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Sports Participation during Adolescence and Menstrual Cycle Education Status in Females across Six Territories

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Abstract

Introduction: There is a substantial amount of sporting dropout in teenage girls worldwide linked, in part, to the menstrual cycle (MC). Firstly, this study aimed to retrospectively quantify the reasons for decreased sports and, or, exercise (sports/exercise) participation during adolescence across different countries. Secondly, this study investigated the prevalence, source and content of MC education received in relation to sports/exercise.

Methods: A survey was distributed via the Strava app to six geographical territories. The survey captured retrospective reasons for changing sports/exercise participation levels during adolescence and the provision, content and source of MC education received in relation to sports/exercise. Descriptive statistics were reported as frequencies and associations between countries, education and adolescent participation levels were determined using chi-square analysis (p=0.01).

Results: Female Strava-users (M=40.8 years, SD=10.7 years) from six territories completed the survey (n=10,371). 24.8% of participants decreased their sports/exercise participation during adolescence with the United Kingdom (UK) & Ireland (39.7%) and Spain (39.1%) reporting significantly higher decreases than the other countries surveyed, X^2 (10)=1023.77, $p \leq 0.001$. The most common reason for decreased participation was a lack of time (28.0%). 71.1% of participants had not received education. Of those that were educated, the most common source was “self-education” (69.8%) and content was “to keep levels of exercise the same” (29.8%).

Conclusions: There is a need for education to be available and easily accessible for girls and women which instructs on managing the MC and other commitments alongside sports/exercise and highlights the many benefits of participating in regular sports/exercise.

Keywords: puberty, sport, women, school, exercise

Introduction

Girls going through puberty face a number of challenges that can impact their sporting participation (Women in Sport, 2018). These challenges can be related to increased social or school pressures as well as physiological changes and consequential negative attitudes towards body image and decreased self-confidence (Eime et al., 2013). As a result, many girls reduce their sporting participation during adolescence. An example is provided by a study of 11–17-year-olds across 146 countries in 2016, in which 97% of countries reported higher sporting participation rates in boys compared to girls, with 85% of girls not meeting the recommended guidelines for daily physical activity of 60 minutes (Guthold et al., 2020). Furthermore, a survey completed in the United Kingdom (UK) by Women in Sport (2019) reported that by age 16, teenage boys are almost twice as likely to be active than girls and 64% of girls who were active pre-puberty stopped sports participation by the time they finished puberty. These figures are not only concerning for the health of adolescent girls, but the beliefs formed during adolescence surrounding sport and exercise are significant and potentially long-lasting (Lau et al., 2019). This makes it crucial to understand why high percentages of girls drop out of sport at this time.

There are various reasons why girls may drop out of sport during adolescence. One reason is lack of time due to social commitments and the pressure to prioritise schoolwork (Youth Sports Trust, 2019). Another is that there has been a relative lack of elite female athlete role models and female sport coverage in the media so girls may not see a future in sport and, in contrast to their male counterparts, sport might not be perceived as ‘cool’ (Cooky, Messner & Musto, 2015). Furthermore, sport often becomes more competitive during puberty. Girls might no longer feel good enough to participate and dislike the pressure, their friends drop out and sport can lose its fun and social aspect (Monteiro et al., 2017). The physical changes that occur during puberty can also make girls feel more self-conscious and uncomfortable when exercising (Chen et al., 2019).

Whilst these reasons are pertinent and need to be addressed, one of the most prominent challenges facing girls during puberty is the onset of menstruation and the menstrual cycle (MC), with many girls citing this as the reason for stopping sport as a teenager (Harvey et al., 2020). Surveys have reported one of the most common reasons for decreased exercise participation during puberty was menstruation (e.g. 39% of respondents, Youth Sports Trust, 2022b). The primary reasons for avoiding exercise during menstruation are pain, fears about leaking, embarrassment that sanitary products may become visible, low mood and confidence, heavy bleeding and a lack of knowledge on how to cope with menstruation alongside sport (Women in Sport, 2018; Youth Sports Trust, 2022b). Additionally, in the first few years after menarche (a girl's first period), cycle lengths can be erratic leading to irregular bleeding which can exacerbate anxiety about menstruation (Peacock et al., 2012). Several studies have shown that girls decrease their physical activity, miss school or disengage from social situations as a result of painful or irregular MC symptoms and bleeding (Banikarim, Chacko & Kelder, 2000; Hillen et al., 1999; Houston et al., 2006; Steiner et al., 2011; Van Iersel et al., 2016). Furthermore, some religions and cultures still perceive menstruation as shameful and even sinful, and these beliefs perpetuate into the next generation, leading girls to believe they should not participate in activities during menstruation (Plan International UK, 2018).

The provision of evidence-based menstrual health education, including the incorporation of exercise for managing MC symptoms and navigating menstruation during physical activity in schools, may be one answer to improving participation and preventing sporting dropout (Women in Sport, 2018). Currently, formal MC education is lacking in low, middle and high-income countries (Brown et al., 2022; Holmes et al., 2021), with many girls receiving information either from their mother or the media (Rembeck et al., 2006; Rosewarne, 2012). Without appropriate education on the MC, girls typically develop negative perceptions of the MC and view it as a barrier, particularly as much of their information has come from popular culture (Rembeck et al., 2006). Additionally, a lack of education, understanding and the

subsequent negative perception of menstruation have been associated with increased school absenteeism and likelihood of missing sporting activities and decreased confidence in adolescent girls (Brown et al., 2022; Houston et al., 2006).

A better insight into the reasons for sports/exercise dropout during adolescence, the frequency and content of MC education received and a consideration of geographical and cultural nuances is required to appropriately curate successful menstrual health education programmes moving forwards. Therefore, by surveying users of the Strava exercise app, this study aimed to:

1. Retrospectively quantify decreased sports and, or, exercise (sports/exercise) participation during adolescence in Strava-users aged 18 and over in different countries.
2. Identify the reasons for participation decreases during adolescence in this population.
3. Establish the prevalence, source and content of MC education received in relation to sports/exercise in this population.

Methods

Participants

An invitation was sent to a total of 425,697 female Strava-users (aged 18 years and over) across six different territories (Brazil, France, Germany, Spain, UK & Ireland, USA), inviting them to complete the survey (180,000 via email and 245,697 via the Strava app). The survey was open for 25 days between 14th February 2019 and the 11th March 2019. 16,219 women started the survey and 10,371 women (*M* = 40.8 years, *SD* = 10.7 years) completed it and were included in analysis (Brazil=1,288, France=1,911, Germany=1,178, Spain=1,204, UK & Ireland=2,311, USA=2,479). This study was approved by the Ethics Committee of St

Mary's University, Twickenham, UK and participants provided informed consent before completing the survey.

Procedure

The overarching survey design and dissemination were the same as detailed in Bruinvels et al. (2021). The online survey (www.surveymonkey.com; SurveyMonkey, London) comprised 39 questions and was translated and further localised by a native language speaker for all territories. The survey included questions on current and adolescent exercise behaviours, MC symptoms and frequency, current menstrual status, perceived effects of MC on work and exercise behaviours, education received on the MC in relation to sports/exercise, medication and contraception use and characteristics of sleep, diet and iron status. The present study focused specifically on the questions surrounding sports/exercise participation changes in adolescence and MC education received in relation to sports/exercise. These questions were close-ended with the option to select the answer 'other' to provide an open-ended response if required. Participants were considered to have 'received education' if they answered 'yes' in response to "Have you ever received any education about your menstrual cycle and how it relates to sports/exercise?".

Survey analysis

The raw data for the questions focusing on sports/exercise participation changes and MC education were exported from SurveyMonkey directly into Microsoft Excel (version 2308, Microsoft) and coded into numerical values. Surveys with incomplete answers to questions required for the purposes of the study's hypotheses and duplicate survey responses (identified by internet protocol addresses and/or personal demographics) were removed and a total of 10,371 survey responses were analysed . Descriptive statistics were calculated for sports/exercise participation changes during adolescence, the reasons for these changes and the receipt, sources and content of any MC education received in relation to sports/exercise. Chi-square analyses were performed using Statistical Package for the

Social Sciences Statistics 22 software (IBM SPSS Statistics for Windows, version 22.0, IBM corp) to analyse associations between countries, education and adolescent participation with the statistical significance set at a value of $p \leq 0.01$. Following these analyses and results of the descriptive statistics, the UK & Ireland reported one of the highest participation decreases and lowest education rates and therefore were further investigated. They were grouped by age (18-30, 31-45, 46-60, ≥61 years) and descriptive statistics were calculated for participation changes during adolescence and the receipt of any MC education in relation to sports/exercise.

Results

Table 1 displays the demographics of this study's participants.

Table 1: Panel A participant characteristics; Panel B participant characteristics per age-group within the UK & Ireland

A

Country	n	Average age (years) ± SD
Brazil	1288	32 ± 10
France	1845	39 ± 11
Germany	1142	40 ± 10
Spain	1203	40 ± 9
UK & Ireland	2385	43 ± 11
USA	2513	41 ± 11
Total	10376	40 ± 11

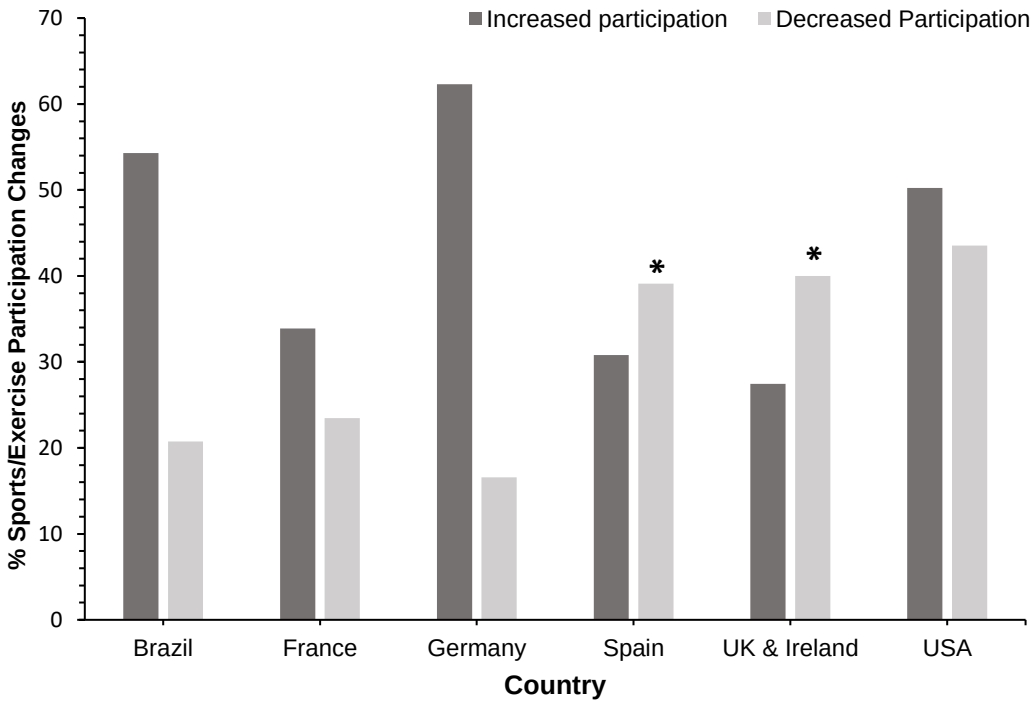
B

Age-Group	n	Average age (years) ± SD
18-30	472	27 ± 3
31-45	1106	40 ± 4
46-60	719	54 ± 4
>61	88	67 ± 3
Total	2385	42 ± 11

Sports/exercise participation during adolescence

Overall, 24.8% of participants decreased their sports/exercise participation during adolescence and there were significant differences in participation levels between countries, X^2 (10) = 1023.77, $p \leq 0.001$ (figure 1). Participants in the UK & Ireland and Spain were significantly more likely to decrease their participation ($p \leq 0.01$) (39.7% and 39.1% respectively) compared to the other countries. Within the UK & Ireland there were significant differences across age-groups and participation in sports/exercise during adolescence (X^2 (3) = 30.29, $p \leq 0.001$). Those in 31-45 years and 46-60 years age-groups were significantly more likely to decrease their participation compared to the ≥61 years and 18-30 years age-groups (figure 1).

A



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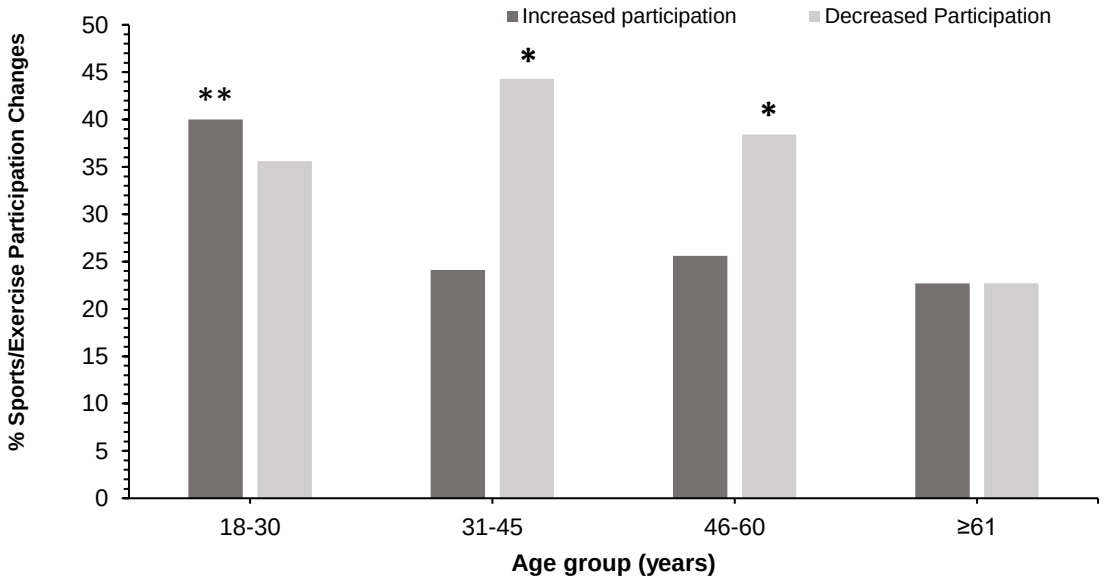

Figure 1: Panel A: sports/exercise participation decreases during adolescence per country. * = significantly decreased sports/exercise participation; Panel B: sports/exercise participation changes during adolescence by age-group in the UK & Ireland. * = significantly decreased sports/exercise participation vs 18-30 and ≥61 years age-groups ($p \leq 0.01$). ** = significantly increased sports/exercise participation vs 32-45 and 46-60 years age-groups ($p \leq 0.01$).

The most common reason reported for decreased sports/exercise participation during adolescence across all countries was a lack of time and other priorities taking precedence (figure 2). Nearly 1 in 3 women in the UK & Ireland and USA reported feeling embarrassed and not having the confidence to keep active while 14.4% of UK & Ireland respondents cited their sports kit as being uncomfortable/unflattering to wear. Furthermore, in the UK & Ireland, 23.0% said that the effects of puberty or the menstrual cycle caused their participation to decrease.

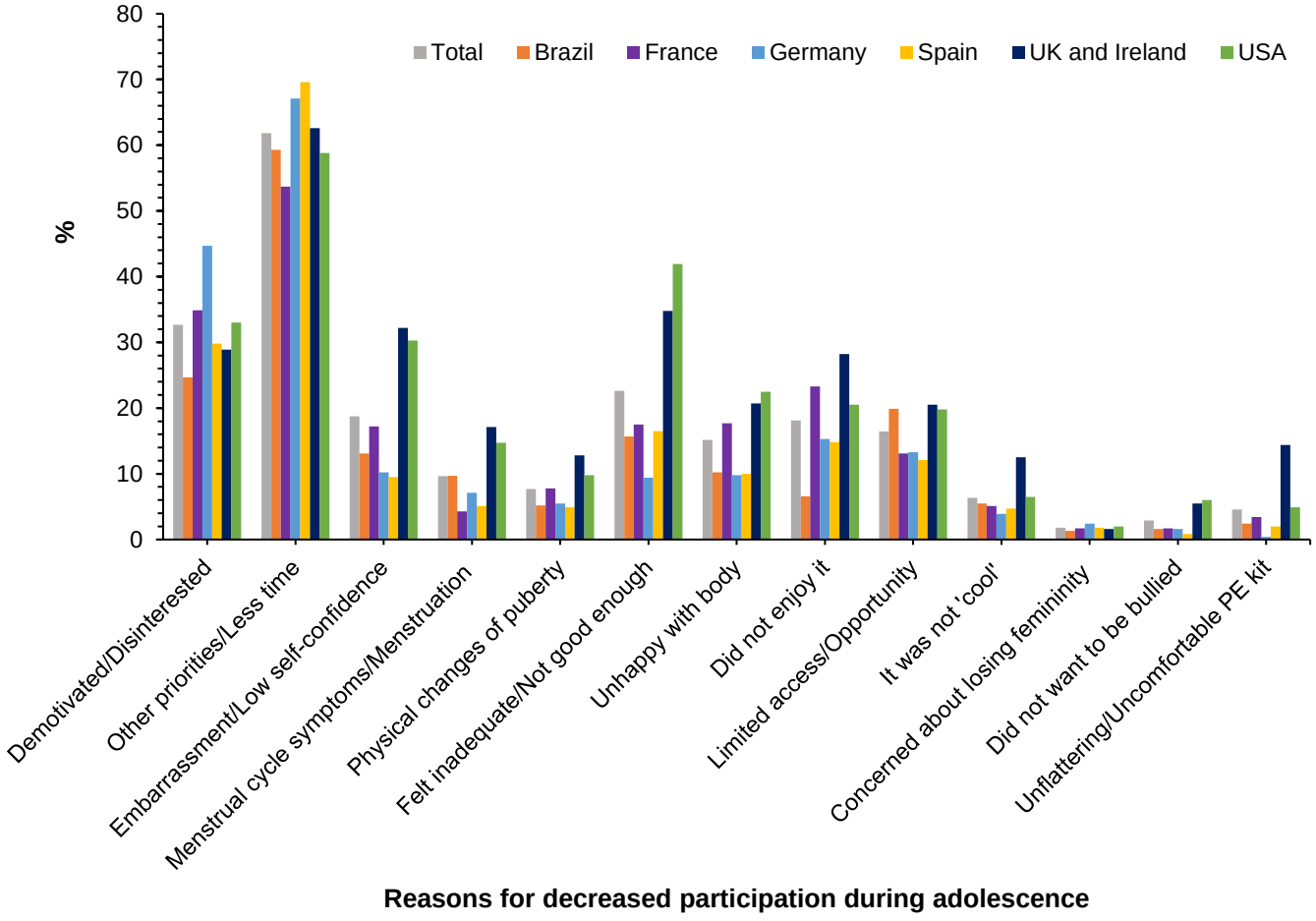

Figure 2: Breakdown of reasons given for decreasing sports/exercise participation during adolescence as a total for all countries and per country

Menstrual cycle education in relation to sports/exercise

Overall, 71.7% of women had never received any education about the MC in relation to sports/exercise. The likelihood of receiving education was significantly different between countries, X^2 (5) = 357.68, $p \leq 0.001$. Participants from Spain were most likely to have received education (27.1%), while those in the UK & Ireland and France were least likely, with 82.4% and 80.3% respectively reporting they had never received any education (figure 3). Within the UK & Ireland, those in the 46-60 years age-group were significantly less likely to report having received education than the other age-groups, X^2 (3) = 36.16, $p \leq 0.001$ (figure 3).

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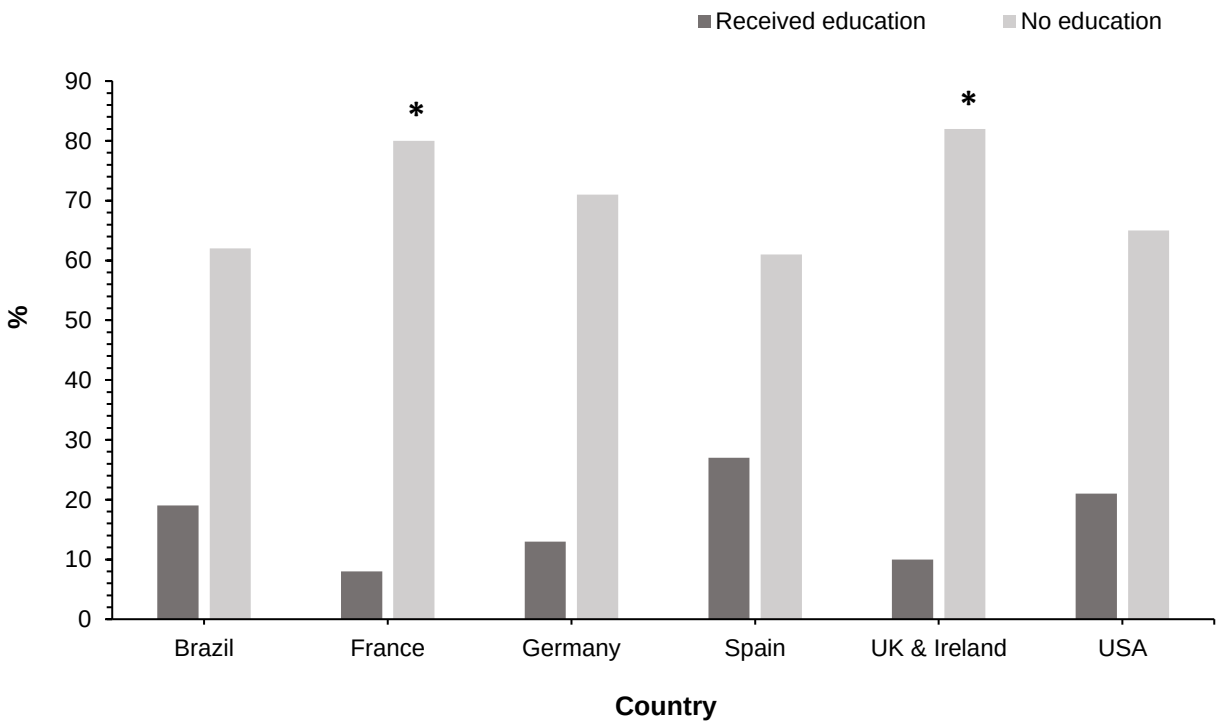

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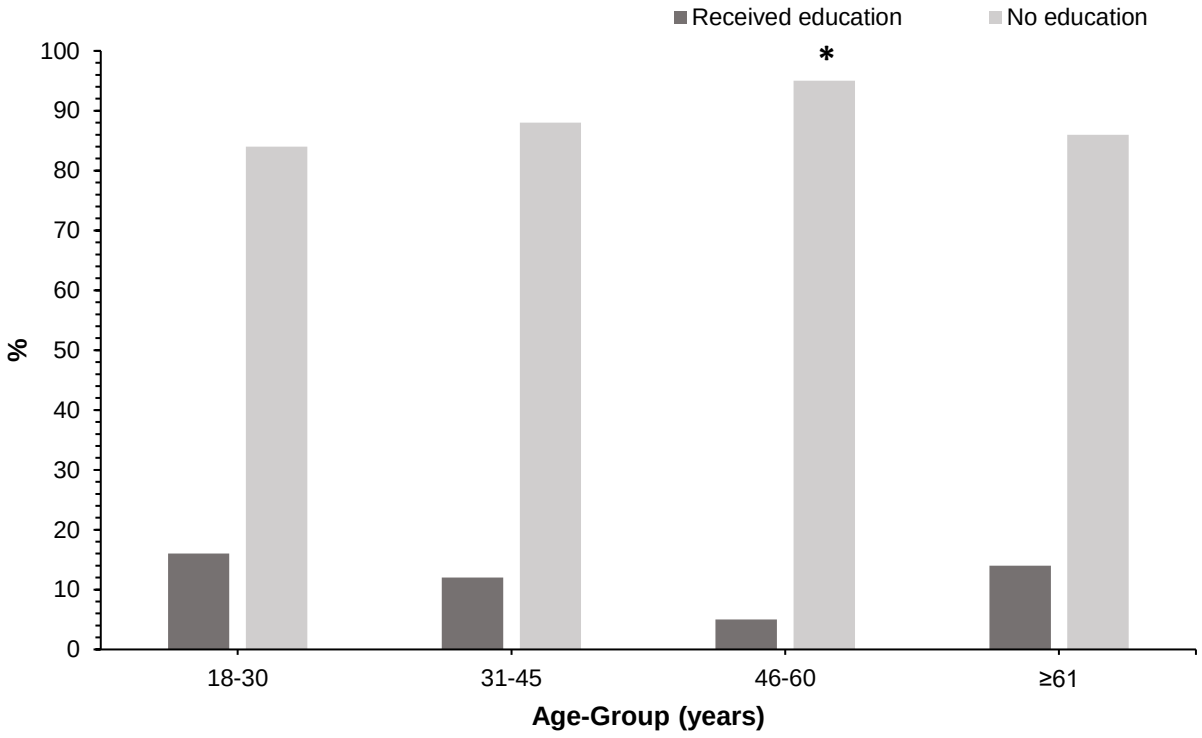

Figure 3: Panel A: MC education status in relation to sports/exercise per country; * = significantly less likely to receive education ($p \leq 0.01$); Panel B: MC education status in relation to sports/exercise per age-group within the UK & Ireland; * = significantly less likely to receive education ($p \leq 0.01$)

Of those receiving education, figure 4 displays how participants were instructed to change their exercise behaviour during menstruation per country. Overall, of those who were told to change their exercise behaviours, the most common instruction was “to keep levels of exercise the same” (29.8%). However, in total, 58.3% received ‘negative’ education that may reduce their sports/exercise participation (not to exercise: 11.2%, reduce exercise: 24.3%, avoid certain types of exercise: 22.8%).

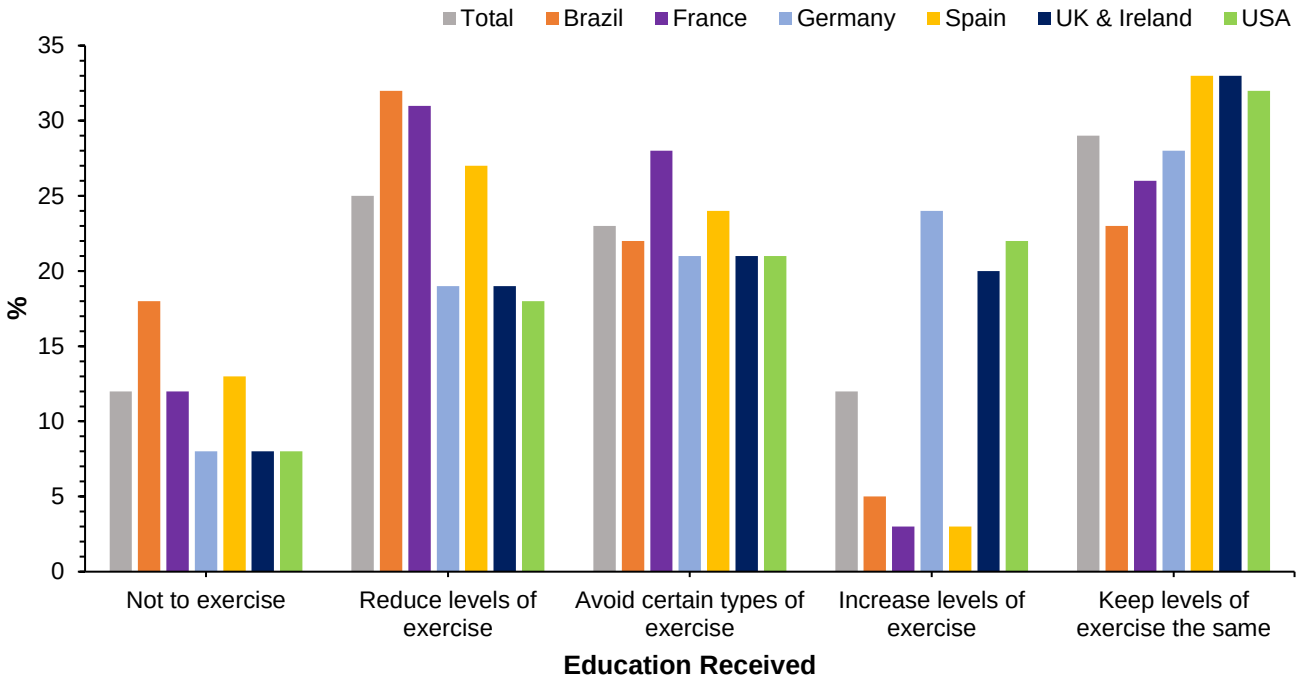

Figure 4: Education received on exercise behaviours during menstruation for participants across each country.

When considering those who had received education, there was a significant association between country and whether participants were likely to receive positive education on the MC and sports/exercise that would encourage participation (that you can maintain or increase exercise levels), or negative education that would prevent participation (that you should decrease, stop or avoid certain types of exercise), X^2 (5) = 132.36, $p \leq 0.001$. Those who were educated in Germany, the UK & Ireland and the USA were significantly more likely to receive positive education than those in Brazil, France and Spain. Within the UK & Ireland there were no significant differences between age-group and whether education received was positive or negative, (X^2 (3) = 2.83; p = 0.419).

Overall, of those who were educated, figure 5 shows the sources from where they received education. The majority of women educated themselves across all countries (69.8%). There was a significant relationship between country and the source of education (X^2 (25) = 204.95; $p \leq 0.001$). All countries shared the most common source of education being 'themselves', however, a 'doctor' was the second most likely source of education for Brazil,

France, Germany and the USA while for the UK & Ireland and Spain the source was through their ‘sport’.

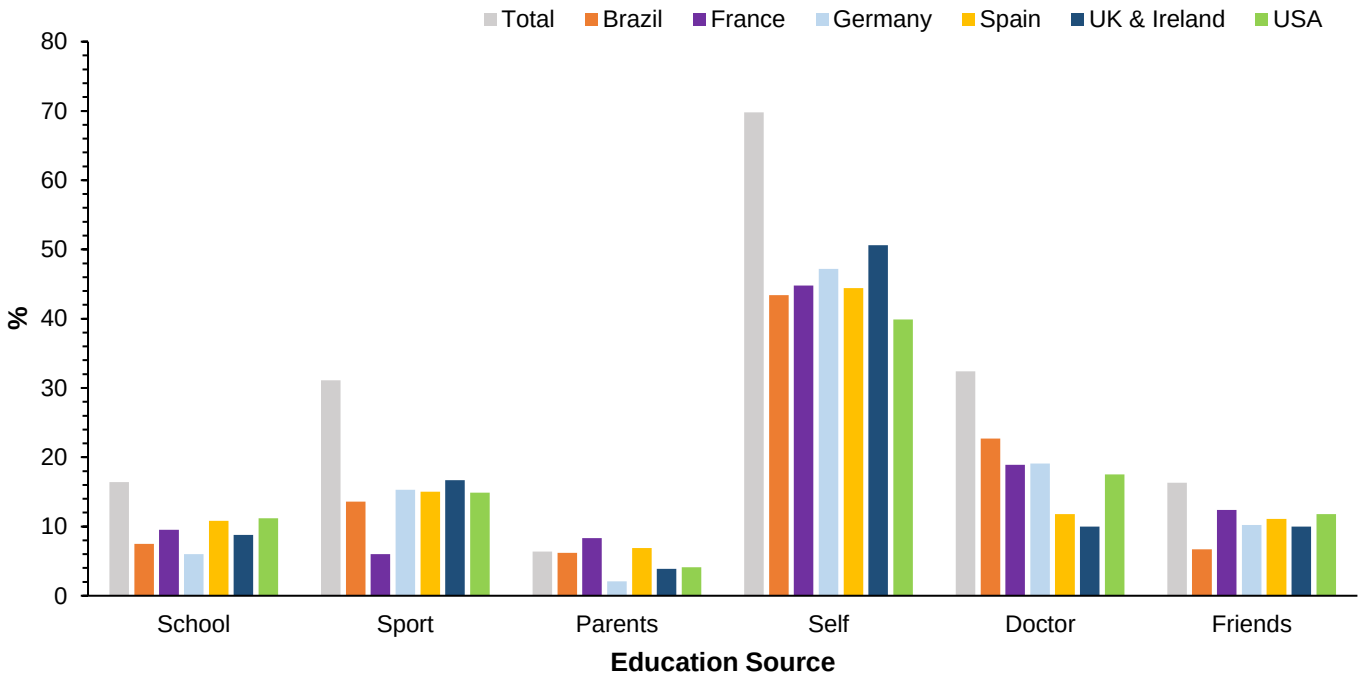

Figure 5: Sources of education per country

Discussion

This study aimed to retrospectively quantify decreased sports/exercise participation during adolescence across several different countries; explore the reasons for this trend; and, in addition within the UK & Ireland set of data, examine any age-group differences. This study also investigated the prevalence, source and type of education received in relation to the MC and sports/exercise. The key findings were as follows: 1) overall 24.8% of participants decreased their sports/exercise participation during adolescence; 2) the most common reason for decreasing participation was a lack of time due to other priorities; 3) 71.7% of participants had never received education about the MC in relation to sports/exercise; 4) the most prevalent source of education was self-education (69.8%) and content on

sports/exercise was “to keep levels of exercise the same” during menstruation (29.8%); and 5) there were significant generational differences in the UK & Ireland with regards to participation changes during adolescence.

Sports/exercise participation changes and causes

Of the countries investigated, the UK & Ireland reported one of the highest percentage decreases in sports/exercise participation during adolescence (39.7%). These data align with previous findings identifying that many girls in the UK decrease their sporting participation during puberty due to anxiety surrounding periods and physical changes, sport becoming ‘too competitive’ and/or new interests and responsibilities taking up their leisure time (Guthold et al., 2020; Women in Sport, 2018; Youth Sport Trust, 2022a). The UK & Ireland’s high rates of decreased participation may be associated with perceptions around school sport as it has been reported that UK students have more negative attitudes towards physical education (PE) than other countries (Steltzer et al., 2004). Differences between England and Germany in the school curriculum could explain why German participants did not decrease their participation as much. The German PE curriculum has a strong focus on personal development and recreation (Ruin & Stibbe, 2021). As a school subject PE is held in high regard by students and teachers alike and studying it at a higher level is encouraged and it garners the same respect as other subjects (Krüger, 2012). Germany has a long history of excelling in sport, and physical fitness is considered a significant part of national identity (Krüger, 2012). In the UK, PE teaching focuses on traditional values, aiming for skill mastery and promoting competition and success (Herold, 2020). This approach is consistently highlighted as alienating teenage girls who are often deterred by the increasingly competitive nature of sport during adolescence (Women in Sport, 2018). Changing the curriculum to focus on the values and benefits of physical activity, rather than the performance aspects of sport, could help improve female engagement in physical activity during puberty and subsequently boost sporting participation into adulthood (Women in Sport, 2019). This different approach towards PE already appears to have been successful

in Germany which has one of the highest sports participation rates in the European Union (EU) for both sexes and is one of the only countries where women report higher participation levels than men (Eurostat, 2018).

Factors such as ‘other priorities’ and ‘less time for sport’ were also frequently reported as reasons for decreasing participation in sports/exercise during adolescence. This is consistent with previous UK findings (Women in Sport, 2018; 2019; Youth Sport Trust, 2022b), however the results of this current study highlight that this may be deemed a global issue rather than something only occurring in the UK. These findings accentuate the need to emphasise the physical, psychological and social benefits of exercise so it is not ignored in favour of other commitments (Youth Sports Trust, 2019). Sports participation is associated with improved self-esteem, confidence, social skills and coping strategies; reframing sport as integral to managing mental health could improve engagement in sport (Malm et al., 2019). A recent survey also found the top motivator for teenage girls to participate in sport was ‘fun’, so efforts must be made to offer a range of non-competitive physical activities during puberty to encourage continued participation (Youth Sports Trust, 2021).

Participants also frequently stated the effects of puberty, the MC, concerns about body image and a decrease in self-confidence as other reasons for decreased sports/exercise participation. In the UK & Ireland, 23.0% of respondents cited that either the effects of puberty or the effects of their period caused their participation to decrease. This corroborates findings from Women in Sport (2019) and the Youth Sports Trust (2021) where 42% and 37% respectively of UK teenagers identified puberty or their period as their main barrier to sporting participation. The lack of support, education and advice surrounding puberty and exercise for girls is believed to be a key reason for teenage dropout in girls (Women in Sport, 2019).

Participation changes during adolescence differed significantly between age-groups within the UK & Ireland. Those in the ≥61 years age-group were least likely to report

that their participation decreased in adolescence, followed by the 18-30 years age-group. Those in the 31-45 and 46-60 years age-groups were significantly more likely to report that their participation had decreased. One consideration for the ≥61 years age-group was the self-selected nature of participants completing the survey. As they are Strava-users aged ≥61 years they may have been 'sporty' throughout their lives, thus naturally reporting lower rates of decreased participation as adolescents. However, participants in the ≥61 years age-group would have also been adolescents before the 1980s, when the majority of recreation was sport-based (Prentice & Jebb, 1995). Since the 1980s, physical activity levels in the UK have declined in both sexes whilst hours spent watching television increased (which may have taken precedence over sporting pursuits), potentially contributing to the higher rates of decreased participation in the 31-45 years and 46-60 years age-groups (Leicester & Windmeijer, 2004). More recently there has been a better awareness of female teenage sporting dropout and an increased focus on preventing it (Plan International UK, 2018). In 2013, a UK nationwide scheme, Girls Active, was launched by the Youth Sports Trust. Girls Active works with schools to improve attitudes to sport and exercise during puberty, tackle negative feelings impacting body image and the MC, improve sports teaching and increase sporting opportunities and accessibility for all. This and other schemes may explain the lower percentage of participation decreases in the 18-30 years age-group compared to the 31-45 and 46-60 years age-groups reported in this study within the UK and Ireland (Sport England, 2022).

Menstrual cycle education: prevalence, content and sources

Across all territories 71.7% of respondents indicated they had not received education on the MC in relation to sports/exercise. Those from Spain were most likely to have been educated

whilst those in the UK & Ireland least likely. It has been reported that Spain has a more forward-thinking and open approach to the MC than other countries and will become the first country in Europe (and only sixth country in the world) to introduce menstrual leave each month (Badcock, 2022). However, it is too soon to judge what impact this will have on dropout from sport; this data was collected in 2019 when Spain reported significantly higher participation decreases during adolescence, the new Spanish policy around menstrual leave was introduced in 2023. The UK & Ireland's education figures in this study align with previous UK findings which reported widespread knowledge gaps in UK teenagers on the MC and female anatomy; 25% did not know what to do when they had their first period and 14% did not know what was happening (Plan International UK, 2018). Across all age-groups in the UK & Ireland in this study, less than 20% had received education. This corroborates findings from Brown et al. (2022) that there is a need for regular education within UK schools, more training for teachers and better resources to help them deliver an accurate education on the MC. While there is no way of determining whether an association exists between reduced participation and MC education in this study, others have found associations between MC education and school absenteeism where those who received MC education from any source were less likely to miss school (Miiro et al., 2018; Vashisht et al., 2018). Providing education on the MC, exercise and managing symptoms has been identified as a key solution to improve sporting engagement/attendance in teenage girls (Women in Sport, 2018). Without education, girls appear more likely to perceive their MC negatively, whereas, receiving accurate MC education can promote a more positive outlook on the MC and provide resources to help manage menstruation and symptoms alongside exercise (Austrian et al., 2021; Hoerster et al., 2003; Rembeck et al., 2006). Reframing exercise during puberty as something that will likely benefit girls mentally and physically across their MC can instil positive behaviour and attitudes that are typically carried forward into adulthood and reduce the avoidance of sporting activities (Women in Sport, 2018). However, it must also be acknowledged that multiple other factors also influence sporting

participation during adolescence such as facilities, accessibility, opportunity, cost and time-constraints (Youth Sports Trust, 2022a).

It is also important that sources of education are reliable and informed. This study found the most common source of education reported was ‘themselves’ while less than 20% of participants from each country had received education from school or their sport. A lack of education and the tendency to self-educate can lead to incorrect understanding surrounding the MC and exercise as there are many conflicting sources that are not always accurate (Harvey et al., 2020). These findings also contrasted with other reports where ‘mothers’ are often reported as the main source of MC information (Rembeck et al., 2006; Srivastava & Chandra, 2017). This can also be problematic, if information is inaccurate and negative whereby menstruation is portrayed as shameful, embarrassing and or something to hide, it can adversely shape a girl’s view on menstruation for life and continue to perpetuate misconceptions and mistruths on the subject (Chandra-Mouli & Patel, 2020; Costos et al., 2002). It is evident schools, national bodies and sports clubs could do more to provide regulated, accurate education programmes to disseminate the correct information on sport, exercise and the MC.

Of those who had received some form of education, 35.5% were told to stop or reduce exercise and 22.8% told to avoid some types of exercise. This is inaccurate as research shows exercise can improve physical and psychological MC symptoms and is recommended by medical professionals (Abedy et al., 2014; Ilka et al., 2015; Kamalifard et al., 2017; Ravichandran & Janakiraman, 2022; Saglam & Orsal, 2020; Tsai, 2016). Participants in Brazil, Spain and France were significantly more likely to receive negative education that would dissuade participation. The results from Spain demonstrate the worrying link between inaccurate education and participation. Spain reported the highest likelihood of education, but this was more likely to be negative, and significantly higher participation decreases then other countries.. This demonstrates that despite their nationwide forward-looking approach to the MC, inaccurate education could be damaging to sports/exercise participation levels.

Meanwhile, participants in the USA and Germany were more likely to receive positive education and reported higher participation increases. This highlights the need for accurate, positive education programmes so girls can make informed decisions in relation to the MC and exercise.

Limitations

The self-reported and retrospective nature of the questionnaire relies on accurate memory recall. Furthermore, it is important to note that this study was conducted with active users of the Strava exercise App, this may have biased results as users are more likely to be active and interested in the MC's impact on exercise, meaning the true extent of the absence of MC education in relation to sports/exercise may be far higher than this report suggests. Additionally, the selection of territories included were determined by the distribution of the questionnaire by Strava, ideally a greater geographical representation would be included in any future studies. Furthermore, since this survey was open in 2019, there has been a rapid increase in the amount of online content available on this topic. Consequently, the opportunity for self-directed education has changed since 2019 and is likely to be different again in the future as there is increased research into the impact of the MC on sports/exercise (Meignié et al., 2021).

Future Studies

Future studies should seek to ask participants when they received their MC education and whether it influenced their adolescent sports/exercise participation. Studies could also look at creating educational content and the effect of delivering this on participation during adolescence. Furthermore, recruiting for the study from a global audience (and including less active or sedentary participants) would give a better overview of the true amount of education received, participation decreases and the reasons why, and also allow for comparisons between the two groups.

Conclusion

This report illustrates high rates of decreased sports/exercise participation during adolescence across all the countries surveyed. Over 20% of participants decreased their sports/exercise participation during adolescence, primarily due to a lack of time. The majority of participants received no education on the MC in relation to sports/exercise (with the UK & Ireland the highest). This demonstrates a need for improved education to be available for women to help them understand and manage their MC alongside sports/exercise to globally prevent the negative impact of the MC on physical activity.

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