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Original research

## Osteoarthritis and other long-term health conditions in former elite cricketers

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### ABSTRACT

**Objectives:** This study aimed to describe the prevalence and risk of chronic conditions in former elite cricketers compared to a normal population, and describe wellbeing in former elite cricketers.

**Design:** Cross-sectional study.

**Methods:** Former elite cricketers, recruited from the Professional Cricketers' Association, completed a self-report cross-sectional questionnaire. The English Longitudinal Study of Ageing (ELSA) served as the normal population. The prevalence of self-reported, GP-diagnosed conditions (heart problems, hypertension, stroke, diabetes, asthma, dementia, osteoarthritis (OA), total hip replacement (THR), total knee replacement (TKR), anxiety, depression) were reported for both population samples. Standardised morbidity ratios (SMRs) compared chronic conditions in sex-, age- and BMI-matched former cricketers (n = 113) and normal population (n = 4496).

**Results:** Heart problems were reported by 13.3% of former cricketers, significantly lower than the normal population, SMR 0.55 (0.33–0.91). Former cricketers reported 31.9% hypertension, 1.8% stroke, 6.2% diabetes, 15.0% asthma, and no dementia, none significantly different to the normal population. OA, THR, and TKR were reported by 51.3%, 14.7% and 10.7% of former cricketers, respectively, significantly higher than the normal population, SMRs 3.64 (2.81–4.71), 3.99 (2.21–7.20) and 3.84 (1.92–7.68). Anxiety and depression were reported by 12.4% and 8.8% of former cricketers, respectively, SMRs 3.95 (2.34–6.67) and 2.22 (1.20–4.14). 97% of former cricketers reflected they would undertake their cricket career again, 98% agreed that cricket enriched their lives.

**Conclusions:** Heart problems were significantly lower, while OA, THR, TKR, anxiety, and depression were significantly higher in the former cricketers compared to the normal population (ELSA). Most former cricketers reflected positively on their career.

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### 1. Introduction

Cricket is a popular sport worldwide at both the recreational and elite levels, with an estimated 1 million players in the UK and 1.3 million players in Australia.<sup>1,2</sup> Physical activity has a wide number of health benefits, so it is important to encourage a sport such as cricket at all levels. However, understanding the possible negative

outcomes of long-term sport participation may help in prevention and mitigation of these risks and contribute to informed participation.

Few investigations have considered the long-term health (i.e. heart problems, hypertension, stroke, diabetes, asthma, dementia, osteoarthritis (OA), total hip replacement (THR), total knee replacement (TKR), anxiety, and depression) of former elite athletes. To the best of our knowledge no studies have been conducted in former elite cricketers with a holistic view of physical and mental health, and overall wellbeing; such a study would provide indications of overall health benefits from this popular sport.<sup>3,4</sup>

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Physical activity, especially sport and recreational activities, has been shown to have major benefits in primary and secondary prevention of chronic conditions that are leading causes of death and disability, such as chronic heart disease (CHD) and hypertension,<sup>5–7</sup> and to be associated with decreased incidence of stroke and diabetes.<sup>8</sup> Research suggests an inverse relationship between regular physical activity in midlife and older age and incidence of dementia in healthy adults.<sup>9,10</sup> Elite athletes would be expected, therefore, to benefit from these positive effects of physical activity. Concurrently, OA has been suggested to be more common in certain former elite athletes, such as footballers, perhaps due to injury rates.<sup>4,11,12</sup> Studies of current elite athletes have found comparable rates of mental health conditions as a general population sample, though athletes were not followed up after their transition out of elite sport, when many athletes experience depression and anxiety.<sup>13–15</sup>

While clinical diagnoses are important outcome measures, how athletes reflect on their sporting career may indicate how their career affected their wellbeing. Therefore, the career reflection of participants was investigated as an indication of wellbeing.

The aim of this study is primarily to describe the prevalence and risk of chronic conditions in former elite cricketers compared to a normal population, and to describe the wellbeing of former elite cricketers.

## 2. Methods

A retrospective cross-sectional questionnaire study was designed for the former cricketers. The study was given favourable opinion by the NHS Health Research Authority (NRES) Committee London Stanmore (REC 15/LO/1274).

There were no known validated questionnaires that included injury, medical, and playing histories for former elite athletes. Therefore, epidemiological questionnaires were developed within the Arthritis Research UK Centre for Sport, Exercise and Osteoarthritis to address these areas in specific sports.<sup>16</sup> Cricket-specific and wellbeing questions were developed through patient and public involvement (PPI). All invited PPI participants agreed to contribute to PPI discussions, including two physicians and one physiotherapist within elite cricket, and ten former and current cricketers. Six PPI sessions were held, resulting in consensus on the cricket-specific variables and wellbeing measures and the phrasing for capturing these variables, as described in other PPI practice.<sup>17</sup> Three wellbeing measures stated, “Considering the benefits and risks of my previous participation in cricket, I would do the same again,” “Considering the benefits and risks of my previous participation in cricket, I would recommend this to my children, relatives, or close friends,” and “Did your cricket career enrich your life?” The responses of each wellbeing measure were categorised into “agree”, “undecided”, and “disagree” responses.

All members on the Professional Cricketers' Association's (PCA) “former players” contact list were emailed an invitation to participate in the study. One reminder email was sent two weeks after initial contact. Participants could complete the questionnaire online, by telephone or on paper via a postal version. Participant consent and study data were managed using REDCap electronic data capture software hosted at the lead institution.<sup>18</sup>

Wave 1 responses from the English Longitudinal Study of Ageing (ELSA) were used as a cross-sectional normal population sample. ELSA is a longitudinal survey of representative households in England, selecting participants from the Health Survey for England (HSE) aged 50 and above and their young partners to follow with annual surveys.<sup>19</sup> Wave 1 of ELSA was collected during 2002–2003; core questionnaire data were requested from and provided by the UK Data Service. Demographic data variables were retrieved from

Wave 0 of ELSA, when these variables were not collected at Wave 1. Normal population participants aged under 60 were not asked questions regarding joint replacement (TJR).

The self-reported, GP-diagnosed chronic conditions investigated were: heart problems, hypertension, stroke, diabetes, asthma, dementia, OA, THR, TKR, anxiety, and depression. All conditions were posed to the former cricketers in questions that were comparable to the normal population, except for heart problems and joint replacement. For the normal population, heart problems were derived from a positive response to any of six heart conditions including “any other heart trouble”; THR and TKR were derived from positive responses to any hip or knee replacement, respectively. Variable harmonization between the former cricketers and the normal population for each condition can be found in Supplementary material Table A.1. Demographic variables analysed were age, body mass index (BMI), smoking status and ethnicity. The cricket-specific variables of predominant playing position and mean years since retirement were reported for former cricketers. Wellbeing questions were reported for former cricketers and examined their career reflection.

Stata 14 was used for statistical analysis. Prevalences and 95% confidence intervals (CI) of the eleven chronic conditions were calculated for the entire cricketer sample and for the cricketer and normal population samples included in matched analysis.

Standardized morbidity (mortality) ratios (SMRs) were calculated to compare chronic condition prevalences amongst former cricketers to those of the normal, reference population (ELSA). Only male participants were included. Age for both normal and cricketer populations was categorized into 10-year bands, starting with 50–59 years and ending with 80–89 years. BMI for both populations was categorized into WHO classifications for Normal (18.5–25), Overweight (25–30), and Obese (30+). WHO subcategories were not used due to small sample sizes in the cricketer sample. The normal population was standardised to the cricketer population by age and BMI using indirect standardization.<sup>20</sup> Age and BMI were chosen, as they are known risk factors for many of the chronic conditions analysed. Post hoc analysis standardized SMRs by age, BMI and smoking status, due to the association of smoking status with several of the conditions investigated.

## 3. Results

Recruitment for the former cricketer study lasted four months, contacted 1500 former cricketers and resulted in a response rate of 13%. Of cricketers that requested to participate, 80.2% submitted a completed questionnaire. Fig. 1 shows how the samples from the former cricketer and normal populations were determined for analysis. Complete responses to age, BMI, and all chronic conditions analysed were required for inclusion in prevalence calculations. For age- and BMI-adjusted SMRs, only male participants aged 50–89 years with a BMI over 18.5 were included. Due to the normal population's questionnaire, only participants aged 60 and over in both populations were included in THR and TKR SMR analysis.

Table 1 shows participant characteristics for the samples included in analyses. The former cricketers excluded from SMRs due to age ( $n = 52$ ) were not significantly different to those included in SMRs ( $n = 113$ ) for any characteristic but age ( $p > 0.05$ ). The normal population ( $n = 4496$ ) was significantly different from the former cricketers included in SMR analysis ( $n = 113$ ) only for smoking status ( $p < 0.001$ ).

Table 2 shows the prevalences and 95% CI of the chronic conditions analysed. Table 2 also shows the age- and BMI-adjusted SMRs and 95% CI for the chronic conditions analysed. An SMR and 95% CI less than 1.0 indicates a statistically significantly lower prevalence in the former cricketers, while an SMR and 95% CI greater

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