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Older Adults' Experiences and Perspectives of a Powerlifting Program 'Never Too Late' in Regional Victoria and the Associated Impacts on Biopsychosocial Outcomes

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Abstract

The Never Too Late (NTLP) powerlifting program aims to improve physical and mental health of older adults. Anecdotally, there have been reported benefits to biopsychosocial outcomes, to date; there is no research to support its effectiveness. This study explored the impact of the NTLP on mental health and psychosocial outcomes as well as evaluating perceived barriers and facilitators of program adoption and implementation. Semi-structured interviews were conducted with NTLP members (n=9) and head coach (n=1). Observation records of coach-participant interactions, social interactions and physical environment were compiled. Initial barriers were program cost and, low exercise self-efficacy due to injury or age-related decline. Participants identified health benefits, characteristics of the program, the coach and the gym environment as enablers. Despite reports of initial challenges engaging with the program, participants experienced improved biopsychosocial outcomes. The unique and varied needs of older adults experiencing NTLP provide insight into resistance-based intervention design for this population.

Keywords: Older adults; Powerlifting; Exercise; Biopsychosocial; Qualitative evaluation

Introduction

Healthy ageing and the importance of fostering older adults' active engagement in inclusive physical activity environments is a crucial factor in improving quality of life, and reduce the public and clinical health burden of disease and disability and related direct and indirect healthcare costs [1]. It is estimated that by 2050 there will be 1.5 billion people aged ≥60 living worldwide [2]. In Australia it is expected that by 2057 22% of the population will be aged 65 years and over [3]. With this increase, it is important that older adults stay as healthy as possible [4]. Better ageing programs and policies worldwide have been established to improve older adult's overall health and wellbeing, including enhancing regular physical activity engagement and access that provides a multitude of health benefits [5-8] [9-13]. The initiation and maintenance of regular sport, exercise and physical activity are important objectives of health promotion and crucial for not only optimising health and wellbeing, but also delaying the potential onset, or reducing the incidence and severity, of many chronic diseases [14-18].

Many forms of physical activity exist and while it is important to study all forms of physical activity, resistance training (otherwise known as strength or weight training), in particular, is commonly recognised as important for disease and injury prevention, wellbeing and functional independence, including broad ranging positive health outcomes [19]. The recommended physical activity guideline for older adults in Australia is engaging with at least 150 minutes of moderate physical activity, including regular resistance training two days per week involving major muscle groups [20,21]. Older adults who partake in resistance training activities are better able to cope with physical challenges in later life, such as performing activities of daily living and reducing the incidence of unexpected falling episodes [19]. Resistance training has also been shown to prevent sarcopenia, age-related muscle decline, as well as prevent chronic diseases, and improve mobility, balance, and flexibility [19]. Additionally, there is also a growing interest in the positive effects that resistance training has on wellbeing, psychological and social health [22] including reductions in depressive symptoms [23] and considerable increases in cognitive function and mood profile [24]. Although resistance training confers many benefits, there is a small proportion (7-15 %) of older people participating on a regular basis [25,26]. In Australia, for example, only 7-12 % of people aged 55 and over participate in resistance training [25]. Older people's engagement with physical activities can be influenced by motivation and personal beliefs, perceived barriers and facilitators, as well as environmental factors, it is therefore important that such factors be considered to increase uptake of programs and for them to be successfully implemented and widely disseminated in practice [27-30].

Burton, Farrier [27] recently conducted a systematic review using the socioecological model to identify individual, social and environmental level-factors associated with motivators and barriers of community-dwelling older people participating in resistance (strength) training programs. Overall, among 14 included studies, 92 motivators and 24 barriers were identified [31-43]. The most

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common motivators included preventing deterioration (disability), reducing risk of falls, building (toning) muscles, social benefits (e.g. social support, sense of belonging), staff/instructor characteristics, lack of exercise facilities, and improved mental health and wellbeing such as feeling less stressed, improved self-esteem and mood, positive outlook on life and being more alert, and having better concentration. Several barriers were reported including low-self efficacy, emotional problems that interfere with daily living, lack of social support, family responsibilities, lack of age-appropriate programs, geographical location and looking too muscular or thinking participation increased the risk of having a heart attack, stroke, or death, despite the minimal likelihood of these occurring. While this review's findings were mostly comparable to that of barriers and facilitators of other physical activity interventions for older adults of various ages ranges [29,44-50], this review highlighted the significance of more fully understanding different cultural, social and geographical contexts, including specific-setting barriers and facilitators, in increasing participation and engagement in resistance training among older people. Additionally, the review recommended that it was crucial to focus on specific benefits valued by older people and the dissemination of accurate information to counter misperceptions [27]. This is essential if programs are to be designed or optimized to meet the needs of the target population in a range of contexts, promote high uptake and program completion [15,27].

Powerlifting is a type of resistance or strength-based training that involves compound movements and free weights. It comprises three fundamental exercises using free weights loaded on barbells including a squat, bench press and deadlift. These exercises comprise multi-joint action, are unsupported so require balance and, use global muscle recruitment so each exercise demands the entire body to engage [51]. Current evidence supports resistance training use by older adults [19], to date, only two studies have been conducted exploring older adults involved in powerlifting [52,53]. A study conducted by Silverberg (2015) focused on lived experiences including important "issues around participants' initial and continued engagement with the sport of powerlifting, the ways in which powerlifting shapes the aging process, and the meaningful role that powerlifting plays in one's life", it however explored masters-level athletes competing in powerlifting (aged 50-59) in the Canadian-context. It also did not consider the general-population of older adults (including ≥60 years of age) using powerlifting in community-based programs for the specific-purposes of prevention, treatment or rehabilitation of a range of health conditions. Another study explored the experiences of older women who engaged in powerlifting to address the declining participation rates in recreational and competitive powerlifting and found that changing beliefs and positive social influences were important determinants [53]. Currently, there is no peer-reviewed published literature to date examining the experiences of community-dwelling older adults of both sexes and the impact of powerlifting programs on physical, psychological and social health outcomes, including older adults in the Australian-context [19,27,53].

A powerlifting 'Never Too Late' program (NTLP) has been recently developed and implemented in regional Victoria, Australia for community-dwelling older adults. Anecdotally, there have been reports of considerable benefits including biopsychosocial outcomes [54-56] but, to date, there has been no formative research to evaluate and support its efficacy and effectiveness, nor have older adults' and other stakeholders (e.g. trainer/coach) perceptions and experiences been reported. The purpose of this study is to conduct an evaluation of the NTLP and its impact on associated biopsychosocial health outcomes. The research question is: What are the experiences of older adults (over 50 years) participating in a regional Victorian powerlifting program NTLP and, what are their perspectives of the impact of NTLP on their physical and psychosocial health? By understanding more thoroughly the experience of older adults in powerlifting in this unique context, more knowledge about resistance and strength-based activities and their reach and impact on successful aging, prevention and rehabilitation outcomes can be obtained. Also, from a practitioner's standpoint, a better understanding of the connection between powerlifting and aging will allow enhanced program translation into practice-based settings that adheres to evidence-based principles and highlight the importance of context-driven programs that complement the setting in which they will be delivered. This in turn will have greater reach of target population and greater effect.

Methods

This study employed a qualitative multi-methods evaluation design with a narrative approach, [57,58] including semi-structured interviews about participants' experiences as well as researcher observations. The NTLP was designed specifically for older adults and tailored to meet individual needs such as recovery from illness, age-related significant muscle loss and/or physical disabilities. The NTLP began in April 2019 and reached 26 people who have participated to date. It consists of small group sizes (n=6), with twice weekly sessions over a 12-week period. Each session is 45-minutes duration and consists of the 3 powerlifting exercises: back squats/kettlebell squats, dead lifts and bench press. The coach is an accredited Level 1 Power Lifting Coach under the National Coaching Accreditation Scheme (NCAS), and has 22 years' experience as a chiropractor [59]. Ongoing review and program adjustment by the coach occurs throughout the program. The difference between the NTLP and standard membership is group size and the degree of 1:1 coaching.

A semi-structured interview guide was developed based on previous research and theoretical frameworks (including the Reach Effectiveness Adoption Implementation Maintenance (RE-AIM) framework, socioecological model, health belief model, self-determination theory) (Supplementary Table 1) which have been used to assist program evaluation and implementation, and strengthen external validity [60]. The semi-structured interviews used open-ended questions, which were refined as the participant's perspective was revealed. Observation records by the researcher were made using handwritten notes describing some of the training sessions (Supplementary Table 2).

Following ethical approval being obtained from the University Human Research Ethics Committee (HEC19257) to conduct a study participants were recruited using purposive sampling in order to identify a group of participants who share a common experience (i.e. participation in the NTLP or standard gym). Sampling criteria included participants who: (a) were aged 50 years and older; (b) currently participating in the NTLP; (c) previously participated in the NTLP and maintained training; (d) had a membership at the same gym in regional Victoria of the NTLP and undertook powerlifting

Table 1: Participant demographic summary (n=10).

Program Participation	Age in years	Gender	Current/Previous occupations	Marital status	Health condition	Past activity		Current activity	
June/July 2019						Structured	Unstructured	Structured	Unstructured
General gym 3 years	74	Male	Minister of Religion (c)	Married	Sarcopenia	Tennis	Walking	Powerlifting	Gardening, property maintenance
NTLP X 1	78	Female	Retired (c) writer, artist (c) Teacher (p)	Widowed	Two hip replacements	Pilates, hockey	Swimming, walking, farm work	Powerlifting	
NTLP X 1	69	Female	Retired (c) Teacher (p)	Married	Two hip replacements	Rehabilitation		Powerlifting	
General gym 3 years	70	Female	Retired (c) Teacher, fitness trainer (p)	Married	Sarcopenia	Resistance training	Walking	Powerlifting	Gardening
Previous NTLP X 1 now general gym	75	Female	Retired (c) Psychologist (p)	Married	Sarcopenia Lumber spinal stenosis	Resistance training, yoga, Pilates, Step into Life	Walking	Powerlifting	Walking
NTLP X 1	59	Male	Retired (c) Policeman (p)	Married	Severe meniscus damage and 3 knee operations	Rehabilitation, Pilates, resistance training,	Cycling, running	Powerlifting	Cycling, walking
NTLP X 2	76	Female	Retired (c) Midwife (p)	Widowed	Sarcopenia	Tai Chi	Walking	Powerlifting, Tai Chi	Walking
NTLP X 1	71	Female	Retired (c) Meteorologist, teacher, tennis wear designer, small business owner (p)	Married	Arthritis in hips, knees, shoulders, fingers	Tennis, elite level croquet		Powerlifting, Tai Chi, elite level croquet,	Building, swimming
NTLP X 1	79	Male	Retired (c) Advertising copywriter (p)	Married	Acquired Brain Injury (ABI) with cognitive deficits (due to car accident)		Property maintenance, walking	Powerlifting	Walking, property maintenance
Trainer	45	Male	Owner Real Strength, Trainer NTLP (c) Chiropractor (p)						

Note: NTLP = Never Too Late Program (general gym is at the same Real Strength Gym Studio); (c) = Current; (p) = Previous; X1 = 12 week NTLP; X2 = 2X12 week NTLP.

training. These criteria were used in order to select participants who had trained and been involved in the NTLP. In total, 10 people were invited to participate in this study including nine participants (aged 59-79, Mage=72.3 years; n=6 females; n=3 males) and one head coach (aged 45 years; male). This sample size was based on the premise that thematic saturation of information can occur from as few as six interviews [61].

All participants were provided with a participant information statement and completed informed consent prior to commencing the semi-structured interviews. The face-to-face interviews were conducted in June-July 2019, lasted approximately 45 minutes, were conducted in a mutually agreed private setting, and were digitally recorded. All data were transcribed verbatim by the researcher and transferred to NVivo 12 software [62].

The data was managed with the support of NVivo 12 software and analysed using thematic analysis [63]. The analysis began with two researchers familiarizing themselves with the data by reading the transcripts several times and preliminary perceptions of the data were noted. Initially five transcripts were coded as they covered a breadth of ideas and experiences, then the researchers met to discuss the initial list of codes. Remaining transcripts were examined using similar codes but also allowing for the identification of new codes. Common codes were grouped to create a list of themes. Given that the analysis was not a linear but was a recursive process [64], the researchers continuously reviewed the themes to combine, refine, separate, or discard them as the data dictated. A final list of themes and subthemes that the authors felt accurately represented data extracts within each theme was agreed upon.

Several methods of trustworthiness were used to ensure rigor in qualitative research [57,65]. These included triangulation of multiple data sources (interviews, observation and document analysis), interrater reliability and peer debriefing and the use of a critical friend.

Results

Nine older adults (Mage=72.3, 33% male) and one coach (aged 45 years) took part in this study (Table 1). Six themes emerged from the analyses. Data across both participants and coach were similar, thus themes are reported together, with relevant group differences noted.

All participants described positive experiences regarding their involvement in the NTLP including flourishing outcomes in mental, physical and social domains. It was also observed that the program was highly engaging, enjoyable and provided an environment that was supportive and inclusive (Supplementary Table 3). The program overwhelmingly supported and helped participants achieve their goals (e.g. health, rehabilitation and recovery) and added purpose and meaning to their lives. Participants summed-up their experience:

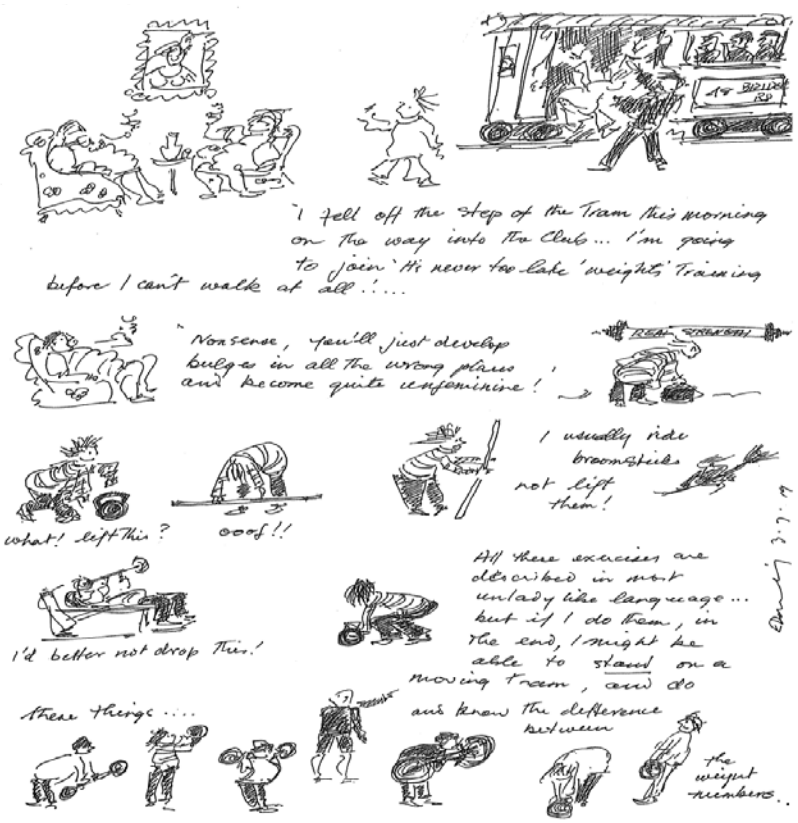

Figure 1: Participatory visual representation.

"The Never Too Late Program is just 'wow', that's what should have been happening all those years ago. For me it's exactly right… it's a brilliant program" (P4).

"I think it really hits a particular mark that otherwise doesn't exist" (P5).

"I've improved more in 10 weeks, going twice a week, with this program, than I did in 3 years of physio [physiotherapy]" (P6).

"I think this program has been the most efficient at delivering a return of strength which I think helps with pain" (P8).

One participant (P2) created a visual representation summing up their experiences of the NTLP highlighting their motivations to change, adapting to powerlifting exercises and overcoming ageing and gender-related stigma and stereotypes (Figure 1).

The coach also described the effectiveness of the program and positive outcomes that can be achieved for older adults (and others) participating:

"We work in a way where we make strength training simple, we make it safe, we provide encouragement, we provide groups of similar skilled people so that not only do they progress together, they encourage one another together. So different elements of being in a group with similar people, having it safe, having them be able to trust themselves, seeing how they progress has led to a great success …"

"[The NTLP develops] …movements that are cleaner and smoother, hip angle movement in squats, proper squatting technique, proper engagement through the posterior chain in squats and deadlifts. So, there's movement, there's strength" (Coach).

Reach and reasons to adopt the NTLP

Key aspects to adopting the NTLP were the perceived severity of participants' conditions and their perceived susceptibility to further decline. Participants describe why they chose to take part in the program with reasons including encouragement from family and friends, advertising and promotion of exercise benefits, slow progress of other rehabilitation programs, decrease in balance, postural changes, decline in mental health, reduced confidence and ability to navigate the external environment, social isolation, decreased strength, decline in cognition and memory, as an antidote to mental health problems, and an inability to continue valued activities. One participant expressed her feelings in relation to rehabilitation prior to undertaking the NTLP:

"If you come to a mountain and it's just too hard, you feel you can't get over it, there's no point trying so I had given up" (P3).

Her call to action was:

"I just happened to see in our local paper a big article about Real Strength here in Castlemaine and I was absolutely mesmerized because I thought well if this can't help me, nothing can" (P3).

Perceived Effectiveness of the NTLP

Perceived benefits

Participants described many perceived benefits from the program.

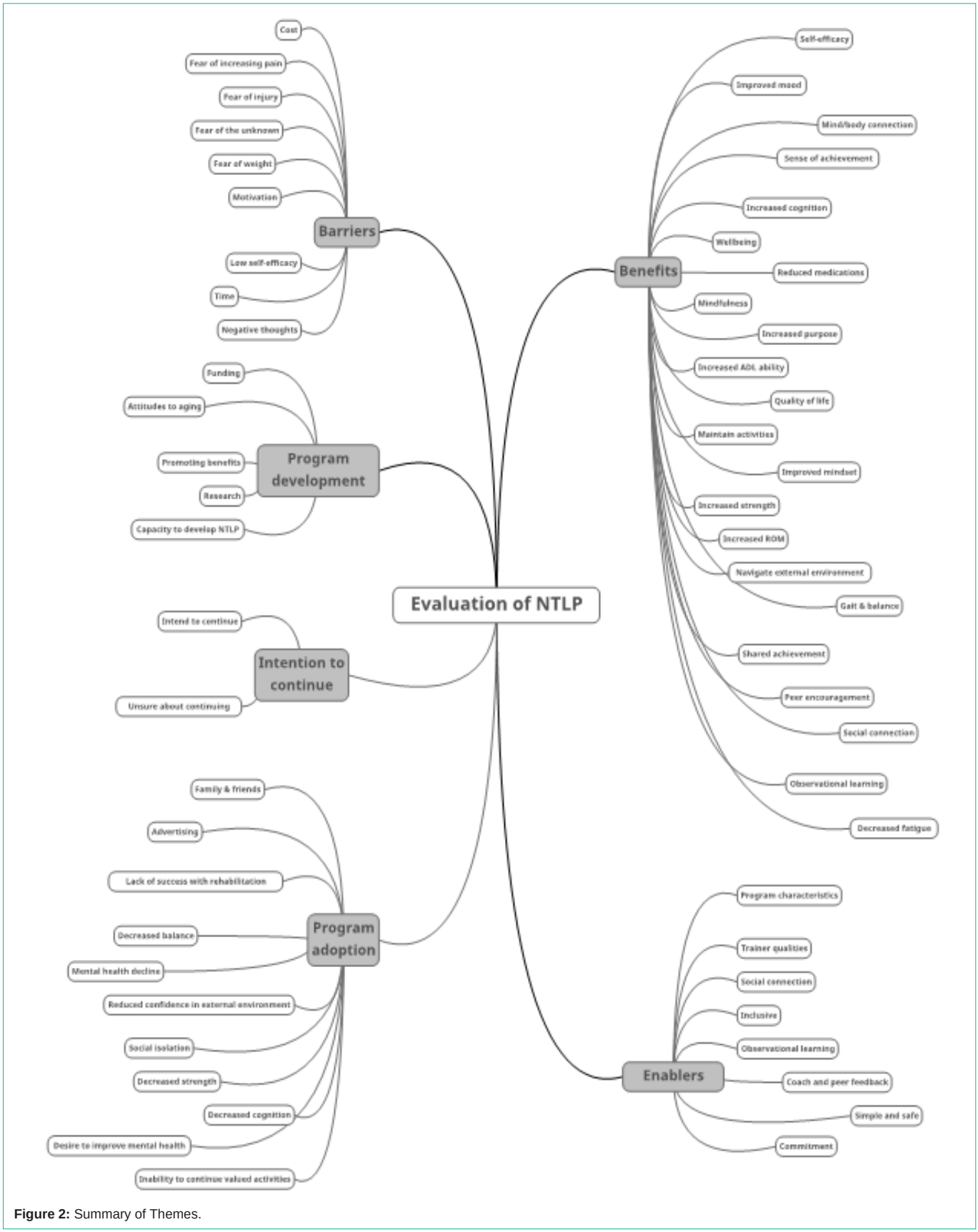

Figure 2: Summary of Themes.

These included psychological (self-efficacy, mental health, confidence, cognitive function, stress management and wellbeing), physical (strength, range of motion, gait and balance) and social support from other participants. It was evident that participants self-efficacy was enhanced through various sources such as their mastery experiences (e.g. mastering lifting weights, feeling they were able to accomplish powerlifting exercise and other things in their life), observing others (vicarious experiences), the coach's influence and, positive emotional and physiological states.

"… my mental acuity seems to be better than it was, my posture and core strength are better, so I just feel better… Apart from that I've just got a bit more strength than I did before, so all of those are positive things" (P1).

"I was fairly fragile when I started and I'm much stronger in every sense now. It's been an amazing experience…" (P4).

"I just don't get as tired or fatigued as I did. The other thing I am noticing is I actually feel better in myself. I feel a bit more like I used to feel" (P7).

Self-efficacy was a key factor facilitating engagement, effort and persistence with the NTLP. Many participants believed they had enhanced their capacity to perform the exercises, and this related to renewed confidence in themselves and their functional bodies. All participants reported they now had more confidence making decisions about, and undertaking, everyday tasks and activities they had previously avoided or had been hesitant about.

"I can walk without wobbling, I used to walk along the footpath and would just wobble a little bit to the left and I wouldn't know why it would happen" (P1).

"All those simple little getting yourself out to face the world tasks are easier. I step off trams more boldly which means I can still move around the city. I'm able to move bigger logs of wood into the fire" (P2).

"I can squat down now, and I can just get up again, which is fabulous. I can go up an incline…I can go up and down steps now and I don't need to hang onto anything" (P7).

Some participants described attending the program when they were emotionally fragile and physically unwell but always experienced feeling physically and mentally improved by the end of the session.

"I've had a lot of stress and anxiety and there've been times when I really didn't want to go or it was really hard to get up and do it… like 99 times out of 100, I will go, I will do it… And surprisingly, usually, the session goes really well, and I go home feeling great. It works when I really had a poor start to the day… I guess that's why I make myself go" (P4).

Some achieved mindfulness while performing the weighted movements, others described attaining a sense of purpose and confidence.

"I find I get mindfulness from powerlifting because you have to be 150% there to do it and that's something, I probably don't do any other time in my day or my week" (P4).

Participants discussed powerful mental health benefits such as exercise being an antidepressant and, halting mental health decline due to stalled rehabilitation and injury restrictions.

"When I say that powerlifting is my antidepressant, I think that is probably true because there would have been too much to manage without something like this for me which ticks all the boxes" (P4).

"When you can't do the things that you want to do, it really does strongly affect your mental health. Being more physically active, you have a much more positive outlook on life" (P6).

Improvement in general well-being, quality of life and sense of achievement enabled participants to stay motivated. One participant described how being involved in the program enhanced his overall wellbeing, increased a sense of achievement and, improved quality of life, focus and cognitive functioning. He had also received encouragement from people not involved in the program who observed changes in him.

"I get people saying things like you look well or you look different. I think it's to do with posture and a certain amount of confidence and you probably carry yourself a bit better when you've got more core strength" (P1).

The perceived physical benefits of the program were numerous. These included increased strength, range of motion, ability to perform activities of daily living, ability to navigate the external environment more confidently, decreased fatigue, improved gait and balance, physical appearance and building of muscle/tone. Participants described how personal activities of daily living such as putting on shoes and getting into tights became easier as well managing physical environments such as walking up hills, shopping, gardening, crossing busy roads, stepping off trams, and negotiating pavements. The descriptions illustrated how the physical benefits of the NTLP were inseparable from the psychological gains.

"I feel more secure in the fact that turning down a hip replacement is the best thing to do…Quality of life is simply that I can get out in the mornings and stick my gum boots on and walk. All the little improvements in mobility make me happy…." (P8).

"I think regaining confidence in my body, and regaining trust in my body, is a really powerful thing and then that translates across to your well-being as well" (P5).

A major facilitator was support from other members. They expressed a shared sense of achievement, social connection, encouragement from the coach and other participants, as well as the pleasure of watching each other progress.

"There are a lot of factors about it that make it different from anything I've done before. Not just the physical, it's powerlifting and it's heavy weights but it's a combination of coaching, social interaction and a very supportive group" (P4).

Perceived barriers

Participants reported several perceived barriers to engagement in the NTLP in particular, psycho-social and economic barriers. Two thirds of the participants expressed concerns regarding cost as a potential barrier to limit engagement in the program.

"First up I thought, 'My god, I can't afford it'" (P8).

"It was much more expensive than anything else I'd done before and that was one of my anxieties at the time" [making a decision prior to the program] (P4).

Despite initial concern about affordability, participants conceded the program was worth the financial cost due to the benefits. With hindsight, many participants reported that their early positive experiences with the program reinforced their decision to be involved and commit financially.

"'Well, if I get a really good result out of this, it's money well spent'. Which is the attitude I took in… it's not a cheap program, financially, but what cost do you put on your health?" (P 6).

"I forgot about the money within a couple of weeks, it was totally right, very quickly, for me at that time." (P4)

Psychological barriers were the most discussed barrier and participants indicated that some were challenging to navigate. Primary psychological barriers were apprehension, low self-efficacy and maintaining motivation. Apprehension included the impact of physical limitations, fear of pain, fear of further injury and fear of the 'unknown' or trying something new. Some conversations about apprehension led to reflections on the stigma of ageing, physical functioning and physical environment features, which participants described as creating and/or compounding their concerns.

"Physical barriers, as you get older, provide incredible mental barriers" (P2).

"There was that initial apprehension of, 'Was this going to cause more pain than what I've already got'" (P6).

"I had a lot of apprehension because I'd never been into one of those places [gym setting] and all it was were weights sitting everywhere. I'd never heard of a bench press; I didn't even know what it was…I was very nervous" (P7).

Fear of lifting weight was a psychological block for many, but some found that challenging themselves and succeeding helped overcome their fears and enabled them to develop self-efficacy.

"It's always a challenge when you start working with weights that are up around the maximum you've done before. It's a head business as much as it's a muscle business. You've got to prepare yourself to do something you haven't done before when you're lifting a heavy weight, and I suppose that's the challenging part of it" (P1).

"You have challenges in life and sometimes you don't meet the challenge and other times you do, and I think it's really interesting because physically, a lot of women don't really challenge themselves. I know I haven't. So that's another aspect in life I'm really grateful to have the opportunity" (P3).

Maintaining motivation was a barrier to engagement for one participant whose life stressors presented an obstacle to staying focused during sessions. However, despite these challenges, the perceived benefits of the program provided the motivation to attend.

"The biggest barrier has been the stressors in my life, but I usually go, so I haven't let them be barriers, but certainly challenges. There are some days when your brain just doesn't want to know about it. You have to work quite hard to be focused…if I'm not doing so well…and we're in a stressful period, the hardest thing for me is to actually focus and switch off for an hour and not be distracted by those things" (P4).

Participants and the coach pointed to low self-efficacy as a barrier. For some, perceived incompetence heighted apprehension and hesitancy to engage in the program. For others it was limitations of the body or lack of confidence in a new environment that served as initial as barriers.

"I started with a little bit of doubt. 'Can I do it, will it be too hard for me?'" (P3).

"Had I found I was the least competent and looked an idiot I wouldn't have come back." (P2)

"I looked at the gym and the apparatus that was used, which was basically free weights, and I thought 'No. I won't be able to do this'" (P1).

"The very first day I was struck by the limitations of my body, even getting up and down off the bench…I thought 'I wonder if I'm going to be able to do this'" (P5).

Implementation of the NTLP

Implementation facilitators: Participants said that despite there being initial barriers, putting their trust in the coach and participating in the program helped overcome these. Many of them commented that the positive reinforcement and support the coach provided was instrumental in this.

"He says, 'When the technique fails, that's when I stop you.' So, I've absolute confidence that he knows that, that's not right. So no, there's nothing that made me think, 'I can't do this'" (P8).

"I knew [the coach] thought I could do it and I wanted to do it, so no I wasn't scared or nervous because he talks you into it and I thought, 'Now this is going to be hard,' and it was. And I was able to do it" (P3).

Coach qualities and feedback, a safe and inclusive environment, observational learning, program characteristics and, personal and financial commitment emerged from observations (Supplementary Table 4) and interviews as key program enablers. The ability of the coach to engage with participants and their confidence in his skills and knowledge appeared a major facilitator of the program.

"I think he occupies a special sort of place in having that combination of clinical expertise and experience in powerlifting. He brings together 2 bodies of knowledge that suits the aging clientele, but on top of that, he brings a personality that is passionate, committed, enthusiastic, positive and he's got great warmth" (P5).

"…he seems to be very quick to read the way my body's working and very quick to know just when I've reached the point when I can't possibly do any more" (P2).

The opportunity for observational learning; a process of learning by watching others, retaining the visual information and replicating the movements observed, was also recognized and appreciated by some participants.

"I observed this morning how much everybody concentrated on the person moving, all their attention was on them and then when

they'd achieved it there was clapping and praise" (P2).

"I think we all feed off each other a little bit, off each other's achievements. We all encourage each other. I've found that really good" (P6).

Program development

Several recommendations were made to develop the program. Participants expressed concern that the program was financially inaccessible for some and hoped that research showing the benefits of powerlifting for older people would enable insurers and funding bodies to cover such programs, making them more accessible.

"I would like to see the health institutions and work cover, TAC, and those kind of funding bodies be able to fund this kind of program" (P6).

"It's quite expensive so it's a bit hard for some people to manage that. Perhaps in 10 years' time the Medibank and all the medical establishment who paid for my rehab [rehabilitation] at the hospital hopefully, maybe, that's the sort of thing they could pay for because it gets results" (P3).

Some participants questioned whether the program could accommodate the rapid growth in members and whether it would outgrow its current premises. They felt it was important to scale-up the program, but workforce support and development would be needed to accommodate this.

"I wonder what happens when all the people doing this say "Oh, we'd like to come to this gym" because he's only got this much space and there's only one of him" (P8).

Participants highlighted the importance of their relationship with the coach and how this was integral to the success of the program.

"If you have other settings, I think you need to have someone deliver it that has some of those qualities or that body of knowledge. I think that lies at the heart of the trust and confidence in what's happening" (P5).

Thoughts were also shared by participants and coach regarding attitudes to, and difficulties associated, with aging.

"…as we get older, particularly as a woman…we become irrelevant in life…become invisible" (P5).

"What I have noticed, is that often people don't value older people, so if they don't value them, they can't really connect with them" (Coach).

The coach described how the NTLP is a model for best practice strategy to retain quality of life as we age. It is an example of a long term and economically sustainable solution to alleviate the public cost and social burden of aged care.

"If we have something where one person can take care of 80, 90, 100 people in a fashion to keep them active, to keep them functioning, to keep them independent, keep them at home, keep them interested, keep them curious, keep them bringing their gifts into the world, it's a worthwhile thing…from an economic perspective, it is critical" (Coach).

Intentions to continue and maintain the NTLP

Most participants were committed and expressed an intention to continue powerlifting. To date, 26 adults have completed a NTLP, and the adherence and retention rate was 95%.

"…as far as I'm concerned… I'll keep going for as long as I can" (P5).

"All the little improvements in mobility make me happy… it's also opened up an avenue of exercise that I see as a positive possibility for me to continue with it" (P8).

"I'll try and still go twice a week" (P7).

Discussion

This study is the first to evaluate the NTLP including exploration of the barriers to and enablers of participation in the NTLP amongst older adults. It contributes to the limited literature exploring involvement in powerlifting for the purposes of improved health, prevention and rehabilitation, rather than competition [51]. This knowledge is particularly important considering the challenges to engagement in physical activity for older adults [66]. In applying the RE-AIM framework [67] and other complimentary theories, results indicate the dynamic nature of the NTLP (physical activity, social connectivity and education) may provide an opportunity to empower older adults, improve access and engagement in lifelong physical activity, and enhance overall physical, mental, and social health and wellbeing [22,31,35,40-43,68,69].

Participant responses indicate involvement with the powerlifting program was exceptionally positive. Challenges for the broader older adult population to be involved due to cost was perceived to be a potential barrier to adoption of NTLP. Inherent features of the NTLP such as healing and enhanced well-being, combined with the benefits perceived by participants, facilitates increased and enduring engagement with physical activity, which is inextricably connected to an improved quality of life [19,31,37,41,43,70]. Understanding these perceptions is not only critical to the ongoing success of the program but also for the design and implementation of similar interventions in the future [27-29,37,71].

Research shows that exercise programs providing for the specific needs of this demographic, as well as demonstrating an appreciation of the barriers to exercise participation, are essential for adoption, adherence and engagement for the older population [72-74]. A 2014 six-month longitudinal study found that the four major predictors of exercise adherence and maintenance in the older population were coach characteristics (e.g. motivational), coach-participant relationship (e.g. trust), environment (safe, inclusive, supportive) and perceived benefits (physical and psychosocial) [30]. The importance of an environment catering to the needs of the individual and, providing support and opportunity to relate to others was evident in this study. Motivational theories, such as Self-Determination Theory (SDT) provide a conceptual backdrop upon which to interpret these findings. Informed by SDT, social contexts can nurture people's intrinsic motivation by satisfying their psychological needs of autonomy (e.g. taking charge of their healing process), relatedness (e.g. an environment where participants and coach can relate to one another) and competence (e.g. a programme

to meet the needs of the individual so they can set and achieve goals) [75]. Promoting autonomy and social support have been found to be critical in engaging older adults in exercise [76]. Self-efficacy has been found to be important in initiating and sustaining Physical Activity (PA) intentions in older adults [27,34,74,77]. In addition, McAuley [78] showed that autonomous forms of motivation (e.g. enjoy the activity itself, value the benefits of an activity) may play a pivotal role in adopting and maintaining PA activity for older adults. Taken together, the findings of this research underscore the importance of a motivationally enriched powerlifting-based, life-skills programme. The wide-ranging benefits should be promoted to older adults, families and other relevant stakeholders and settings (e.g. WorkCover, Aged Care, Veterans Affairs, Workplaces) to optimise the adoption and sustainability of programs such as the NTLP and the outcomes that can be achieved.

Consistent with previous research, perceived barriers relating to the use of the NTLP emerged in this study such as lack of self-efficacy, fear of exacerbating pain and fear of further injury [27]. Some NTLP participants initially questioned whether their body would cope with the demands being placed upon it. Beliefs can be a major predictor of exercise behaviour, and control over the aging process has been shown to be important for healthy aging [31,33,74,79]. Physical and cognitive changes that accompany aging impact independence and feelings of wellbeing conversely, engaging in PA can mitigate these age-related changes [80]. Literature suggests that strength related PA is one of the most beneficial influences countering age related decline [80-82]. However, the traditional strength training approach for older adults uses TheraBand, small handheld weights and body weight for resistance which is unlikely to provide adequate stimulus for sufficient adaptation to counter major injury or disability [83]. The NTLP coach describes his approach is to start with simple, achievable movements then load them. This gives participants a sense of power and progression in a safe environment. Increased resistance and greater complexity of movement are then added, which promotes physical, behavioural and cognitive adaptation. The number of barriers reported highlights the complexity of the implementation context and the importance of targeting multiple levels (e.g. participants, families, and coach) when implementing programs, aligning closely with previous research and established guidelines and frameworks (RE-AIM, socioecological model) [67]. Ensuring health professionals (e.g. exercise scientists/physiologists) delivering such programs are aware of potential barriers for older adults and have the skills to optimise self-efficacy and facilitate adaptive behaviour change, including implementing action and coping planning, motivational interviewing and person centred therapy approaches, for older adults to overcome barriers are important.

Participants reported intentions to continue powerlifting. This is important and suggests the NTLP will likely be maintained on an ongoing basis by many of the participants and result in further positive health and social outcomes being achieved and promoted. It is also highly likely that participants intentions to continue and maintain the NTLP related to their positive beliefs, perceived benefits and experiences of the NTLP. Consistent with this, other studies have shown that beliefs developed during an intervention (e.g. exercise self-efficacy) correlate with intentions and program maintenance [30,74]. Ongoing longitudinal evaluation to assess program implementation, maintenance factors, including assessing outcomes for older adults is warranted.

Program development for the NTLP is ongoing and includes collaborating with researchers and professional industry bodies to conduct further studies into the NTLP, as well as into the benefits of powerlifting for rehabilitation and healthy aging in general. More coaches are currently being trained to help support the increasing number of weekly programs and, communication between the coach and interested parties is underway, both in Australia and internationally, to increase the reach and maintenance of the program. These are critical steps in the implementation process and will enhance capability and capacity to deliver and successful implement the NTLP and support broader scale (up and out) dissemination to improve population-level health outcomes and policy and program changes [15,18]. Ongoing longitudinal evaluation to assess program implementation, maintenance and scale-up and scale-out factors, including assessing outcomes for older adults is needed [15,18]. Frameworks such as the RE-AIM framework, in isolation or in combination with other theories, can provide a solid basis for designing, evaluating and reporting the implementation of NTLP and other similar programs [67].

Limitations and Future Directions

The socio-demographic of participants was limited as all were well educated with careers prior to retirement. Future work could include surveying older adults' and other stakeholders (e.g. health practitioners, policy makers etc) in the regional Victorian region to discover awareness of the NTLP and the motivation to adopt it (or not). This would inform program reach and devising targeted strategies and plans to promote and support the sustainability of NTLP and overcome any potential barriers. The majority of study participants were female which reflects the gender ratio of the participants in the NTLP to date. While it is not uncommon for older adult female ratios to be higher in the extant literature surrounding participation in exercise or resistance training programs [27,84], it would be interesting in future research to explore why more females than males become involved in this context to support active strategies to address this. The study also did not capture participants experiences post the NTLP. A follow-up study could be conducted to discover the levels of exercise maintenance and associated determinants to support the sustainability of the NTLP. Longitudinal studies are also needed to assess how and whether there are any changes across an individual's life span. Awareness of how motivators change with age can assist in keeping older adults active. Other future directions to be explored could include focusing on the economic and social impact of participation in similar programs as an alternative to residential aged care or WorkCover approved programs, conducting implementation and dissemination research of similar programs in a variety of settings and locations with a view to improve wider-scale accessibility and engagement, exploring the preventative nature of similar programs (e.g. mitigating age-related decline and chronic health conditions); and assessing the feasibility of similar programs in more ethnically and socioeconomically diverse communities.

Conclusion

The findings emphasise the unique and varied needs of older adults' involvement with the NTLP and provide knowledge that can

be used to guide the design and development of resistance-based interventions for this population. Results of this study indicate that despite reports of initial challenges engaging with the program, the participants experienced many benefits that have enabled improved health and psychosocial outcomes such as quality of life. This suggests that the benefits of the NTLP can inform ways to limit barriers and maximize facilitators enough to enable engagement and ensure older adults achieve safe and sustainable outcomes, especially enhancements in their psychosocial health and wellbeing.

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