

Understanding the Barriers and Enablers to Sporting Activity in Relation to Bone Health: A Qualitative Narrative Study among Adolescents and Young Adults in New Zealand

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ABSTRACT

Background: Sports participation may be considered a method of reducing the risk of fragility fracture in later life by maximizing Peak Bone Mass (PBM) in the growing years. However, sports participation typically declines during late adolescence and adulthood. This qualitative study aims to identify barriers and facilitators to engaging with regular weight bearing sporting activity in adolescents and young adults in New Zealand.

Methods: 44 adolescents and young adults aged 17 to 33 participated in nine focus groups. The study was conducted using a semi-structured approach with open-ended questions and prompts. Transcripts were thematically coded using an inductive content analysis approach.

Results: The three main barriers to sports participation that emerged were a) structural (disorientation in a new living environment, facilities, access to healthcare), b) social (financial and time constraints) and c) personal (social pressures and lack of an understanding of why sporting activity matters for bone health) while enablers of sports participation included a) supportive environments, b) access to health checks including support to avoid injury and c) education to better understand benefits of recreational sporting activity.

Conclusions: Current awareness of osteoporosis and lifestyle factors that impact PBM is limited. Educational interventions are now warranted and urgently required.

Keywords: Barriers; Enablers; Adolescents and young adults; Recreational sporting activity; Qualitative; Lifestyle; Peak Bone Mass (PBM); Osteoporosis

INTRODUCTION

Osteoporosis is a major public health problem through its association with fragility fracture. Such fractures are typically described as occurring at the hip, spine and distal forearm, and are associated with considerable mortality and morbidity, which has huge personal and societal cost [1]. Peak bone mass (PBM) is an important contributor to osteoporosis risk in later life and can be modified through regular weight bearing sporting activity in the teenage years and young adulthood, as highlighted by recent systematic reviews [2-10]. Despite this, sporting activity tends to decrease in late adolescence [11]. A study by Sport New Zealand in 2016 showed that the rate of adult participation in sporting Physical Activity (PA) declined over a 16 year period by nearly 8% in all adults, with a greater decrease (13.9%) in young people

aged 18 to 24 years. The study also indicated that the rate and pattern of sporting PA decline is dependent on ethnicity, with the greatest decline (over 11%) in the Pacific group [12]. Furthermore, patterns established in earlier life may carry through to later life, the World Health Organization's (WHO) 2018 global action plan on PA 2018-2030 aimed towards a 15% reduction in the level of physical inactivity but globally, one in four adults and three in four adolescents do not meet the global PA levels required for optimum population health [13].

PBM is typically attained in the late twenties and while weight bearing sporting activity is an important contributor, although other modifiable lifestyle behaviours are also contributory, including dietary calcium intake, smoking and alcohol consumption [2,14]. Given the particular importance of weight bearing sporting activity

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to PBM acquisition it is important to understand what factors limit activity in such sport, and what factors might encourage young adults to engage in sporting behaviour that could have long lasting health benefits. Therefore, in this study we sought to document barriers and facilitators of sporting activity among adolescents and young adults in New Zealand through a qualitative focus group study. Information gathered in this study may help inform future public health initiatives to improve bone health in young adults.

METHODS

Participants

Study recruitment was undertaken from July to October 2018 in the Wellington region in New Zealand. Ethical approval was obtained from the New Zealand Health and Disability Ethics Committee (reference #HDEC 18/CEN/18).

Students from Victoria University of Wellington, and other adolescents and young adults aged 16 to 35 associated with the university, were approached to participate in the study. The participants who had previously been involved in a larger quantitative bone health study had consented to being contacted by email for further research. Others were recruited through word of mouth, recruitment flyers and emails posted through the university media service. Participants were provided with participant information sheets and informed consent forms. Written informed consent was provided by willing participants. Focus groups were held at the university in a neutral toned meeting room with comfortable seating. At the focus groups, participants were reminded that their participation was voluntary and could elect to use a pseudonym of their choice for the group discussion by writing their own name tags to be worn on their clothing (if they preferred). Participants were also reminded that they could choose not to answer any questions, could leave the group at their own discretion without giving any reasons and without consequence, and that any data provided prior to leaving the group would not be withdrawn (but would be stored in a de-identified form).

The focus groups were semi-structured with open-ended questions. Participants were given an option to write points of interest on scribe pads to share information that they did not want to discuss openly for whatever reason. The discussions were recorded with two or more recording devices and an assistant recorded non-verbal communication (field notes, to record information about the level of consensus and dissension to the topic under discussion). Examples of guide questions are shown below in Table 1.

At the end of each discussion, the lead interviewer summarized the ideas that had been discussed and asked for any final feedback to

ensure all ideas, opinions and experiences were recorded. After each focus group, a debriefing session was held with the study facilitators to highlight any discussion issues to be addressed, including any keywords, themes or patterns and relationships identified in a reflexive diary (preliminary analysis). Subsequent focus group interviews used an iterative process whereby any previous emergent themes were followed up to obtain further insights until all themes were fully explored to achieve theoretical data saturation.

Data analysis

The recordings of the focus group discussions were transcribed verbatim and then verified by listening to the voice recordings several times to ensure all data was recorded correctly. All participants' data were de-identified. The transcription and any tabulated data, including any notes obtained from the focus groups, were thematically analysed. We used Corbin's iterative process of qualitative analysis whereby inductive patterns emerge into themes from the data itself by constant comparative analysis [15]. Sections of data were then assigned codes and compared for consistency. The assigned codes were categorised into themes. NVivo (qualitative data analysis software, QSR International Pty Ltd. Version 12, 2018) was used to organise the data.

RESULTS

Nine focus groups discussions were held in total between August and October 2018, with 3 to 11 participants attending each group. The length of the discussions for each focus group ranged from 35 to 60 min (excluding the time taken for introductions, completion of the consent forms and post interview discussion). The sample size comprised 44 individuals, with a mean age of 22.9 and an age range of 17 to 33 years. The majority of participants were of European descent, 10 were of mixed ethnicity including Māori, Pacific people, Asian and Indian, approximately two thirds were female, with one third male (29:15).

Themes

The themes that emerged are displayed in Table 2 below.

The analysis of the results indicated the presence of three main types of barriers to sports participation: structural (disorientation in a new living environment during the transition to adulthood, facilities, access to sports injury care), social (financial and time constraints) and personal (social pressures/self-image, lack of an understanding of why sporting activity matters for bone health).

The results indicated that enablers for sports participation included having supportive environments in social groups that improved mental well-being, having regular health checks and support

Table 1: Guide questions.

Question No's.	Questions Asked
1	How important is recreational sporting activity in your day to day life?
2	What prompts you to stay physically fit?
3	What made you take up recreational sport? What kept you going?
4	Was there anything that stopped you from taking up recreational sport?
5	How happy are you with your recreational sporting activity level?
6	Have you ever sought any medical care for sports related injury?
Closing Questions	
7	If you had to sum up the barriers you face daily to undertake regular recreational sporting activity, what would they be?
8	How would you overcome those barriers?

Table 2: Key barriers and enablers to recreational sporting activity.

Barrier	Enabler
Structural <ul style="list-style-type: none"> • disorientation in a new living environment • facilities • access to healthcare 	Supportive, social environment that promotes mental wellbeing.
Social <ul style="list-style-type: none"> • financial constraints • time constraints 	Support to avoid injury
Personal <ul style="list-style-type: none"> • social pressures • lack of an understanding of why sporting activity matters for bone health 	Financially viable i.e. affordable access to university and sports facilities. Better education to understand the advantages of recreational sporting activity on long term health

structures to avoid injury, understanding the specific attributes and benefits of habitual recreational sporting activity, supportive socio-economic structures, and the affordability of university and sport facilities.

The types of barriers and enablers to sports participation that emerged from the focus group discussions are explored in further detail below.

Structural barriers

Participants felt disoriented in new environments: Participants were aware of structural changes occurring throughout life, that the decisions made by families or educators during the different phases of school life can change the course of a life. Previously, parents and educators modeled sporting activity behaviours, encouraged sporting activity. The change of routines and behaviour during the transition from a home environment to independent living at university or as adults may be considered a barrier to sporting activity initially. Previously, young people indicated that they had a more structured and relaxed weekly routine in their home environment so there was more time available to enjoy participating in sporting activity. Despite having more free time available in tertiary education, young people felt scheduling sporting activity arduous.

“It’s just kind of like adult life gets the best of you, seriously.”

There seems a definite lull in sporting activity during the transition to university life. Without the assistance of parental management or sports co-ordinated activities young people found organising new club memberships or activities or meeting new people in unfamiliar environments a barrier to engaging in new activities.

“It’s all too new and so much is going on-you are not even sure who your friends are yet and who you want to hang out with.”

Environmental facilities affecting access to sports: The physical environment (space and place experiences, including indoor and outdoor culture) affects levels of participation in recreational sporting activity. When attending university, the recreational sporting activity participated were mostly indoor sports, and during the evenings to around study or work schedules. Those who had previously lived in rural areas or had beach or small-knit communities with unlimited outdoor access or communities within the bigger urban structure wanted to feel protected, *“still feels safe.”*

“It’s easier to go outdoors and get sunshine when you are at home and get into a routine of PA with the dog going for walks...or go play in the garden... when flatting there is no garden no ...and sitting outside in the garden for sun exposure.... the buildings are not designed for outdoor living.”

Weather dependency, seasonal changes with long dark nights and poor weather disrupted the recreational sporting activity routine.

“When you realise you have been indoors all day and haven’t seen the sun,”

Although nearby the university’s gym/sports complex is regarded as *“not the best facility”*, and perceived as small, overcrowded with limited options and an expensive option when on a limited budget.

“Accessibility and ease of use is important.”

Managing sports injury and accessing to health care: Others avoided or delayed seeking medical/healthcare attention and, especially after injury or sickness which would permit periods of sedentary behaviour, young people found it difficult to return to routine recreational sporting activity.

“So that put me off for like ages, but I don’t know what I did to myself, I never checked it out.”

Injury prevents sporting activity participation. The likelihood of significant injury in sports such as rugby was a concern, for example being spear headed in rugby was *“scary.”*

Inadequate supervision and training is a barrier to sporting activity as, in New Zealand young players maybe supervised by senior students as coaches and umpires who may be inexperienced in understanding potential risks to injury.

“You have to coach and umpire games younger players as part of your training and commitment to the game as they don’t have enough people to help otherwise you don’t get to play.”

In addition, there was a general agreement that winter sport was *“off-putting,”* because of the very early start of Saturday gameplay times, *“cold damp weather which made playing with foggy glasses,”* difficult, *“and “falling onto wet concrete was not fun,”* (dangerous) and *“would rather sleep-in on a Saturday morning,”* and *“always felt tired,”* as there was always a busy schedule of, *“something every day of the week.”*

Discussions with friends may lead to conflicting ideas of the benefits of some activities. For example, a vegan participant remarked that his flat mates claimed that milk is not related to strong bones, but repeated prolonged high impact forces (through Kung-Fu or boxing) strengthened bones by damaging bone tissue.

“The pain doesn’t put you off, it’s like sitting and riding a bike it becomes ok.”

Inadequate healthcare and support structures impacts on sporting activity and bone health. One participant who regularly trained in long distance agreed his shins were painful and suffered lower extremity overuse bone injury (LEOBI) continue to enter marathon

events regularly and chose to rely support from his physiotherapist as he was not prepared to give up running.

Participants found access to health care difficult. Doctors' visits were considered costly and a deterrent to seeking appropriate healthcare, and sometimes would prefer cheaper options.

"Physios always good at claiming through ACC, so its \$5 versus \$45."

A participant (who previously was a sports trainer) suggested sport had financial incentives which themselves were barriers to sporting activity as players would play even when injured.

"There is a lot of money going on performance even at high school, as [some are] recruited for scholarships at around 14."

Participants viewed distance running as competitive and addictive. Participants wanted to run further and faster, weigh less and receive accolades for weight loss and endurance. Despite being very knowledgeable about healthy diets and behaviours, some participants would continue to run or play sports while injured using internet for advice for self-treatment or did not permit adequate injury recovery time to resolve the injury.

"Changes to running style helped."

Although they trusted their doctor's knowledge and competence, most participants felt rushed during doctors' visits and did not receive detailed information or suggestions of ways for maintaining good bone health.

"Seeing doctors [was] really bad, can wait for a specialist for 2-3 months of waiting, letter in the post-who uses the post anymore?"

"You do make an effort to avoid things but try to get back to doing it again and will still find a way to play."

"Would get to my brain-I need to play."

Social barriers

Sports participation was dependent on finances: During the transition period from home to university life students experience new financial constraints. With newfound independence, students have to self-manage their own limited funds. Allocating money to sporting activity may be not as feasible when considering the cost of transport, sports equipment such as bikes, training boots and specific sport clothes.

"Played touch for 8 h, rolled ankle-had really bad shoes."

Gym or sports memberships were selected for a number of reasons such as: the price of the membership (resulting in participants often choosing the cheapest gym available), the type and size of facilities available, the activities offered, the opening hours, the ease of access (whether they were able to walk or commute to the venue) and the quality and level of personal privacy available in the changing rooms. Some of these factors were a barrier to engaging in sporting activity.

"When the scholarship money ended so Kung Fu ended."

"Ridiculous fees to be part of a [sports club or] team, so expensive as a PhD student, basically on the minimum wage and with Wellington rent being so expensive..."

"Student course fees are so expensive, so exercise is a luxury. It is so wrong."

Balancing work and study commitments impacts sports participation. Academic pressure, especially for those students with the burden of limited student living costs, to perform well

outweighed the benefits of sports participation. International fee paying students and those students lacking parental financial assistance were further disadvantaged and often sought paid employment to support themselves.

"Needed to work and study... trying to hold down three jobs and have to study harder, so harder to be committed to exercise, and gained weight."

"I couldn't...to join the university netball team it was like 350 bucks for the season and, because I'd never paid before, so stopped playing so much, as it was so very expensive."

Managing time commitments independently was a progressive learning curve: During the school years, young people felt that they were more likely to enjoy sporting activity when they were supported by family and peers, and were involved in volunteering to assist sports activities at school. The lack of parental support with coaching and managing teams or transport impacted some young peoples' level of sports participation.

"My sister was playing netball, my brother was playing rugby and I was playing football, which was always real hard for my parents, 'cause like, drop that one off, go and watch half of this one, go back watch half of that one, pick them all up again."

Finding the time to engage in sporting activities independently required time management. Being too busy tired or wanting to sleep were deterrents to engaging in sporting activity. Additionally, conflicts of agendas manifest as further barriers to sporting activity participation. These conflicts include: academic demands (including lack of coordination of exam loads between course work and exams), work commitments, food preparation/household chores, public transport costs and time taken in travelling or commuting and the inability to drive a car or have access to a car.

"I think something a little like that. If I have something to do like I will put exercise on a backburner or do it tomorrow like it's, when I was its summer I would do it regularly but then come back to Uni, I kind of, yeah push it aside."

"More responsibility here. Living in the Hutt transport is an issue, don't drive-how to get here is a problem."

Participants used electronic devices to procrastinate or to distract themselves from other activities.

"I spend a lot of time on my phone, I don't even realize it."

Time spent in small screen recreation (SSR), that is, television, computer, video, and DVD distraction, represent lost opportunities to participate in sporting activity.

Personal barriers

Social pressures and self-image issues: Extracurricular sports activities are common at an early age in New Zealand with a high expectation to engage in both summer and winter sports during the school years. The high personal and peer expectations to achieve sporting success was seen as a barrier to sporting activity. The pressure of social media recognition through the internet magnifies the response of achievements (or non-achievements).

"I saw you in the newsletter."

Another participant said that their parents wanted them to play sports, most commonly rugby, followed by athletics.

"Dad was rugby born, born to play rugby. Good but not good enough to dad's standards. Motivation-because family also pushed."

Successful sport role models include national and international sports personalities who inspire sporting activity participation from an early age, although, this may also lead to despondence and lack of self-esteem by not achieving similarly high levels.

In New Zealand, gender was not seen as a deterrent to sports participation with mixed gendered teams at primary school level common, although at senior school males often played rugby and cricket, females played netball and badminton.

“Social barriers like gender-no!”

“In our family everyone talked and played, watched the footie weekdays and weekends either on the field, on the side-lines or on the telly or at the pub.”

Negative aspects of sporting activity include fear of disappointment or under-performing especially in team sports. Therefore, non-competitive sporting activity is preferable for some young people. College rivalry encouraging heroism amongst young may also be perceived as a barrier to sporting activity, with feelings of psychological pressure to attain goals which may impact on mental health.

“It’s in the culture, how you are perceived at school. It’s cool to play (rugby), it’s part of who you are in NZ... being selected for the top team is cool, at school.”

Young people are influenced by social media and are challenged by self-awareness of how their own physique, fitness status, self-perceived athletic prowess or lack of ability or skills or confidence, shyness, self-consciousness is portrayed often publicly. The fears may be masked by showing lack of interest or willingness to participate in sports which may cause feelings of conflicts and exclusion and the fear of being judged or embarrassed. Self-image and body dissatisfaction was common some for female participants.

“I feel like I’m really out of shape.”

“You get bullied- kids are cruel when you are chubby.”

“My boobs get in the way!”

One participant was not able to play rugby as it was considered dangerous to have a small physique.

“A beanpole.”

Lack of an understanding of why sporting activity matters for bone health: How different types of sporting activity affected bone health were not well understood. The concept of weight-bearing activity was detrimental to bone health as it may cause injury.

“Underwater hockey is not too bad for your bones-not weight bearing.”

“Never think about, I could do something that could change my bone structure?”

Enablers

Participants suggested a number of drivers to increase sporting activity and PBM potential including the lifestyles young people adopt including: increasing bone health knowledge, free access to sports and healthcare especially when injured, positive reinforcement of healthy behaviours from health professionals with nutritional advice, migration away from alcohol consumption, support from academics regarding workloads, social groups (friends and family) and a desire to learn and enjoy new sporting experiences including cycling as an alternative form of transport.

Supportive environments

Some young people were aware of their carbon footprint and wider concerns for climate change but were unsure of how to change their lifestyle and how this impacts on their bone health. They felt that environmentally conscious modes of transport such as walking and biking would have the added benefit of increasing their PA.

“Now it’s biking primarily as I don’t have a driver’s licence-logically it is easier to bike for a good combination of reasons.”

“It was definitely environmental to begin with... I went through my whole process of finding things up, mostly to do with industry and the environment. Then you just suddenly grow to appreciate every aspect of it and just how better it is.”

Fun, friendly routines in social groups: The social interactions young people have play a crucial role in young people’s decision making and encouraging positive lifestyle patterns such as sporting activity. Social motivations that encouraged regular sporting activity included forming new friendships, discovering new opportunities, positive peer influence, enjoyment away from studying/routine, the prospect of healthy competition, outdoor spaces with sun exposure and general mental health benefits.

“The main motivation was fun and to do what your parents want you to do.”

Including reaffirming family social connections using sporting activity such as, *“skiing with the family as an annual trip.”*

Having the company of friends and family inspires confidence and reduces the anxiety and shyness felt in unfamiliar group situations.

“It makes it easier that others go in the family-don’t like going in by myself.”

“Played with siblings-plays touch, at the games, ...we are there, so may as well play rather than get bored... in my family everyone plays touch-it’s easier.”

“The motivation was the social aspects, fun, less awkward to do something with others.”

Going as a group was found to involve more fun, more motivating to participate in classes/sports.

You have to show up or others will notice...having a friend helps you show up, saying, let’s go, so going in groups helps you to show up. Definitely helps to meet friends-a more normal routine.”

“It’s always game, competitive, mostly as a kid you choose sports just for fun and it’s enjoyable, just want to sleep and hang out with friends. That’s what you did as a kid-it’s not a waste of time, it’s a mind-set.”

“When someone asks you where you were when you didn’t come the week before.”

Taking caring of mental well-being: Engaging sporting activity induces increased energy levels to feel energized and improves mental health status.

“Playing sports - feel good, is good, feel awake. Bad, also enjoy the stiffness, sore muscles feel good. Pain is good makes you feel strong-wouldn’t do it again if it hurts too much.”

“Main motivation-help with my mental health.”

Self-organization was the key to organizing a sporting activity schedule.

“I like to get it out of the way. I find working to the natural daylight cycle helps.”

Students found regular sporting activity (such as football) beneficial to health and were a stress reliever during exam periods of intense studying.

In the winter, participants were aware to be supportive of each other as a team to get some sun exposure.

"We try to make each other go outside [for sunshine and a break], the reasons were not always specifically to get some vitamin D, just going outside and feel good."

Participants found sporting activity reduces frustration and anxiety, choosing a variety of different activities to keep motivated.

"I started off with soccer, then tennis, then around my puberty basically nothing... then sometimes went to the gym to impress the ladies."

Participants found negative self-image issues a driver of sports activities.

"As a kid... raised for academic studies, for debating classes. Dad thought I was getting too fat as a child and encouraged me to play badminton every day."

A participant found a positive attitude helped to achieve good health.

"Now more health conscious and want to be active at 60-80 and still be active for my kids-healthy is good!"

"But I used to use the excuse be like I am too busy or too tired so I will do it later but I sort of recently realized that you are not actually ever that busy that you can't find an hour, 3 or 4 times a week to do this. And it just improves like everything like my mood, my ability to think and all that kind of stuff. Also if I am tired, it actually you know helps. So I find that very easy to motivate myself to go. It's probably also a large part procrastination I much, much prefer to go to the gym and lift weights for an hour than to sit at my desk and do work."

Negative attitudes to sporting activity may be masked by showing lack of interest or willingness to participate but may also be motivators of action.

"Feeling out of shape, motivates, you need access to sports, timing and scheduling, so and up walking and hiking most of the year-it really enjoyable."

Health checks and support to avoid injury: Regular health check-ups may permit awareness of changes and motivate positive changes. One participant suggested that young people were concerned more about the present situation and the immediate benefits rather the future impacts or benefits.

"Psychology of teenagers is always going to make risky behavioural decisions. Need a hard sell or reverse psychology. Not many worry about what's going to happen when they are 90 years old."

Most adolescents and young adults felt that if their doctors gave them choices to adapt their behaviour especially through sports and nutrition to obtain good bone health and, that if they were aware of their risks of fragility fracture/osteoporosis, they would proactively modify their behaviour.

"If was told, like was told by my GP or something that I am on track to develop osteoporosis or I am not doing something I should be. Then I would be happy to like add something extra to my diet to help or maybe if there is like a particular type of exercise that would be better then maybe incorporate that into my routine."

Making sporting activity more accessible and affordable: Financial constraints impacted sports participation as expected. Access to

free and nearby sports facilities was perceived as a motivator for sporting activity especially with social group activity incentives that may encourage regular PA with moral support and guidance to training and help build PA routines.

"I heard about that, how they have a free gym at Otago, and I'm so jealous. I would totally, oh my god, I would go to the gym every day if it was free and I'm not even kidding."

Relevance: understanding why sporting activity matters for bone health: Young participants found self-awareness and positive affirmation their health was on track gave them feelings of wellness, fitness, strength and pleasing physical appearance which further motivated sporting activity.

"I was younger, I never did at all. Yeah, so when I did that [heel bone] scan, that was probably me at my most unfit, unhealthiest and now it's like come in to healthiest I have ever been."

There was a suggestion that there is a need to plan sporting activity especially when there is a big project coming up.

"Everything improves when I exercise, I don't want to ruin the benefits of the exercise."

There is an internal driver to engage in sporting activity to balance less healthy lifestyle habits.

"Guilt-because I tend to eat more when I stress."

As a form of procrastination young people may choose to exercise or go to the gym rather than to be at the desk studying.

"Mum and dad wanted me to swim and started when I was two years old. At 11 started kick boxing and scuba-diving-more through clubs, competitive teams and so much fun in between studies. Important to keep a work life balance-more to do sport than to study."

Students felt time management skills were important to allow time for sporting activity for bone health, leisure, day routine chores such as planning healthy meals and other domestic tasks. Strategies incorporating routine sleep and work patterns such as meditation and yoga assisted managing work and study commitments.

"Sports did not impact on academic sides, still got good grades just managed time better."

"Force yourself to break out your comfort zone/habit, routine makes it easier to go, not to question yourself, just go."

Many participants recalled nutritional and healthy lifestyle advertised campaigns from childhood such as the "Push Play," and "exercise, sun and fresh air," "Five plus a day," and "food pyramid," and "eat your colours," as well as campaigns targeted at parents that encouraged milk or dairy consumption when they were younger.

To incentivize individual or team challenges young people used fitness or mobile tracking devices and training Apps such as Pokémon Go to monitor fitness levels and sporting activity.

"Sets up team challenges at work, crazy competitive, crazy number of steps."

"It's like, public boasting right."

"See your ranking in the same stretches makes you competitive, it's a challenge."

"Using sports to stay active, is a method to keep up the fitness level."

"By signing up for two marathons. Not much support after the day event. For those doing super long distances you are basically on your own. Need proper shoes, you can find the information out there but more professional

info available-feels like you sign up they have your money. The information given is just basic information. But likes the banana and cookie at the end-so good! Support for training apps, coaching pamphlets, get a running coach, or a running group."

"Guidelines-there are experts out there but there is information, just need to know to get it. Runners know what a good recovery period is-but will keep on going, can't stop, keeps pushing yourself tracks himself 200 kms-5 h, it's "part of the bravo thing" going 27 kms on Saturday and runs 2 h every day. "Gets used to it". See your ranking in the same stretches makes you competitive, it's a challenge."

Once committed to the team, the pressure to perform and not let the team down was a motivator to continue playing and turning up for the games and practice sessions.

"In team sports you can't just not turn up!"

"Addicted to competing, using mobile apps to track his progress and public competitions to motivate himself as competitive as hell."

"He'll do...he'll do...he actually, he tracks his thing on (...) like "I have to do 100 km this week."

Competitiveness and demonstrating fitness by following exercise regimes, or endurance feats may be drivers to action.

"P45-3 h, 5 days a week, an intense workout for a few weeks - can make you vomit as you eat very clean, no sugar, no calories."

"Don't want to be seen chickening out."

DISCUSSION

Promotion of sporting recreational activity may be considered a tool to reduce the impact of fragility fracture and help in the prevention of osteoporosis disease later in life. Young people understand nutrition and sporting activity are important for overall health, but general knowledge about osteoporosis is typically lacking [16,17]. In this study participants did not identify with the concept that bone health could be improved with increased high impact weight-bearing recreational sporting activities.

It was noticeable that barriers to sports participation were more vividly recalled by the participants compared to enablers of sporting activity. The barriers young people faced in adopting lifestyles associated with better bone health revolve around the transition stages in life. In particular, the transition from secondary schooling to tertiary education, that involves newfound independence, financial independence, the opening of new horizons and social interactions without the familiar social support of home life. Participants acknowledged that many of their teenage sporting activities would not have occurred without parental support. Other constraints to sports activity included complexities in managing increasing academic pressure with part-time work and social commitments. In particular, at the start of tertiary education, some young people prioritized social engagement over sports activities.

Our study concurs with a systematic review of barriers to sporting activity that found a lack of time, financial affordability and social aspects along with physical access issues placed significant barriers to participating in sports activities [18]. A New Zealand study suggests that the prioritization of sports participation diminishes when trying to balance study and work commitments [19]. Without formal time structures around activities such as tertiary education, young people felt their time management were barriers to engaging in sporting activity.

A review of women's sports participation in Southern Europe suggested that gender inequality played a significant role [20]. Our study found some female participants felt they had to be good at everything both academically and physically. Gender stereotypes in sports participation do not seem to be a barrier until a lower college level, with females commonly playing rugby, cricket and football [21].

Obstacles in accessing appropriate healthcare also formed a barrier to participating in sporting activity by complicating and delaying comprehensive and timely recovery from prospective injuries. Injuries occurring when young people participate in sporting activity may impact in future playing abilities of young players, reduce the fun factor and motivation to play [22]. A recent New Zealand study of sport participation and association to injury found that early sports specialization (before 13 years of age) was not associated with an increase the likelihood of reporting a history of injury [23]. Research by National Basketball Association and USA Basketball suggests the engagement in sports should be a positive experience that the focus on achieving results rather than for "fun" can distract from the long term physical and mental health benefits achieved with sporting activity. The same study suggests there may be detrimental consequences due to early childhood high intensity training, single-sport specialization, frequent competitions leading to increased burnout and overuse injury and for reduced competency and life skills in other areas in life [24]. Our study found that fun with family and friends was an important driver of sporting activity. Some participants wanted to enjoy sports for fun but found the competitive nature of sports participation to be a barrier to joining games as selection and ranking during sports trials was off-putting [25-27].

Participants generally noted access to a variety of sporting activity facilities available but the associated costs did not always make them viable. The cost of purchasing sports equipment, club membership costs, and transport to sports venues imposed further financial barriers. Participants felt the financial burden in various ways.

Participants in our study suggested positive reinforcement of healthy behaviours and to improve sporting activity sports coaching, friends, family, support from academics with study and work load, free access to sports and healthcare. Other suggestions for enablers to sporting activity include aid for: student loans, the costs incurred for sporting activity access/equipment/sports dress codes/protective gear required, health care access (including associated GP costs, nutritional and dietary advice, physiotherapy, long-term injury recovery support, injury prevention, including appropriate shoes, sport-protective spectacles or supportive sportswear or sports library to loan equipment and verified and qualified sport club/school trained coaches and umpires [28].

The strengths of this study include the participants' ethnic diversity, age range and spread of socio-economic groups. Although the generalizability of this study may be considered limited to the university environment, the data was sourced from a range of participants from the university campus who came from a wide variety of backgrounds, reflecting local population diversity in in the Wellington region [29]. Trustworthiness in a qualitative study may be judged by its credibility, transferability, dependability and confirmability [30]. An appraisal of the research protocol by an external party and other qualified researchers in the field ensured dependability of the research process. The study protocol and reflexive diary of the iterative research process permitted transferability of the methods used to other contexts. The data

presented here were sourced from a range of participants from the university campus who came from different backgrounds, affirming credibility. Participants were encouraged to talk freely, the interviewer's interactions were minimized after the initial introductions to the group. Ideas were summarized after each discussion group in the debriefing sessions held with the study facilitators to highlight any discussion issues to be addressed, including any keywords, themes or patterns and relationships identified from the focus groups and recorded in the reflexive diary. The data were interpreted independently and by continuous comparisons and consensus to confirm that the findings and interpretations were true to the participants' views. The emergent themes were auditable in NVivo, the software program used for managing the data and to objectively compare and develop the emerging themes.

However, this study has some limitations. No formal data were collected on the participants' socioeconomic status. Although it is known that the rate and pattern of decline varies by ethnicity, due to low group numbers our study was not able to perform sub-group analysis based on ethnicity. It is well known that generally, Māori participate favourably in sport participation and volunteering to assist as coaches and mentors at an intergenerational level, these positive attributes may be further expanded to improve health and educational outcomes within communities, including bone health [31]. Further work is required in this field with a focus on ethnicity, given the largest decline (of 11.4%) in sports participation in New Zealand is amongst Pacific adults [12]. Our study did not include those with mobility disabilities and for young people who do not neatly fit into the dichotomous gender categories of other genders, gender diversity has not been addressed although very relevant in this population [32,33]. Some of those in this study participated in sporting activity beyond a recreational level at different stages of their lives. Additionally, some of the views of the participants may reflect a more an international perspective, due to spending differing amounts of time in and out of New Zealand. Finally, we acknowledge the modest sample size of the study population and the need to conduct similar studies in other populations, reassuringly data saturation was reached despite this.

Our participants strongly recalled past health campaign strategies which had a lasting impact on adolescents' and young adults' lifestyle behaviours and have encouraged PA and healthy eating habits. Studies have indicated that national Push Play campaign increased awareness and intention to increase PA to become more active and were recalled by participants easily [34]. Given that globally nearly 25% of adults and 80% of young people, most so in females, do not achieve the recommended levels of PA for good health, for adults this is 30 min of moderate or 15 min of vigorous activity most days and, for young people 60 min of moderate or vigorous activity every day, further intervention is required [13].

CONCLUSION AND FUTURE WORK

We have found in this study of New Zealand adolescents and young adults affiliated to tertiary education that participation in sporting activity is often motivated by enjoyment and by developing and maintaining social support networks. Barriers to sporting activity participation included financial and academic pressures, and personal time management issues. During the transitions from secondary school and home life to adulthood and tertiary education, young people struggle to independently and proactively engage in sporting activity in a new world of exciting opportunities.

While some of these themes will resonate with those in higher education, many will be more generally applicable. The findings of this study will aid young people and policy makers to recognize the barriers to sporting activities that enable beneficial bone health lifestyles. Further studies are required to understand how the current available policies to support sporting activity translate into good bone health in young people to maximize PBM potential in young people.

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