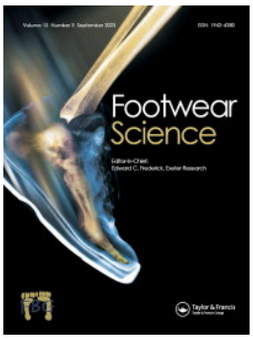

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The footwear needs and preferences of adults over 55 years of age participating in court sports

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ABSTRACT

Court sports like tennis are popular with older adults and important for maintaining physical and mental health. Footwear can influence player experience and injury risk in sports. Previous preliminary work using interviews and focus groups identified key themes regarding comfort (including cushioning), functionality (including a wide width) and choice (including appearance) that are important aspects of footwear for older adults. The purpose of this study was to explore the attitudes towards athletic footwear and the footwear features considered important in older adults playing court sports across the population. An online survey was conducted of older adults in the UK/Ireland who participated in court sports at least once a week. Questionnaire items included descriptive information on age, gender, playing level and sport played and Likert item questions regarding attitudes and important footwear features. Using a mixed methods approach, percentage agreement and importance was combined with qualitative comments. Comfort, appropriate grip, good cushioning and overall support were all important for over 95% of respondents. Width, durability and reducing the likelihood of injury were also important to over 80% of respondents. Around 20% of female participants agreed they had difficulty in purchasing sports shoes with their desired aesthetics compared to around 10% of male participants. Some women reported needing to buy men's shoes for adequate width, while 12% of respondents reported wearing non-specific footwear like running shoes, often for extra cushioning or to avoid foot pain, which could put them at greater risk of injuries such as ankle sprains. It would appear the athletic footwear industry in the UK/Ireland could do more to improve player comfort and safety of older adults in court sports.

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Footwear; racket sports; tennis; badminton; active ageing

Introduction

Physical activity in later life can increase life expectancy and counter declines in function and feelings of social isolation (Chodzko-Zajko et al., 2009; Stathi et al., 2002; Windle et al., 2010). Sport in particular is appealing for added reasons such as achievement and competition (Stenner et al., 2020), and racket sports like tennis are some of the most popular physical activities for older adults (Arkenford Ltd & Act2, 2006; Buzzelli & Draper, 2020; Cozijnsen et al., 2013; Sport England, 2021; SportAus, 2018). However, being physically active in later life may be hindered by painful conditions like arthritis (Der Ananian et al., 2006). Key barriers to being physically active reported by inactive older adults across nationalities and ethnic groups are physical health concerns and fear of injury (Arkenford Ltd & Act2, 2006; Costello et al., 2011; Heesch et al., 2000; Jenkin et al., 2021; Mohammad et al., 2022; Moschny et al., 2011). Illness or injury can cause older adults to give up participating in specific exercises or sports (Arkenford Ltd & Act2, 2006).

Footwear is an important consideration when participating in sport, influencing factors such as comfort and risk of injury (Kirk et al., 2022; Menz & Bonanno, 2021; Nigg et al., 1986; Sinclair et al., 2015, 2017; Taunton et al., 2003). Challenges in obtaining suitable footwear of good fit and comfort can act as a barrier to participation (Brenton-Rule et al., 2019). In addition, a particular consideration for court sports like racket and team sports is the requirement for lateral movements and changes of direction, which are common causes of lower limb injuries (Harper et al., 2019; Paterson et al., 2016; Petersen et al., 2005). Footwear designed specifically for court sports therefore have several features intended to reduce the risk of injury from sideways movements, including stability to avoid excessive supination, which could cause an ankle sprain (Bouché, 2010). However, the focus of sport footwear research and design has tended to be on the requirements of young adult participants. It is therefore not known whether older adults have specific needs and requirements of footwear to support their participation in sport.

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Using semi-structured interviews with older adults who play racket sports, we previously reported that a comfortable yet supportive shoe was believed to be important by the majority of participants (Reeves et al., 2022). Over half of the participants also reported that their choice of footwear was limited by a need for wide-fitting shoes, which is a common concern for older adults (Buldt & Menz, 2018). This current study adopted a survey approach to investigate whether the footwear needs and preferences we highlighted in our interview-based study (Reeves et al., 2022) are representative of a wider population in the UK and Ireland. Also, given the differences in foot anthropometrics between older males and older females (Mickle et al., 2010) and that sport footwear selection and foot related problems may be affected by gender and competition level (Kirk et al., 2022), we also sought to explore these additional factors that might influence footwear needs in this population. Therefore, for over 55 year olds participating in sports involving a change of direction (to capture both racket and team sports), our aims were:

1. To explore the attitudes towards athletic footwear and features considered important in sports footwear.
2. To determine if attitudes and features considered important in sports shoes differs by age, gender, playing level and sport played.
3. To explore the extent to which older adults are wearing sport specific footwear and factors influencing this.

Methods

Survey design and administration

The study was a cross-sectional online survey made using Microsoft Forms and is reported following guidelines for Web-based surveys (CHERRIES) (Eysenbach, 2004). Ethical approval was obtained from the University of Exeter (210324-A-01). Participants provided informed consent on the opening two pages of the survey, which included the purpose of the study and the names of the investigators. A time limit on the survey was not set prior to launch; therefore, the length of time of the survey and how long data would be stored were not stated. Participants were informed that their responses would be anonymized so they could not be identified from the data. Inclusion criteria were: over 55 years of age; English speaking; a resident of the United Kingdom or Ireland and typically play a racket sport or a team sport at least once a year.

A convenience sample was recruited as it was an 'open survey', open to anyone who accessed the link to the form. Recruitment was via email to sports clubs (primarily tennis, badminton, pickleball, walking netball and walking football) and local notice boards, social media, personal contacts and visits with flyers to sports clubs and leisure centres. The recruitment email and Tweet used on Twitter are included in Appendix 1. There were no incentives to take part in the survey. Responses were collected between May 2021 and February 2022. Questions were asked in a fixed order; however, there were conditioned items, such as rating of pain levels only if the participant reported experiencing pain in that context. The survey consisted of seven pages in total, including two pages (10 and 3 items) of demographics and descriptives relating to respondents' sport(s), one page on pain and foot problems (4–10 items depending on responses), one page on footwear, five point Likert items and additional comments (1, 33 and 4 items, respectively) and a final page to consent to submit responses. The additional comment questions included: 'If you have indicated that reducing the likelihood of injury is IMPORTANT or VERY IMPORTANT, can you tell us why this is?'; 'If money was no object my ideal sport shoe would have the following features'; 'If sports shoe colour is IMPORTANT or VERY IMPORTANT, what are your preferred colour(s) of sport shoe?' and 'Do you have any other comments?' The latter question allowed for 'qualitative' free text comments. The purpose of these free text responses was to add illumination to the quantitative results and to identify any important areas, which had not been included.

As part of the descriptives, participants were asked if they consider themselves with respect to sport a 'late starter' (not playing until after 50 years of age); a 'rekindler' (played at a young age, took a break and re-initiated involvement) or a 'continuer' (involved in sport for most of life) according to the definitions of Brennan et al. (2018). Gender was determined by asking participants to select from a number of options with the question 'Which of the following most accurately describe(s) you? (Choose as many as you would like)'. Likert item statements were based on the footwear needs and preferences of older adults who play racket sports identified from our semi-structured interviews (Reeves et al., 2022). The Likert items involved attitude statements ranging from 'Strongly agree' to 'Strongly disagree' and features of a sports shoe ranging from 'Very important' to 'Not at all important'. Participants had the option to change their answers with a Back button. No IP address checks or cookies were used.

Analysis

All data were extracted from the survey questionnaires and entered to an Excel spreadsheet. Both the quantitative and qualitative data analyses were primarily performed by author J.R. who has a background in sport and clinical biomechanics and is a regular racket sports player.

The qualitative data were also iteratively reviewed by author A.W. (experienced qualitative researcher) to ensure that truthfulness was achieved and that the interpretation aligned accurately with the quantitative results. All results were reviewed by S.D. (associate professor in biomechanics specializing in footwear).

We took a mixed methods approach to the analysis, combining descriptive analysis of the quantitative responses with the qualitative comments, as well as calculating the median response, responses were collapsed into binary outcomes, due to the subjective nature of Likert scale data and the inability to determine equal spacing between levels. For the attitude statements, 'Strongly agree' and 'Agree' were combined into 'Agree' and 'Neither agree/disagree', 'Disagree' and 'Strongly disagree' were combined into 'Disagree'. For the features of sports shoes, 'Very important' and 'Important' were combined into 'Important' and 'Neither important/unimportant', 'Unimportant' and 'Not at all important' were combined into 'Unimportant'. The number of responses in each category

was then calculated as a percentage of total responses per question.

Respondents' playing level was categorized into two levels with the intention of being able to compare possible different motivations for engaging in one's sport. Those who defined themselves as social players, playing for fun or exercise/fitness were combined with those who considered themselves average or intermediate (social/intermediate). Respondents who categorized themselves as club or league standard, advanced or elite were combined (advanced/elite). Sub-analysis by sport was restricted by the total number of respondents and the limited heterogeneity of sports played. Therefore, sports played were categorized into those who played only tennis (tennis) and those who played tennis along with other racket sports/team sports with a change of direction and any other included sport (other). Age was separated into 55–64 years of age (younger old) and ≥65 years of age (older old), similar to previous research on participation rates (Arkenford Ltd & Act2, 2006; SportAus, 2018). If respondents reported a range of typical playing frequency or duration a mean value was taken for analysis. Pearson's Chi-square (χ^2) was used to analyse the association between categorical variables, which was conducted in IBM SPSS Statistics (Version 28, Armonk, NY) with an alpha level of 0.05.

Results

Respondent characteristics

There were a total of 264 responses, of which 253 met the inclusion criteria and consented for their data to be included. The characteristics of the respondents are presented in Table 1.

Table 1. Respondent characteristics (n = 253, females n = 122, males n = 129, prefer not to say n = 1, non-response n = 1).

Characteristic	Mean	SD	Median	IQR	Min	Max	Count
Age (years)	65	7	64	11	55	93	
"Younger old" (55–64 years)							130
"Older old" (65+ years)							123
Playing frequency (~times per month)	11	6	12	6	1	56	
Typical session duration (minutes)	108	37	120	30	30	330	
Years playing current sport	32	19	34	35	1	73	
"Late starters"							85
"Rekindler"							69
"Continuer"							157
"None"							9
Social/intermediate							136
Advanced/elite							117

Respondents included 122 females, 129 males, 1 'prefer not to say' and 1 who did not select a gender. Nineteen respondents were team sport players, while the majority of respondents were racket sport players. The sports most frequently played were tennis (155), badminton (63), pickleball (34), squash (17), table tennis (10) and real tennis (10). Responses were received from throughout the UK and Ireland. Fifty three participants were over 70 years of age and 26 over 75 years of age. Due to the multiple channels of distribution of the survey and the uncertainty as to how many clubs passed on information about the survey to their members, it was not possible to establish the response rate.

Important features and design aspects of the footwear

The overall responses to whether participants agreed or disagreed with statements relating to sports shoes are presented in Table 2. The features of a sports shoe considered important are presented in Table 3, by order of importance. The most important features were reflected in the response to 'If money was no object my ideal sport shoe would have the following features' and 'Do you have any other comments?' Comfort, appropriate grip, good cushioning and overall support were all important for over 95% of respondents. Width, durability and reducing the likelihood of injury were also important to over 80% of respondents. Example responses for each of these design aspects are provided below.

Comfort

> Finding comfortable shoes is always a problem, sometimes they feel comfy at first and then after long sessions that can change, especially as your feet change when hot etc. (ID 17)
> Comfort is my primary concern. I don't have it at present. (ID 24)
> Comfort – I want them feel like slippers! (ID 71)
> … trying to find comfortable ones in women's ranges is pretty hopeless. (ID 147)

Grip

> Excellent grip- minimise likelihood of falls. (ID 88)
> Better grip on all surfaces, especially when its wet. (ID 76)

Cushioning

> Lots of cushioning. (ID 208)
> Good cushioning, good support, to protect the feet. Definitely suitable soles to enable play on different surfaces in different conditions. Flexibility. (ID 17)
> Good cushioning to protect the joints. (ID 76)
> Extremely cushioning to reduce impact on the rest of me. (ID 115)

Table 2. Percentage of total respondents (n = 253) who agreed with statements about their attitude towards sports shoes. Statements presented in the order in which they were asked.

Attitude statements	Agree (%)
I have difficulty in purchasing sport shoes that don't hurt my feet	21
I have difficulty in purchasing sport shoes that fit	35
I have difficulty in purchasing sport shoes in the colour I would like	15
I have difficulty in purchasing sport shoes in the style or design I would like	17
The footwear I wear for my sport is influenced by the rules of the sport or venue	47
I would always choose laces as the means of fastening my sports shoe	80
I would consider a toggle as the means of fastening my sports shoe	29
I would consider Velcro as the means of fastening my sports shoe	24
A Velcro sports shoe would suit my needs for fastening my sports shoe	13
Once I've found a brand or model of sports shoe I like, I tend to stick with it	78

Table 3. Percentage of total respondents (n = 253, females n = 122, males n = 129, prefer not to say n = 1, non-response n = 1) who considered features of a sports shoe important, ordered by importance.

Features of a sport shoe	Important (%)
Comfort	99
Appropriate grip for my sport(s)	98
Good cushioning	98
Overall support	96
Width	86
Durable (don't wear out quickly)	83
Reduce the likelihood of injury	82
Arch support	78
Ease of adjusting the tightness	78
Heel support	77
Flexibility in the upper	77
Flexibility in the sole	74
Lightweight	74
Sturdy/rigid/robust	68
Breathability	67
Versatility for different surfaces	62
Cost	59
Ease of getting on and off	57
Able to accommodate or change the insole	44
Design/aesthetics	40
Colour	34
Versatility for different activities	26
Waterproof	21

Support

> Support all through to keep the foot and ankle firmly enclosed. (ID 147)
>
> Good support, appropriate grip, wide fitting for my size 5 foot, as I struggle to find this. (ID 178)
>
> Good support for my foot to stop it rolling over. (ID 22)

Width

> Widths the most important and difficult to find in tennis shoes. (ID 57)
>
> Many of the shoe companies are American. The ones that make a selling point of making 2e and 4e footwear such as New Balance do not make their wide shoes available in Europe or the UK. This is most annoying. I have written and asked them for their reasons but have never had a reply. (ID 212)
>
> A choice of widths in women's shoes – I have to buy a man's shoe. (ID 147)
>
> Good width to accommodate broad metatarsal heads without having to go up a size. (ID 112)
>
> Width choices – to accommodate my bunions. (ID 32)
>
> It would be good if more shoes were available in a variety of widths – even if it were only two or three variations. (ID 88)
>
> Laces, narrow widths (I have long narrow feet)… (my son commented that some tennis shoes I tried on looked as though I was wearing fridges). (ID 201)

Reducing likelihood of injury

Responses to the follow-up question regarding why reducing the likelihood of injury was important, responses included the themes of avoiding slips/trips/falls, avoiding general injuries like sprains and blisters, reducing the fear of falling, avoiding exacerbating existing problems, not wanting to have to stop the sport and other activities, (and subsequent reduced mental/physical health as a result of not playing) and taking longer to recover from injuries or injuries being more severe with age.

> Because the older you are, the more likely an injury can debilitate you and affect your everyday life. (ID 17)
>
> I take too long to heal these days and I can't play while injured. (ID 191)
>
> Would like to avoid injuries later in life as they don't heal easily and worry about rolling my ankle. (ID 204)
>
> foot support important: foot or ankle injury or a fall would be a disaster. (ID 196)

Durability

Several participants commented that their ideal sports shoe would be durable, e.g. "Durability of sole. Not wear out quickly…" (ID 30).

Characteristics influencing responses

Notable differences by gender, age, playing level and sport are presented in Appendix 2.

Differences by gender

Around 20% of females agreed that both they have difficulty in purchasing sport shoes in the colour they would like and that they have difficulty in purchasing shoes in the style or design they would like compared to around 10% of males (Appendix 2, Figure 1(a,b)). However, this difference was not significant, χ^2 (4, 233) = 6.04, p = .196 and χ^2 (4, 238) = 5.84, p = .212 for colour and style, respectively. For both statements, the median original response for females was "Neither agree/disagree", while the median response for males was "Disagree". Around 10% more males than females reported that the footwear they wear is influenced by the rules of the sport or venue (median response "Agree" and "Neither agree/disagree", respectively, Appendix 2, Figure 1(c), χ^2 (4, 238) = 2.70, p = .609). Although around 10% more females than males rated versatility for different activities to be important (χ^2 (4, 244) = 11.85, p = .018), the median response for both genders was "Neither agree/disagree" (Appendix 2, Figure 2(c)). There was a significant difference in response to the importance of comfort by gender (χ^2 (4, 250) = 9.32, p = .025); however, this was not considered meaningful given comfort was considered important by 100% of females and 98% of males with the median response being "Very important" for both. Similarly, there was a significant difference in response to the importance of overall support by gender (χ^2 (2, 248) = 10.99, p = .004); however, this was not considered meaningful given overall support was considered important by 95% of females and 97% of males with the median response being "Very important" for both.

Breathability, lightweight and flexibility in the sole were considered important overall, but by approximately 10% more females than males (Appendix 2, $p > .05$). Flexibility was mentioned in the comments by nine male respondents compared to 16 female respondents. Some female respondents stated that their ideal shoe would have:

> Flexible grippy soles. (ID 53)
>
> Flexible reflecting the fast changes of direction on court. (ID 105)
>
> Plenty of flexibility to accommodate enlarging feet – when they get hot they expand. (ID 250)

More females than males considered it important that a sports shoe has versatility for different activities (Appendix 2,

Figure 2(e)); however, the median response was "Neither important/unimportant" for both genders.

Age

The majority of respondents agreed that they would always choose laces for a sports shoe, with this figure being around 10% greater for the older old than the younger old (median responses strongly "Agree" and "Agree", respectively, Appendix 2, Figure 3(A), χ^2 (4, 251) = 11.95, p = .018). Similarly, of the younger old a greater percentage than the older old would consider a toggle sports shoe (median responses "Neither agree/disagree" and "Disagree", respectively, χ^2 (4, 245) = 7.44, p = .114), and or Velcro (median response "Neither agree/disagree" and "Disagree", respectively, Appendix 2, Figure 3(b,c), χ^2 (4, 244) = 3.72, p = .445). The percentage of over 70s (n = 53) who agreed that they would always wear laces, would consider a toggle and would consider Velcro were 82%, 22% and 22%, respectively.

Level and sport

While the majority agreed that once they have found a brand or model of sports shoe they like they tend to stick with it, this was particularly true for the advanced/elite group (Appendix 2, Figure 4(a), χ^2 (4, 244) = 9.47, p = .050). However, one elite real tennis player who agreed to sticking to a brand he liked commented on his frustration of a lack of continuity in a particular shoe:

> Big problem is that when I find a shoe I like the manufacturer then changes it so that when I need to replace the shoe in say 2 years' time it is no longer available. V[ery.] frustrating. So buy 2 pairs if I find one I like. (ID 202)

The other key difference between playing levels was that 20% more social/intermediate players considered sports shoes being waterproof important (median response "Neither important/unimportant") than advanced/elite (median response "Unimportant", Appendix 2, Figure 5(b), χ^2 (4, 244) = 23.62, p < .001). However, there were relatively more tennis players (an outdoor sport) than other sports in the social/intermediate group, while there were relatively more other sports players than tennis players in the advanced/elite group (Figure 1). For tennis players, 30% (median response "Neither important/unimportant") considered waterproof to be important while 13% of other sports players (median response "Unimportant") considered waterproof to be important (Appendix 2, Figure 7(a), χ^2 (4, 244) = 30.24, p < .001). Around a quarter of tennis players agreed that they have difficulty in purchasing sport shoes that do not hurt their feet compared with less than 20% of other sports players (median response "Disagree" for both categories, Appendix 2, Figure 6(a), χ^2 (4, 252) = 6.36, p = .174). Although more social/intermediate players than advanced/elite players reported that a sports shoe having study, rigid or robust features to be important, the median response was "Important" for both groups (67% important overall, Appendix 2, Figure 5(a), χ^2 (4, 241) = 8.07, p = .089).

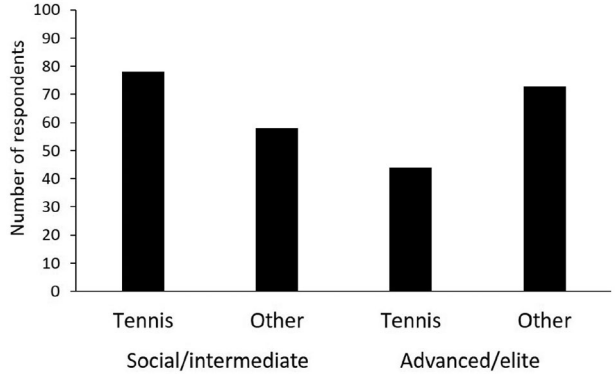

Figure 1. Relative distribution of respondents who played only tennis and other sports or multiple sports including tennis by playing level.

There was a significant differences by level in those who would consider a Velcro shoe (χ^2 (4, 244) = 9.53, p = .049); however, this was not considered a meaningful difference given only 24% agreed with the statement in both groups. Similarly, there was a significant difference by level in those who considered versatility for different surfaces to be important (χ^2 (4, 239) = 9.56, p = .049); however, 61% of the social/intermediate group and 62% in the advanced/elite group considered this important. There was a significant difference in the importance of the ease of adjusting the tightness of a sports shoe between groups (86% important and 70% important for social/intermediate and advanced/elite respectively, χ^2 (4, 245) = 11.15, p = .025); however, the median response was "Important" for both groups.

Specificity of footwear

Of the 253 respondents, 30 (12%) reported wearing footwear either not specific to the sport they play or surface they play on (indoor shoes for outdoors). The majority of these respondents were social/intermediate players who played once a week or more. However, one 67 year old good club standard female tennis player reported wearing running shoes for tennis and reported playing three times a week for two hours at a time. From the qualitative comments, some reasons for wearing nonspecific running shoes for tennis related to avoiding pain.

> I always buy standard running shoes (at the moment adidas) because tennis shoes are reinforced around this bunion area and that is super painful. (ID 64)

> [What footwear do you wear?] Adidas or ASICS running shoes. I did try Adidas tennis shoes but they aggravated my knee problems. (ID 215)

Conversely others chose sport specific footwear for support: "I tend to buy shoes for a specific sport to ensure that they provide the correct support" (ID 262).

Discussion

The findings of this survey that comfort, support, good cushioning and width of footwear are important to older adults who play court sports is in line with our previous findings (n = 16) (Reeves et al., 2022); however, the larger sample size in the present work (n = 253) increases the generalizability to the wider population. The features of a sports shoe considered important did not differ by gender,

age or level of sport played. Although colour and design/aesthetics were less important than other functional shoe features, more women than men reported finding it difficult to find sports shoes in the design or colour they would like. Having waterproof shoes was generally considered unimportant. Waterproof was 20% more important to respondents who were social/intermediate players than advanced/elite. This is likely a reflection of the sample we were able to recruit in which there were more tennis players (who play outdoors) classified as social/intermediate than classified advanced/elite.

Arguably the desire for comfortable shoes is not surprising for any age group and agrees with previous literature on the footwear needs of workers (Anderson et al., 2017; Norlander et al., 2015), individuals with gout (Brenton-Rule et al., 2019; Frecklington et al., 2019), those with foot pain (McRitchie et al., 2018) and older adults (Davis et al., 2013; Menant et al., 2008; Munro & Steele, 1999; Reeves et al., 2022). In an early study, the foot was the most common site of pain/discomfort in young adult tennis players ($n = 171$, mean age 25.8 ± 8.8 years) and flexibility of the shoe was found to influence comfort (Nigg et al., 1986). In another study in elite badminton players ($n = 10$, mean age 19.7 ± 1.6 years), a flexible forefoot outsole was perceived as less comfortable than the regular and stiffer forefoot outsole during lunges (Park et al., 2017). Tennis shoes have been described as comfortable by 68% of young adult tennis players ($n = 146$, mean age 26.1 ± 8.2 years), while 23% and 9% considered their tennis shoes acceptable and uncomfortable, respectively (Llana et al., 2002). In the latter study, discomfort related to footwear design errors with respect to arch support, shoe hardness, rigidity, hold and sole height. In young adult basketball players ($n = 19$, mean age 25.0 ± 2.3 years), there was no difference in heel comfort between basketball shoes with three different levels of cushioning (Wei et al., 2018). Comfort in our previous study with active older adults, was related to cushioning, being pain-free, support, and in contrast to the previous studies with younger adult populations, also a wide width (Reeves et al., 2022). While the desire for comfortable footwear is universal, the design features associated with comfort may differ between active young adults and active older adults.

The need for cushioning and a variety of widths of general footwear becomes more pertinent with changes due to ageing such as stiffer joints, reduced medial longitudinal arch height and foot deformities (S. J. Dixon et al., 2010; Echeita et al., 2016; Lilley et al., 2011; Mickle et al., 2010; Naidoo et al., 2011). It has been shown that older adults often wear everyday footwear that is too narrow for their feet, particularly in the forefoot region (Buldt & Menz, 2018; Jalali et al., 2020). As in our previous study (Reeves et al., 2022), women reported needing to wear men's sports shoes to have sufficient shoe width, which could have negative consequences regarding the wearer's sense of identity due to a poor 'mental fit' of the footwear (Farndon et al., 2016). Men's footwear with the width to accommodate the forefoot may also be too wide in the heel, which could lead to blisters and could also mean the shoes are too long (Buldt & Menz, 2018; Burns et al., 2002), which may increase falls risks (Barbieri, 1983; Edelstein, 1987). While inadequate footwear may not necessarily cause foot/toe deformities (Colò et al., 2021), it has been suggested that footwear with flexible soles like tennis shoes can make symptoms of Hallux Rigidus worse (Ho & Baumhauer, 2017). It would appear the athletic industry in the UK/Ireland could do more to accommodate older adults in court sports like tennis, both with the provision of wider footwear options, but also with consideration of the designs that do not aggravate foot deformities like hallux valgus (bunions), e.g. the locations of the seams.

This study supports previous evidence that several older adults are wearing non-sport specific footwear, such as running shoes for tennis, which may be due to the running shoes being more comfortable and less likely to aggravate pain compared to court shoes. In a study comparing lower limb biomechanics during lunges in different footwear, young adult male squash players ($n = 12$) reported a subjective preference for a running shoe over a squash shoe and a minimalist shoe, which the authors suggested was due to the superior comfort of the running shoe during high impacts (Sinclair et al., 2017). Some older adults may prefer a running shoe over a sport-specific shoe as a consequence of the desire for good cushioning to compensate for stiff joints and to accommodate foot issues. Although good cushioning is important in racket sports due to the high impact forces (Bouché, 2010), cushioning has traditionally been less of priority in court shoes than running shoes (Reinschmidt & Nigg, 2000). Differences in design features such as lateral heel flare and heel-forefoot differential between tennis shoes and running shoes are likely to influence the amount of rearfoot inversion during turning movements, an important contributor to risk of ankle inversion injury (Lysdal et al., 2022). Similarly, lateral support provided during changes of direction by netball specific shoes is considered important in reducing the risk of chronic injuries associated with excessive eversion (Sinclair & Stainton, 2017). The majority of respondents in the current study wore sport specific footwear and even commented on the need for ankle support. The percentage of respondents wearing non-specific footwear in this study (12%) is similar to the number of female netball players reportedly wearing non-specific shoes (15%), but much less than the number of male netball players wearing non-specific shoes (67%) (Kirk et al., 2022). Nonetheless, if our sample is reflective of the general population, then given the large numbers of older adults in court sports (Sport England, 2021), if 10% or more are wearing non-specific athletic footwear, then a substantial number of individuals may have an elevated risk of incurring an injury such as an ankle sprain. The risk of injury from wearing non-specific footwear may be exacerbated if the individual is an occasional/low level player performing movements sub-optimally.

The majority of respondents considered selecting footwear with appropriate grip for the sport important (98%), along with reducing the likelihood of injury (82%), and for more than in our previous semi-structured interviews in which both grip and reducing injury were both considered important by 50% of participants (Reeves et al., 2022). The need for good grip was reasoned by the desire to avoid injury and falls, which can have more severe consequences with ageing. In a preliminary study of active older females ($n = 4$), we demonstrated significant differences in the utilized coefficient of friction (uCOF) between two hard court tennis shoes when performing a change of

direction task (S. Dixon et al., 2021), while there was no difference in uCOF between the same shoes in younger adult players ($n = 8$, females $n = 3$) (Damm et al., 2013). The uCOF is calculated as the resultant horizontal component of ground reaction force (GRF) to vertical force (Buczek & Banks, 1996) and is an indication of the amount of sliding of the shoe that will occur during ground contact. These initial lab-based findings indicate the potential of footwear to influence the experience and injury risk of older players performing lateral movements on a hard surface, and the value of population-specific footwear in supporting safe lifelong participation in sport.

The slightly greater preference for laces as fastening in the 'Older old' than the 'Younger old' was somewhat surprising. One might have expected the reverse and the older group to be more open to the idea of a Velcro sports shoe and/or consider ease of donning/doffing more important than younger respondents, as getting in and out of shoes becomes more difficult with increasing age with general reduced flexibility and the increased prevalence of complications such as rheumatoid arthritis affecting hand function (Williams & Nester, 2006) and vision deterioration (Edelstein, 1988). Ease of putting them on was previously shown to be one of the most popular reasons for selecting one's current household shoes in overs 65s (Munro & Steele, 1999). Our findings may be a reflection of the fact that we were only able to recruit a relatively small number of over 70 year olds and our 'Older old' group was 65 years and above, highlighting a limitation of this study. However, the percentage of over 70s who agreed that they would always wear laces, would consider a toggle and would consider Velcro was very similar to the over 65s as a whole. The reluctance to wear a Velcro shoe may also relate to a reluctance to appear old (Reeves et al., 2022). Similarly, in another study, a man in his seventies felt judgement for wearing shoes with Velcro as he was told he looked 'ridiculous' (Farndon et al., 2016). Respondents may also feel that Velcro was not secure enough for sport (Reeves et al., 2022), especially as the majority of respondents had a lot of experience of playing sport over their life time as the majority considered themselves 'Continuers' and the average respondent had more than 30 years' experience playing their sport.

This study has further limitations in that we were only able to separate sport by tennis alone and other sports collectively, due to the low numbers of respondents from other sports. In particular, we were only able to recruit a small number of team sport players. While our recruitment emails to sports clubs targeted more tennis and badminton clubs than team sports, we felt this was an appropriate strategy given the evidence that older adults tend to play more individual sports than team sports (Arkenford Ltd & Act2, 2006; Buzzelli & Draper, 2020). According to the Active Lives Survey November 2020–2021 by Sport England, for participation at least twice within the last 28 days there were 2.5 times as many over 55 year olds playing racket sports than team sports and 3.4 times as many over 65 year olds playing racket sports than team sports (Sport England, 2021). The results of our survey cannot be generalized to very infrequent players as very few respondents played less than once a week, likely a consequence of recruiting primarily through sports clubs, alongside the typical low response rate to questionnaires (Anderson et al., 2021; Finch & Eime, 2001; Oppenheim, 1992).

Conclusions

For older adults playing court sports like tennis multiple factors appear to be important in footwear selection, namely comfort, grip, cushioning and a wide width. While having comfortable athletic footwear is arguably important at any age, it may be that the design features that are most pertinent to comfort may differ between younger adults and older adults. It would appear that many older adults cannot find sports shoes that satisfy their needs in the market in the UK/Ireland and are so choosing non-sport specific footwear like running shoes that may place them at a greater risk of injury when performing lateral movements and changes of direction.

Disclosure statement

The authors report there are no competing interests to declare.

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