-based programme. A process of constant comparison was used in that ideas and concepts raised in one focus group were used to inform the questions of the subsequent focus groups. Each focus group discussion was audio-recorded and transcribed verbatim. Summaries of the focus groups were sent to participants for verification prior to analysis in order to ensure accuracy. Participants were kept anonymous within the transcriptions.

**Data Analysis and Interpretation**

The General Inductive Approach (Thomas 2006) informed data analysis. No conceptualized framework was used to guide this analysis, rather the General Inductive Approach allows for the examination of the data from the perspective of the research questions. These questions were: (1) what benefits did the participants gain from involvement in the exercise, (2) what were the facilitators and barriers to engagement, and (3) how did they feel they could continue with the exercise now that the research classes were finished? As described (Thomas 2006), all transcripts were read multiple times and specific text segments related to the research objectives were identified and rudimentarily coded by the primary researcher. The generated codes and themes were then discussed and refined by the research team. Each transcript was then coded independently by two researchers and discrepancies discussed to ensure that the coding process was reliably and exhaustively undertaken.

**Results**

Nineteen individuals consented, 16 of whom attended focus groups and one of whom attended an individual interview. One potential participant withdrew due to illness and another potential participant forgot to attend. Of the seventeen participants, four were male and 13 were female. The average age of the participants was 78 years (range 68-89 years).

Two over-arching key themes emerged from the data: ‘wonderful’ and ‘sustainability’ (Figure 1). The theme ‘wonderful’ encompasses three sub-themes. These were “The social part of it,” “It woke me up and got me going,” and “It’s better to go there than going to the doctor”. The theme ‘sustainability’ encompasses three sub-themes. These were “I’ve got one complaint and it is only really my complaint”, “We don’t want much do we?” and “I’d sooner have a leader”. The next section discusses these themes and subthemes in detail.

**Theme: Wonderful**

All participants thought that the water-based exercise programme was “wonderful” for a number of reasons; for the social aspect of it, that it was motivating, they derived benefits from it and they were extremely enthusiastic to keep going.
“The social part of it”

Participants spoke of the good social atmosphere of camaraderie created by the group and the instructor, “the social side of things is really, really good” (FG1) and the friendships that were forged. Exercising with others made it more fun and enjoyable and participants found they helped one another. As they were “all in the same boat” (FG1) they felt more comfortable and could empathize with and relate to each other.

The instructor was important and group members considered essential attributes of an instructor were: being understanding, tolerant, friendly, and someone who will “jolly you along.” (FG3)

The participants valued their relationship with a challenging instructor who could empathize with and relate to each other.

“Yes, I think the instructor was sort of aware of our capabilities and kept the challenge up. And it made it more interesting that way, because if you did the same thing over and over at the same level, it would be boring.” (FG2)

“It woke me up and got me going.”

Participants found the programme to be motivating: “Well I thought it was marvellous really if um you know got us out of bed in the morning and got us into the pool and umm the instructor we had was very, very good and ah I think it was just so good. And I think the motivation was there which is the big thing is to get you motivated you know?” (FG1). It emerged that accountability was an important factor in motivation; participants felt if they missed a class the instructor or group would notice, and this helped keep them motivated to go: “Yeah, so it’s just funny little things that keep you thinking you have a responsibility to attend ‘cause someone’s gonna miss you.” (FG1) The fact that there was a record of attendance being kept also contributed towards this. Participants were cognizant of the instructor watching them and noticing if they were doing exercises incorrectly, that he would playfully encourage them to challenge themselves and they wanted to do well for the instructor. All of these factors contributed to the feeling of accountability, and were strong motivators to attend the classes.

Many people stated they would not have gone to water-based exercise or similar exercise on their own: “…sometimes being actually on your own to be motivated uh it’s harder. It’s harder: A lot harder.” (FG1) Some participants expressed frustration that they could not motivate themselves to go alone, but that there was no problem with motivation if they went with the group. Being part of a group contributed to motivation both for getting to the classes and also once they were there. Some people believed that fun was an important motivator; for others their motivation came from having a structured programme to attend. There were some participants who were motivated to go because it was free. Being part of the study contributed to motivation as participants said they were committed to the classes and knew the researchers were relying on them to attend and to be tested.

“It’s better to go there than going to the doctor”

Participants reported a number of benefits that they derived from participation in the water-based exercise programme; they found it fun, enjoyable and interesting and expressed gratitude at being able to partake. Participants described the perceived health benefits they received from attending the programme, such as an increase in movement or mobility, an improvement in breathing, a decrease in their pain levels, balance had improved and a reduction in falls. Non-physical benefits included a greater awareness of their balance, valuable knowledge about falls prevention and greater confidence to move around.

Participants were of the opinion that exercise in water was superior to other forms of exercise for them. They talked of other types of exercise they had tried and how land-based exercise caused pain whereas water-based exercise did not: “…exercise in the water, it’s not like walking or running…You’re not jarring any limbs or bones…And for old people I’m, I’m sure that’s the best sort of exercise that you could do.” (FG1)

Participants had overwhelming enthusiasm for continuing with water-based exercise. Many participants wished the classes had continued and there were numerous comments or requests for the classes to continue: “Anything that will help me continue with it? You put it on and I will be there! Let’s start tomorrow!” (FG1)

Theme: Sustainability

Participants were enthusiastic about continuing with the water-based exercise programme and discussed ways in which this could occur now that the research programme had finished. In the first subtheme below, they spoke of the barriers to participation that could be addressed in order for the programme to become sustainable.

“I’ve got one complaint and it is only really my complaint.”

Barriers or difficulties that prevented or hindered participation in the classes were actively sought in the interviews, and a few factors, specific to individuals, were identified, prompting one participant to say: “I’ve got one complaint and it is only...
really my complaint. It was that most of them could manage so much quicker than me." (FG4) In fact most participants had no complaints, and the discussion frequently focussed on potential rather than real issues. One initial barrier encountered by some participants was the anxiety at starting the programme, and some admitted a fear of the water. In fact, one participant had never learnt to swim and had kept to the side of the pool throughout the class when he first started.

One barrier to on-going participation was that of illness, “Umm, I suppose the things that sort of do prevent you are if you get ill. One thing, that’s probably the only thing would be if I got ill…I probably wouldn’t be able to go, but only that would keep me away.” (FG1) For some participants fatigue was an issue, “Well for me, at first that’s why I missed some of them. I couldn’t go more than one because I was just so tired the next day and would sleep so sound, you know at the night-time, that I couldn’t always wake up early enough to get myself organized to get the bus.”(FG4)

Transport could be a major problem, especially if the person could no longer drive. However, the convenience of the city bus service to the pool was commended. A few participants without transport had been able to get a ride to the pool with other members of the group, which was very helpful to them. All other issues regarding the sustainability of the water-based exercise programme could be considered logistical problems and these are discussed below.

“We don’t want much do we?”

The location of the water-based exercise classes (a large indoor aquatic centre pool) was discussed, as well as other potential locations (the warm therapeutic community pool, local school pools, the community salt water pool and other smaller community pools). Participants weighed up the pros and cons of the various pools and opinion differed on the ideal location for the classes. One discussion was on the temperature of the pool. A few people thought the pool used was too cold and would prefer a warmer pool such as the therapeutic pool, whereas others thought a therapeutic pool would be too hot to exercise in. The next discussion centred on which community pool to use. While a few people thought that using local smaller community or school pools would increase accessibility and reduce transportation issues, the suitability of these pools, the community salt water pool used. For some this was related to school groups using the pool at the same time, and it was suggested that the classes be scheduled when the schools were not using them. This would also alleviate the problem of crowded changing rooms. However, for some, the busy times were interesting, seeing what everyone else was up to in the pool, and that this kept them entertained while they did their exercises.

The size and age of the classes were discussed. The smaller classes were appreciated although participants realized that in reality larger classes would keep the costs down. Having classmates who were of a similar age was considered by some participants to be beneficial: “Being with the group of elderly people...of same age and we related to so many things that we did, you know. We talked about what helped us and what didn’t help us, you know?” (FG2)

There was much discussion surrounding all aspects of the timing of the classes (time of day, frequency, regularity, which days of the week, how many days per week, duration of class, duration of programme, continuity, time of year/season) and no consensus was reached. This discussion mostly hinged around tiredness, illness and busyness. Some people felt they could not manage twice a week as they got tired or were too busy, while others would prefer the classes to be more frequent, for example three times a week or more to derive more health benefits. It was considered inevitable by some participants that they would become ill going to the pool in winter and thus classes should be held in the summertime only, while others felt they would like a year-round programme. Some participants said a continuous programme would help keep them motivated because if they stop they would not go back. Others felt they would need a break every twelve weeks or so.

Money (for example, cost, funding, payment, expense, price, discounts) and who pays or contributes was discussed extensively. While grateful for the free classes, participants were realistic in understanding that this could not continue. The majority of participants said they would not mind contributing a small amount of money towards pool entry or the cost of the classes. Some participants were confident that alternative funding could be sourced, and thought that personal contributions may not be necessary allowing the classes to continue to be run free of charge. Ideas of how the classes could continue were discussed and are presented below.

“I’d sooner have a leader.”

A number of questions as to how a water-based exercise programme could continue to run, especially if funding for it was limited, were discussed. One question was the use of a buddy system, where people would be paired up and go to the pool with their buddy to do the exercises together. However, most participants were unenthusiastic about this idea as they would rather attend in a group with an instructor. “No, I’d sooner have a leader.”(FG3), and did not want to rely on one person to go with; although a buddy system for transport to group classes was considered a good idea.

It was asked if groups could run with a short term instructor for a few weeks to demonstrate the exercises, with the groups then becoming self-sufficient. Reactions to this idea were mixed. Some felt this would work, as long as it was a structured group with a set time and place to meet. Most participants however, felt that an instructor was essential and that a class without an instructor would fall apart; that they were too forgetful to remember the exercises without an instructor there to tell them or that there would not be sufficient motivation. It was considered embarrassing to go without an instructor and some felt it would not be safe exercising without an instructor to guide them. A few participants had continued with the water exercises on their own since the classes had finished, and had found it difficult to maintain. Nominating a leader from the group to be the instructor was suggested and some participants...
liked this idea but others felt this would not be fair on the nominated instructor. A question related to reducing costs would be to have an unpaid volunteer instructor. Some liked the idea of this and it was proposed a student or retiree would be ideal for the job. Others felt it was an unreasonable request.

Alternative sources of funding was discussed, such as from local charitable organisations concerned with assisting older adults or perhaps the pool itself would provide discounted or free entry for these classes. The majority of participants said they would not mind contributing a small amount toward pool entry or to the running of the classes. Some participants however stated they “...couldn’t probably afford a big amount, twice a week” (FG5) on their pension and that it was a great motivation to have the classes for free.

Participants also discussed other options if the water-based exercise classes could not continue, such as attending the “Thursday” water-based exercise class (another water-based exercise class run in the same aquatic centre for all age groups), individual aqua jogging, or aqua jogging classes. These classes were not considered suitable because they were too difficult and participants felt they would be “left behind.”

**DISCUSSION**

This study explored participants perceptions of the water-based exercise programme, with particular emphasis on how a similar programme could be developed and sustained long-term. The theme ‘wonderful’ highlighted participants’ enthusiasm for the water-based exercise programme; they found it to be a positive and beneficial experience. Creating an exercise programme that people will enjoy enhances regular attendance and sustainable participation, as observed in a focus group study of 48 older adults recruited from the community (not necessarily from group exercise classes), which also found that enjoyment and support from others were key factors in enhancing self-efficacy and the belief that the individual could continue participating in physical activities (Hardy and Grogan 2009).

Support from others was also a key finding of the present study, similar to that reported by other studies (Fuller et al 2010, Schoster et al 2005). A strong link emerged between the ‘wonderful’ sub-themes: “The social part of it” and “It woke me up and got me going” . Most participants said they would not be motivated to do water-based exercise or similar exercise on their own, but once they were in a class they continued to attend because of the class structure (both the group, the instructor and having a definite time and place to go) as well as the responsibility they felt towards other members of their class. The fun atmosphere added to the social motivation. Peer support has previously been identified as a strong facilitator for physical activity engagement in older adults, both those with disability (Damush et al 2007), and those without disability (Hardy and Grogan 2009). Older adults participating in group Tai Chi classes considered important factors to encourage engagement in exercise were education about exercise requirements and the benefits to be gained; support from health professionals and peers; and classes conducted by well-trained leaders to ensure safety and suitability, and in accessible and appropriate venues (Hutton et al 2009). One focus group study explored the perceptions of 99 healthy older adults and those with chronic illness (aged over 50 years) to the barriers and facilitators to being physically active (Fuller et al 2010). Participants spoke of the importance of social support and environments conducive to promoting physical activity.

Additionally, in the present study, participants felt strongly that the instructor was an important encouraging factor. This has been previously reported (Crone et al 2005, Hale and Waters 2007, Schoster et al 2005). One study reported, on a grounded theory based study of the perceptions of adults referred to exercise programmes, that the instructor has an important role in helping exercise participants to understand a more holistic experience of exercising (Crone et al 2005). This allowed for a more positive exercise experience than if the instructor purely focused on the physiological benefits or technical aspects of the exercise.

Participants believed that exercise in water was particularly relevant to them, a finding similar to that of other studies. Water-based exercise programmes have been reported to make it easier for people with arthritis to exercise (Der Ananian et al 2006, Foley et al 2003, Wilcox et al 2006), as less pressure is placed on the joints (Der Ananian et al 2006, Foley et al 2003). A common finding among older adults with arthritis is a fear that exercise will cause pain or exacerbate the disease process. Water-based exercise has been shown to reduce pain in people with arthritis (Hendry et al 2006, Lambert et al 2000). Confidence, water, and balance appeared to be linked in the present study. From the participants’ discussions, the benefits of the programme creating a positive cyclical effect, being in the water gave participants the confidence to perform balance exercises safely, which then improved their balance which increased their confidence.

Some participants identified barriers to participation in the water-based sessions such as the pool being too cold or that the class was too difficult; however these negative perceptions were countered by other participants (the temperature of the pool was fine or the class needs to be tougher). Although it is acknowledged that it is difficult to please everyone, research has shown that not only do different people with arthritis respond to exercise differently, but that an individual with arthritis’ response to exercise can change daily (Der Ananian et al 2006). Being aware of the body, and understanding how it is responding on any particular day, assists the person to know the level of exercise they can engage in, so that the exercise session is a beneficial (Der Ananian et al 2006). Thus, it is not surprising that participants in this study had varying needs. Providing a flexible programme may be required, such as offering two variations on the classes. One could be a gentler class, no more than twice a week for twelve weeks, perhaps in summer only. This could be for those that are new to water-based exercise or those particularly prone to illness or fatigue. Another class could run that is ‘tougher’, running twice a week or more and continuously year round. This could be for those that want more of a challenge. Participants could graduate from the gentler class to the tougher class if and when they felt ready.

It was recognised that the classes were funded by the research study and that funding for their continuation would have to come from other sources. One of the attractions of the research classes was that they were free. While the majority of participants said they would not mind making a payment contribution to continue to attend, it would probably be necessary to explore funding options for the remainder of costs.
Water-based exercise classes are probably more expensive than land-based exercise classes. The pool entry fee, hire of pool space and an audio system (to deal with the acoustic problems) is more expensive (locally at least) than hiring a community hall. Furthermore, for many people, exercising in a public pool can be daunting, and participants spoke of their anxiety to attend, were concerned about their lack of safety if an instructor were not present as well as feeling embarrassed when exercising without an instructor. Although participants considered alternative options to sustain the water-based exercise programme now that the research funding the programme had ceased, such as a buddy system to assist each other in the exercises, groups running with a short term instructor for a few weeks to demonstrate the exercises and then the groups becoming self-sufficient, or finding a voluntary instructor, the strong opinion was that a trained instructor was a necessity.

Locally, in the South Island of New Zealand, land-based strength and balance exercise classes are run in citywide community halls. These classes begin with a paid instructor and after ten weeks move to being a peer-run model with a member of the class becoming the instructor. This person is trained and supported by a local organization catering for the needs of older adults, and some of the classes have been running continuously for over five years (Waters et al 2011). This option however did not appear to be appealing to the participants in this study. The smaller community pools, although accessible, were not considered suitable (not deep or wide enough), and many do not have lifeguards in attendance. Furthermore, they are only open in the summer months. Having a peer leader or buddy system was also not considered conducive to continued, safe exercising; a trained instructor appeared to be the essential element.

While the water-based programme was considered to be ‘wonderful’ and perceived to be extremely beneficial by participants in this study, running it in a low cost manner does not appear to be appealing. To continue the programme at the level run in the study would require alternative sources of charitable or government funding along with personal contributions in order for it to be affordable for older adults on pension to attend.

Strengths and Limitations
Consistent methods of data collection and cross checking of the analysis strengthened the reliability of this focus group study and data saturation was clearly obtained. The focus group facilitator also actively sought negative comments about the programme from the participants. A limitation of the study was that due to the voluntary nature of study recruitment, individuals who were unable or unwilling to attend the water-based exercise classes for the randomised controlled trial were not sampled, creating the potential for selection bias. Also, the small sample size, and being predominantly European New Zealanders, limits general applicability.

CONCLUSION
This study explored the perceptions older adults with OA of participating in a water-based exercise programme. Participants were enthusiastic about the programme, deriving enjoyment and benefit from it, and they expressed a desire to continue. Water-based exercise may therefore be considered a viable exercise alternative to land-based exercise programmes for this population. However, this form of exercise is probably a more expensive option. Solutions such as peer leaders, buddy support or using smaller community pools were not appealing, and thus sustaining the programme would necessitate additional funding. The findings of this study, including insight into motivating this population to attend, should be considered by providers and potential participants of water-based exercise classes alike, to aid in creating sustainable programmes.

KEY POINTS
- Older adults with lower limb arthritis and at risk of falling value and enjoy water-based exercise programmes.
- The perceived benefits of such programmes included an improvement in mobility, breathing, pain levels, balance, and a reduction in falls.
- Key to sustaining adherence in our water based exercise programme was a motivating instructor, commitment to a structured programme and valued companionship.
- Solutions to reduce the expense of an instructor-led water-based programme, such as peer leaders or buddy support did not appeal to participants.

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"This course was developed from the document: Perceptions of a water-based exercise programs to improve physical function and falls risk in older adults with lower extremity osteoarthritis: barriers, motivators and sustainability: Moody J, Hale L, Waters D (2012), and The New Zealand Journal of Physiotherapy 40(2) 64-70, used under the Creative Commons Attribution License."