Ageing & Society **31**, 2011, 1330–1349. © Cambridge University Press 2011
doi:10.1017/S0144686X10001406

Exercise in later life: the older adults' perspective about resistance training

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ABSTRACT
For older adults, exercise that challenges the muscular system, commonly referred to as resistance training, has significant physical, psychometrical and functional benefits. While well recognised by the scientific community, the translation of these benefits into practice has received little attention. Particularly neglected is an understanding of the personal experiences, motivation towards and adherence to resistance training recommendations among older adults. This paper investigated the benefits older individuals attribute to resistance training and the motivational tactics they employed to undertake it. Data were drawn from three focus groups where participants ($\geqslant$65 years; presently, previously or wanting to become involved in a resistance training intervention) were encouraged to openly discuss resistance training, physical activity and exercise. Findings revealed that participants were aware of the benefits of training on general and functional health, and that these benefits were employed in the motivation to train. In addition, presently or previously trained individuals stress the importance of environment and programme structure as a training motivator. The benefits to mental and social health, effect on ageing and body image were also raised. However, participants discussed these in a broad context. While it could be said that public knowledge reflects current evidence, it is also clear that individuals are still unaware of a number of specific benefits.

KEY WORDS – resistance training, physical activity, exercise, functional ability, older adult.

Introduction

As we age physiological changes occur and compromise our ability to deal with internal and external challenges. Of these changes, the age-related loss of muscle mass, known as sarcopenia, is considered the most debilitating

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https://doi.org/10.1017/S0144686X10001406 Published online by Cambridge University Press

and the most predicable (Fiatarone *et al.* 1990). Associated to loss of muscle mass are decreases in muscle function (Frontera *et al.* 1991), metabolic rate (Evans 1997), and bone mineral density (Burr 1997). In addition, loss of muscle mass is also a known contributing factor to later life chronic disease and falls (Rogers and Evans 1993). Consequently, normal ageing can cost the individual their ability to continue independent living (King *et al.* 2000), ensuring the need for dependent care or institutionalisation (Janssen *et al.* 2004).

Exercise and physical activity commenced, even very late in life, is shown to be a safe and effective countermeasure to the age-related loss in muscle physiology (Liu and Latham 2009). Specifically, gymnasium-based and weight-bearing activity, commonly referred to as resistance training, are a proven path to increased muscle strength, muscle power and muscle endurance (Adams *et al.* 2001; Henwood, Riek and Taaffe 2008). Most importantly, these increases are associated with significant improvements in tasks replicating activities of daily living (Fiatarone *et al.* 1990; Henwood, Riek and Taaffe 2008), thereby enhancing functional capability and prolonging independence. Moreover, in addition to general health determinants like sleeping patterns and energy levels, research has now linked resistance training to a plethora of chronic disease prevention and management benefits including osteoarthritis, diabetes and depression (Buchner 1997; Buchner *et al.* 1997; Rogers and Evans 1993; Singh, Clements and Singh 2001). In fact, worldwide the importance of resistance training for disease prevention, wellbeing and functional indpendence for older adults has become so well recognised, it is a common inclusion to national healthy ageing strategies (Chodzko-Zajko *et al.* 2009; Sims *et al.* 2006).

The concept of using resistance training is not by any means new. Following the realisation that aerobic exercise could be used to improve physical fitness among older adults in the 1960s (Wessel *et al.* 1968), reports of the muscle mass and muscle strength improvements associated to resistance training began to emerge (Aniansson and Gustafsson 1981; Moritani and deVries 1980). There followed a plethora of studies showing improved muscle quality, balance, flexibility, dexterity and the ability to undertake daily tasks (Hakkinen *et al.* 1998; Lexell *et al.* 1995; McCartney *et al.* 1996). More recent research has further developed the application of resistance training to reduce the symptoms of disease and cognitive impairment, and improve quality of later life independent of the older individuals' age, level of fitness or disability (Chodzko-Zajko, Schwingel and Park 2009; Littbrand *et al.* 2006; Liu and Latham 2009). However, even in light of the significant range of benefits, insufficient numbers of older adults are becoming involved (Winett, Williams and Davy 2009).

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In a review of the barriers and motivators to exercise for older adults it was revealed that individuals often perceive the symptoms directly associated with exercise as negative and the environment where activity is undertaken as unwelcoming (Schutzer and Graves 2004). This is particularly relevant to resistance training, which often leads to muscle soreness and is most often conducted in loud, cluttered gymnasiums. Other listed barriers are the individuals health, physicians advice, time, fear of injury, illness and knowledge (Brawley, Rejeski and King 2003; Schutzer and Graves 2004). As with barriers, the list of motivators to exercise is broad and personal. Interestingly, one motivator is self-efficacy of overcoming the barriers to activity (Schutzer and Graves 2004). While recent studies suggest that supported behavioural modification may be the primary step in increasing exercise among older adults (Brawley, Rejeski and King 2003; Cohen-Mansfield, Marx and Guaralink 2003), little is known about the motivators to resistance training adherence. However, given the rehabilitative benefits of this form of exercise, increased population knowledge may entice greater participation numbers. Manini, Druger and Ploutz-Snyder (2005) reported that surveyed older adults understood the benefits of resistance training to improve muscle function. They also found that participants had significant misconceptions about the effects on muscle mass and morbidity (Manini, Druger and Ploutz-Snyder 2005), which raises the question whether community awareness is equally attuned to the growing research evidence. Of those involved, the physiological benefits of training are regularly sighted (Myers *et al.* 1999), suggesting these individuals may have information related to training and motivational techniques that could assist in guiding other individuals into participation.

The current study has three main objectives: first, to investigate through focus group interviews the knowledge older adults have in relation to the spectrum of benefits available through resistance training; second, to examine whether the individuals' knowledge reflects current evidence; and third, to identify the techniques utilised by individuals who have undertaken continued training in the hope that these techniques can be communicated to the older population to increase exercise participation and adherence.

Methods

Information related to perceived benefits of exercise and specifically to resistance training among older adults was obtained through a series of focus group discussions that involved purposefully selected older adults

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(Tuckett 2004). Adults aged 65 years and older were selected from three distinct groups: presently involved (G1), previously involved (G2), and those contemplating involvement (G3) in a resistance training intervention. Therefore, the focus group cohort offered a broad perspective of the learned and understood concept that drew individuals to this form of training, and for this reason those not interested in training were excluded. It would be assumed that had a disinterested group been interviewed, the discussion would have reflected previously established barriers and not the motivational tactics to training (Brawley, Rejeski and King 2003; Schutzer and Graves 2004).

Specifically, G1 (four males, two females; 67–77 years) were involved in a high-intensity resistance training intervention being conducted at the University of Queensland (UQ; Brisbane, Australia) investigating multiple- *versus* single-set training in adults 65 years and older (Galvao and Taaffe 2005). G2 (three males, three females; 69–81 years) were recruited from a cohort who had participated in an intervention investigating high-velocity varied resistance training among adults aged 60 years and older (Henwood and Taaffe 2005). Four participants of G2 had continued training in the 18 months since the intervention had concluded, while the remaining two described mainstream gymnasiums as 'unwelcoming'. As with most laboratory-based interventions, G1 and G2 had been offered structured exercise regimes and given sufficient support and verbal motivation during training to promote progression. This included telephone follow-up when individuals missed a session, periods of familiarisation to ensure exercise techniques were perfected and make-up sessions where required. Group sizes varied between studies, but generally catered for six to eight participants supervised by two exercise specialists. From G2, individuals who continued to train still used the programme employed during research participation and, in addition, a variety of extra exercises prescribed by health professionals to aid any injury rehabilitation. G3 (three males, three females; 65–79 years) were participants from the UQ Australasian Centre on Ageing 50+ Registry, a pool of volunteers interested in ageing research. All participants recruited into G3 had not previously undertaken resistance training, but had given a written expression of interest to participate in their 50+ registration.

From G1 and G2 potential participants were contacted in person while those from G3 were sent a letter inviting their participation. Of the 25 adults originally contacted to participate, 18 volunteered. The research was conducted with the approval of UQ Medical Research Ethics Committee and all participants gave informed, written consent.

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Focus group discussion

All focus group sessions were convened by two researchers (TH, HB). This allowed TH to guide the session and HB to take notes. Each focus group interview lasted approximately two hours, was tape-recorded and later transcribed verbatim.

All focus groups where asked the same questions, informed by the literature, addressing their thoughts on resistance training and exercise. Participants were encouraged to openly discuss all concepts, beliefs and behaviours they felt relative to the topic. Relying on a conversational style, interview topics ranged from quality of life, impacts on wellbeing and family, social interactions and the general health benefits of resistance training and exercise (Tuckett and Stewart 2004). The nature of the conversation was facilitated by the author (TH) relying on the following questions as a guide:

- What are/were your experiences in preparation for exercise and resistance training?
- What do you think attracts older people to being involved in a resistance training study?
- What would motivate you or has motivated you to continue with your exercise programme?
- What do you believe are the benefits of resistance training?
- What do you perceive is the importance of physical activity, exercise and resistance training?

Data analysis

The research team realised the importance of the independent perspective, as well as the perspective of the group. Therefore, along with the written notes transcribed during the interview, transcripts from the focus group data were analysed individually and by group. Before, during and following analysis this premise was revisited to ensure data had been comprehensively judged and the intended concepts allowed to become known. Data were imported to NVivo (QSR NVivo, Version 2.0.161, QSR International, Melbourne, Australia) to facilitate the emergence of the conceptual fields (Kolewaski *et al.* 2005). This initial analysis was undertaken by the primary author (TH) and reviewed by the secondary author (HB), with data checked and double checked to ensure the participants' statements coherently reflected the conceptual fields. An extensive literature review informed the key benefits to resistance training and known motivators to exercise, which were then used to draw the reflective

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components out of the individuals testimonials, and theses concepts were again employed to inform the larger domains (Bouchard *et al.* 2009; Boyle *et al.* 2009; Brawley, Rejeski and King 2003; Brown *et al.* 2000; Cohen-Mansfield, Marx and Guaralink 2003; Dionigi and Cannon 2009; Grant 2001; Hurley and Hagberg 1998; Liu and Latham 2009; Verdijk *et al.* 2009; Winett, Williams and Davy 2009). The fields generated were guided by focus group data in accordance with the frequency with which participants referred to items (Grbich 1999) and data saturation was deemed to have been reached. Specifically, based on the repetitive nature of the comments, it was concluded (TH) and confirmed (HB) that saturation had been reached and that further interviews would not add to the data set.

This inductive process generated six core wellbeing domains and a domain dedicated to the motivational tactics employed by participants. The core domains were: General Health, Functional Health, Ageing Well and Ageing Better, Mental Health, Social Interactions and Body Image. To ensure fields were mutually exclusive within nominated domains a commonality elimination process was undertaken (Henwood and Bartlett 2008). Specifically, data were analysed and reviewed stringently by the research team to ensure domain exclusivity. Domain overlap lead to the restructuring and in some cases the domain division to best reflect the breath of discussion. When concepts reoccurred within multiple domains statements were reanalysed to ensure there conceptual context. In contrast to aforementioned core domains, Motivation Factors were drawn broadly from focus group data. This was done to ensure all tactics employed by participants in being motivated or continuing adherence were acknowledged.

Results

Data analysis revealed that individuals were aware of a number of key benefits available from resistance and exercise training, and that they could link these to improved functional health. However, a number of established benefits did not receive specific mention, while others were only minimally reflected in contrast to their clinically recognised effects. Moreover, G1 and G2 displayed greater knowledge of the broad range of benefits than their interested in training but not previously trained counterparts (G3). General Health and Functional Health emerged as the dominant topics of discussion, while other domains still received valid mention. Conceptual fields are presented in italics within each specific domain.

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General Health

The impact of resistance training, physical activity and exercise on General Health was the most regularly mentioned concept in the present investigation. All participants at one point or another during focus group sessions acknowledged these forms of training having important benefits for *increased* and/or *maintained wellbeing*. This is reflected by SB's (G2) comment about his improved resilience to injury when he said, 'You know I've fallen over at the bowls club, or stepped in a ditch and fell over backwards. Nothing! I've got a chair at home on wheels, one time I missed it and went down on the floor, and no problems. You know before [I came] I'm sure it would have been a different outcome'. He reinforced this with 'I was concerned [about getting involved] because I had a bung shoulder for 30 years. I didn't know whether I'd be able to do it or what! But now, well you know, within two weeks of starting it [the shoulder] was on the way to repair. It [resistance training] was the answer to my problem'. This was supported by JA (G1) who said:

> Another benefit is that when I started coming here there was this one joint in my ankle and it use to seem to cramp on me when I went walking. It was sore forever, though it didn't affect my walking, but since I've come here that's gone. The soreness has gone out of that. Maybe it just did in time, but since I came here it's gone.

While SB's and JA's comments reflect the generalised benefits of training on injury and injury rehabilitation, very little conversation was generated around *disease prevention* benefits. Furthermore, the impact of training on a specific disease was not mentioned. JM (G2) did note, however, the impact training had had on his health in his comment:

> I've failed latterly [referring to his dropping away from his regular gym workouts] and haven't been since June. But it's on the cards to come back. Since stopping my shoulder hasn't been as good, or my general health. But let me say this, after we started [referring to the training intervention] some two years ago now, for the first 12 months my health was better then and I got fewer colds than other people.

When analysed by group, those who were preparing for training (G3) were far less likely to mention the rehabilitatory or preventative benefits of training. Within the domain of general health, participants from G1 and G2 made reference to other factors such as raised energy levels, disability prevention and improved sleeping patterns. Reflecting raised energy levels was CD's (G1) comment:

> I'm not really a morning person, but I have found that this [the programme] has really got me going in the morning. I mean normally I make a cup of tea, get the paper, sit and read it from cover to cover and put off doing anything as long as possible. Now I race around, eager to get here.

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Functional Health

While not as dominant in discussion as general health, participants were aware that training was an important precursor to *improved* and *maintained functional wellbeing*. Within this domain, it was the effect that resistance training would have on overall *physical ability* that was referred to most often. An example of this was a comment made by JL (G1) about what brought him to the programme and the effect it has had.

> It was curiosity for me. Because there was an ad in the paper which said 'Do you want to become stronger?' And I have a mulcher that I can't start and I have to wait for my son to come over. And I thought if I can start the mulcher without him by the end of the time [referring to the intervention period] it will really have meant something. And I can almost start it!

Similarly, G3 expected training to offer improvements in their functional ability making comments like 'I might hit a golf ball better' (BL) and 'I would hope it [referring to training] would make me more flexible. I'm not as flexible as I was. I'm still strong, as strong as I was relatively, but definitely stiffer getting up' (CL). In addition, G3 seemed to understand that the loss of ability associated with ageing can be rapid, as referred to by ND who, when discussing the potential for randomisation to a non-training research group, said 'Cause no one will want to go into the second group [non-training group] where you deteriorate'.

This resistance to negative functional change was a common concept among the groups that had experienced training (G1, G2). The ability of resistance training to affect functional longevity was commented on in many ways, but best probably summed up by CD (G1) who said that

> Some of the women in my family have lived till their early nineties. So in that case, unless I get run over by a bus, I'm likely to live to 100. So it's terribly important that I look after myself so I don't become a burden to my children. I want to be as independent as possible.

Improved ability to maintain family relationships and commitments was realised with ME (G2) stating:

> The other thing I wanted to improve my strength for was family. It seems to be people have children later than they did when we were young. As did our son. So as a grandparent to look after these young things you become responsible for lifting them. And we found we had greater ability.

While not mentioned as regularly, focus group participants also were aware of the impact of training to improve the specific parameter of *balance*, *flexibility* and *strength*. Those who had experienced training talked about improved balance and strength first hand, while those who wanted

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to get involved comment on individuals they knew who had commenced training. A conversation between BL and CL of G3 showed this.

BL: I have seen SB [of G2] at the bowls club. He is very mobile for his age.
CL: Physically he is pretty good. He's not a running sort of athlete; he's a strong old man. He thinks he has had really good outcomes [from training].
BL: I remember him talking about his shoulder problem because I have a similar problem. And yes I have seen his muscles.

Overall, *flexibility* and *strength* were mentioned as a benefit as regularly as *balance* but only a third as often as the broadly encompassing field *physical health*. In contrast, the *self-perceived* impacts on functional ability were mentioned least, as was any specific relationship to *falls*.

As with the domain of General Health, when groups were analysed independently, it became apparent that those preparing to train (G3) were much less likely to mention the specific benefits of training.

Ageing Well and Ageing Better

Participant's interviews showed an understanding that exercise training was an effective means of revitalising the aspects of *physical health* that they understood changed in normal ageing. While a positive effect on ageing related to *bone mineral*, *range of motion*, *body composition* and *balance lose* were acknowledged, they still featured less prominently than the understood improvement in *muscle mass* associated with resistance training. As could be expected, those who had undertaken training made comments reflective of their experience, such as JM (G2) who stated '[Resistance training] helped rebuild my muscle mass. I didn't have any muscle before I came here. My bicep used to be flat, but now there is a bit of a rise there'. Interestingly, those who were or had been involved showed an understanding that ageing could be reversed in relation to health. This is shown in JA's (G1) comment:

> What I was thinking is at the shopping centre you see people with no walking stick or anything, but they're moving very slowly. Now I have a subconscious thing, 'You should be going to the gym.' I feel sorry for you [them] because you could be doing better.

In contrast, those contemplating resistance training (G3) tended to suggest the benefit to ageing in a more general fashion. For example, when discussing the benefits of exercise, ND simple stated, 'Being able to do physically what you want to do'.

Mental Health

Participants appear to understand that exercise will have a positive effect on their Mental Health referring to *increased mental health* regularly during

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focus group interviews. However, these exchanges were minimal when compared to the dimensions of General Health, Functional Health and Ageing Well and Ageing Better. Moreover, specific knowledge regarding physical exercise associations with *cognitive exercise*, *cognitive disease prevention* and *improved motor control* were not mentioned. Participants used terms such as 'mind and body', suggesting the psychosomatic improvement as an outcome of resistance training, but little attention was given to the ability of exercise to ward off later-life cognitive decline. Those of G3 appeared to have a broad grasp of the impact of training on mental health and were less specific than those of the other groups. Still G1 and G2, while aware, tended to treat mental health broadly as well. For example, when involved in discussion about the importance of physical activity, CD (G1) said 'It's very good for mental health as well'. In contrast, the psychological benefit of increased *self-confidence* associated with improved function received rare acknowledgement across groups, but was mentioned by JL (G1):

> And of course this makes us feel more confident [following discussion of improved strength]. I use to have to watch my balance getting on and off things, but I noticed the other day I had parcels and stepped on to the bus so much more confidently.

Body Image

Given the acknowledged association between exercise and weight loss, and population drive to reduce obesity, interestingly, the impact of training on Body Image did not generate significant discussion when compared to the previous domains. It is worth noting that while not mentioned as often the specifics of Body Image improvement were touched upon by all groups and an improved body shape was a recognised benefit from training. In contrast to those who had experience training, G3 tended towards training misconceptions such as the ability of exercise to lead to area-specific 'spot' reduction. Examples of this are comments made by ND: 'I'm getting a little baggy in the arms and wanted to get rid of them. I think exercise could be the answer'; and CL: 'I think my legs have gotten a bit flabby. I can turn it all around and get it back. Look young again'. But experienced trainers made the association between exercise and weight management. ME (G2) stated in response to DE's suggestion 'She's good on the tooth', that 'Well, yes I love to eat. If I didn't exercise I would be obese'. Still there was no mention of the relationship between resistance training, increased muscle mass, and the associated increase in metabolic rate and weight loss.

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Social Interactions

This final core domain describes the Social Interaction accompanying training or to prospective attendance to training. The interaction with individuals of a similar age was highlighted as more important than the *social wellbeing* achieved during such interaction. This suggests that participants felt an increased sense of security among people of a similar age but did not necessarily sense this had specific benefit besides social contact. In contrast, participants viewed the need to be around younger adults while exercising as insignificant in comparison to those of a similar age group. When analysed by group, it appeared only G1 and G2 appreciated the social contact that was available during group training. In contrast, the mention of valued social contact through group-based resistance or exercise training was hardly raised by G3. From G1 the following conversation illustrates the value individuals placed on their training company, in addition to the physical benefits.

JL: We like the social environment.
CD: A very supportive social environment, where everybody is supporting everybody else.
JA: A positive group.
JL: Especially after the testing everyone is interested to know how the others went in the test.
CD: Yes. Everybody was hoping that everybody else was improving.

Motivational Factors

Participants of the current research primarily cited the *physical benefits* of resistance training as the most important Motivational Factor for training attendance. As well, *mental benefits* and *personal benefits* were also a valuable motivator. Those individuals who had previously trained (G2) declared the *group and trainer benefits* of exercise as important whilst those presently involved (G1) suggested the *programme structure* they had was an important consideration for their continued training. Finally, participants also mentioned the donation of their time to important *research* as a Motivational Factor for continued participation. Other factors that were highlighted by G1 and G2 included the *social environment* and the *challenge to improve*. This is supported by JA's (G1) comment:

I think the mild support that we had for each other was a good motivator. Sometimes there was one or two or half a dozen of us, and all these young folks getting around down there. Which is great to see, but if you were just one person down there it would be more intimidating.

While G3 suggested that when involved continued adherence would be dependent on the *timing of sessions, commitment to attend* and the *noticeable*

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improvements. For example CL (G3) stated '[She'd] had trouble getting around to it. I mean I'm always saying I'm going to do more exercise. Then if I joined a group like this, on a regular few times a week, then I will go'. To sum up, when asked what made people keep coming to gymnasium-based training, SB stated simply 'The tremendous sense of wellbeing'.

Discussion

The use of physical activity and exercise to prolong wellbeing into later life has long been understood by the research community (Cress *et al.* 2004; Shephard 1993). More recently, this has been embraced by governments worldwide, with a number of internationally accredited position statements informing policy encouraging older adults to engage in regular physical activity and exercise, independent of age or disease status (American College of Sports Medicine 1998; Sims *et al.* 2006). Resistance training, even commenced very late in life, is shown to have added benefit for the older adults over those obtained through regular cardiovascular activity (Cauza *et al.* 2005; Fiatarone *et al.* 1990). Research shows that with the increased drive to a more physically active lifestyle, a growth in the understanding of the benefits to exercise has also emerged (Belza *et al.* 2004; Berg, Cromwell and Arnett 2002). Still the prevalence of sedentary behaviour among older adults is high (Marquez *et al.* 2009; Sims *et al.* 2006).

The primary objectives of the current study were to investigate the knowledge older adults have in relation to the spectrum of benefits available through resistance training and examine whether the individuals' knowledge reflects current evidence. In general, the study's participants were aware of benefits of physical activity, exercise and resistance training to improve general and functional health. In addition, they regularly mentioned the impact of exercise training as a countermeasure of the decline in wellbeing with ageing, and showed some knowledge of the benefits to disease prevention. However, while the specifics of some of these benefits were mentioned they were reserved to those who were presently or had been previously involved in training to make broad tautology statements that suggested limited knowledge of the impact on disease. Nevertheless, these findings suggest that with training comes a certain level of education more specific than general knowledge. While participants displayed a well-voiced awareness of the primary benefits, they were less inclined to mention some less well-publicised benefits. Moreover, the benefits to strength and mental wellbeing as a discussion theme did not feature as strongly as the generalised impact.

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To the best of our knowledge it is the first study to investigate from multiple perspectives how older adults perceive resistance training and remain motivated. Dionigi and Cannon (2009) showed that as older adults progress through a resistance training intervention physiological benefits were accompanied by improved feelings of self-worth, as well as greater awareness of the physical, social and cognitive impacts of training (Dionigi 2007). Moreover, it is suggested that periods of training only reinforce what older adults expected with participation (Rydeskog, Frändin and Scherman 2005) and that with the growing drive towards exercise, older adults are possessing increased levels of knowledge (Chodzko-Zajko, Schwingel and Park 2009). The present research builds on this, showing that of those who wanted to become involved, a certain level of benefit expectation and knowledge existed. These anticipated positive changes are closely aligned to the suggestion that older adults are broadly aware of the benefits to physical activity and exercise (Berg, Cromwell and Arnett 2002). However, those who had been or were involved displayed increased knowledge, associating specific functional, physiological, mental and social benefits to training. This could be related to an increased education level achieved through trainer contact or retention of information related to activity involvement.

Also mentioned in our focus groups was the relatively new field of the social interaction achieved through resistance training which recently emerged as an important benefit to training (Cress *et al.* 2005). Participants in this study enjoyed training with individuals of their own age, and while not raised as a primary benefit, individuals did appear aware of the importance of the social interactions achieved during training. However, and as with the benefit to mental health (Brown *et al.* 2009), the social relationships achieved were not mentioned as regularly as the broadly encompassing general and functional health benefits.

The final objective of the current study was to identify the techniques utilised by individuals who have undertaken continued training in the hope that these will inform recommendations to increase exercise participation and adherence among the older population.

Training education is highlighted as the primary step an older adult should consider before commencing an exercise programme (Resnick 2000). In our study, the focus groups displayed a broad level of education about the benefits to resistance training. While their knowledge of the gross benefits appeared to be adequate, limited emphasis was given to improved sleeping patterns, disease prevention and rehabilitation, supporting the misconception to resistance training reported previously (Manini, Druger and Ploutz-Snyder 2005). However, the impact of resistance training on general and functional health were the primary motivators to

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involvement, supporting previous research investigating the broader concept of physical activity and exercise (Brawley, Rejeski and King 2003; Cohen-Mansfield, Marx and Guaralink 2003; Schutzer and Graves 2004).

A former investigation of physical activity beliefs among older adults participating in sport highlighted that those involved were bemused by the limited exercise adherence among the older generation (Grant 2001). In fact participants suggested that, given present knowledge and the positive testimonies associated with activity, the excuse used by the sedentary could be assumed invalid. Nevertheless, future research is needed into the barriers specific to resistance training in the hope it may aid allied health professionals whose greatest challenge is finding appropriate means to promote activity motivation and adherence among older populations. In addition to peer education and emotional blackmail campaigns that emphasise the predicted personal and family burden, a number of tested models have been suggested to motivate the older individual (Cress *et al.* 2005; Dionigi and Cannon 2009; Janssen *et al.* 2004; Layne *et al.* 2008). An example of this is Brawley, Rejeski and King (2003), who stressed the importance of behaviour change models that accounted for the individual and group-based environment for training, but still insufficient numbers are adhering to the suggested guidelines. In our study, the primary motivational tactics employed by participants, independent of whether they were, had or wanted to commence training, reflected the positive benefits of training. In addition, the research benefits were cited as a motivational factor, particularly among those who had experienced resistance training. It is known that individuals who volunteer into activity studies are commonly more motivated and feel good about the time they donate to knowledge building, while often receiving free/affordable quality guided training (Greenfield and Marks 2004; Stiggelbout *et al.* 2006). Of specific interest was that those who had left the intervention environment were motivated by group and trainer benefits, suggesting an appreciation for the regular social contact and guided training not available when training independently.

The concept of the quality supervised training environment as a motivating factor is supported by Dodd *et al.* (2006). In their investigation of resistance training among multiple sclerosis suffers, participants suggested that having people who were encouraging, supportive and knowledgeable about the benefits of training was important for adherence. Furthermore, it was suggested the concept of noticeable improvements was a strong motivator. In our study, groups G1 and G2 were regularly reviewed for strength changes, and could track their own progress using their training cards. These external motivators have important implications

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for future programme design and support the presence of exercise professionals' experience in delivery to older adults.

Limitations

A primary consideration for these data is that it may not translate to all older individuals due to the cohort from whom it was drawn. Those interviewed for this study were or had been involved in, or were interested in becoming involved in resistance training. While it is established that knowledge among older adults is growing with respect to the benefits of exercise and resistance training (Chodzko-Zajko, Schwingel and Park 2009; Manini, Druger and Ploutz-Snyder 2005), it is possible those involved in the present study may have varied opinions to older individuals who have no drive or inclination to become involved in this form of training. However, the present study specifically aims to investigate population knowledge, its alignment to presently clinical knowledge and the motivational tactics employed for adherence, not the barriers to resistance training. Among older adults, the barriers to exercise has received significant attention (Cohen-Mansfield, Marx and Guaralink 2003; Schutzer and Graves 2004) and it is possible the barriers to resistance training may align with those previously established to exercise in general. A further consideration is the one-off 'snap-shot' nature of these data did not provide for any follow-up interviews. It is hard to determine, therefore, whether a change in attitude could have been sampled from this population. It would have been interesting to see if changes in G1 and G3 could move towards reflecting the option of the longer experienced trainer, G2, or the evolution of knowledge. However, it could be suggested the 'cap' of personal knowledge will never thoroughly reflect that of clinical knowledge. Finally, we did not collect level of education data, which is suggested to be a significant motivator to participants and to level of understanding in relation to benefits (Manini, Druger and Ploutz-Snyder 2005).

Conclusion

With the increase in longevity and growth of population over 65 years of age worldwide, means to prolong independence and later-life wellbeing are imperative for both the individual and health systems alike. A physically active lifestyle, and specifically an exercise regime that challenges both the muscular and cardiorespiratory systems, offers older adults functional and physiological protection. This study confirms that individuals are aware of

https://doi.org/10.1017/S0144686X10001406 Published online by Cambridge University Press

the general and functional health benefits to exercise, and that these are employed as the primary motivational factors to get and remain involved. In addition, our study shows that a broad knowledge of the mental and social benefits are present, and that individuals understand that resistance training can be an effective countermeasure to some natural ageing processes. Data from the present study show that structured exercise involvement leads to greater knowledge, but it could be said this knowledge does not completely reflect the breadth of the clinical understanding of resistance training's benefits. This study has important information for increased participation, suggesting the availability of affordable, group-bound, guided programmes might be a positive step to increasing resistance training numbers among older adults. To date, an increased international awareness of the benefits of resistance training is moving policy to encourage older individuals to incorporate physiologically challenging activities into their daily lives. While these data show that a community awareness of the general and functional health benefits exists, it could be suggested that education to align community knowledge with clinical understanding may attract a broader spectrum of individuals to commence some form of resistance training. This tactic, coupled with structured behaviour change models offering supportive, guided training opportunities may have important international implications to raise participation and thereby offer older individuals prolonged functional health and wellbeing.

Acknowledgements

The authors would like to thank the focus group participants who generously donated their time to this research. It is encouraging to see many of them continuing to reap the benefits of resistance training.

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Accepted 18 November 2010; first published online 7 February 2011

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https://doi.org/10.1017/S0144686X10001406 Published online by Cambridge University Press