Normative FJS-12 scores for the knee in an Asian population: a cross-sectional study

Jia Ying Lee1*, Wai Weng Yeo2, Zi Yang Chia1 and Paul Chang1

Abstract

Background: The Forgotten Joint Score is a patient-reported outcome measure validated in assessing patients post knee arthroplasty, anterior cruciate ligament (ACL) reconstruction surgery and patellar dislocation. A previous study had established the normative scores of a population in the USA but included knees with pathology. The aim of our study is to obtain normative Forgotten Joint Scores in young Asian adults without any pre-existing knee pathologies to increase the interpretability of the Forgotten Joint Score-12 (FJS-12) score.

Methods: We conducted a cross-sectional study across young healthy Asian adults via electronic platforms. Participants who had sought either Western medical consultation, physiotherapy or traditional medical therapies were excluded. Demographic data, occupation, type of sport played, and FJS-12 scores were collected. Scores were stratified into subgroups and analysed.

Results: There were 172 participants who met our inclusion criteria for this study. The average age of participants in our study was 28.1 ± 10.5 years (range 14–70 years), with 83 (47.7%) participants falling into the ages 21–25 years. Average body mass index (BMI) was 21.9 ± 3.3 kg/m² (range 14.7–36.3 kg/m²). The average FJS-12 score was 62.8 ± 25.6. The median FJS-12 was 63.5 with a range of 4.2–100. Nine participants (5.2%) scored the maximum score possible, and 56 (32.6%) participants scored below the midpoint score of 50. The percentiles for each subgroup of participants were tabulated and reported. Notably, males aged 46–70 years old scored the highest average FJS-12 score of 73.4 ± 5.5, and females aged 31–45 years old scored the lowest FJS-12 score of 57.1 ± 25.1. Females scored lower than males, although the difference was not statistically significant (p = 0.157). There were no significant correlations between BMI, age, or type of sport played with FJS-12; however, interestingly, we observed that women reported similar FJS-12 scores across all age groups, while men reported better scores with increasing age.Interestingly,we observed that women reported similar FJS-12 scores across all age groups, while men reported better scores with increasing age.

Conclusion: Having normative values provides opportunities for benchmarking and comparing individuals against age- and gender-matched peers in the general population. Knowledge of normative values for FJS-12 scores would aid evaluating and tracking progress in patients recovering from injuries or undergoing post-surgery rehabilitation. This would help clinicians determine if they return to normal post intervention.

Keywords: Normative scores, Patient-reported outcome scores, Forgotten Joint Score, Knee, Sports, Young adults

*Correspondence: jiaying.lee@mohh.com.sg
1 Department of Orthopaedic Surgery, Singapore General Hospital, 20 College Road, Academia Level 4, Singapore 169856, Singapore
Full list of author information is available at the end of the article

© The Author(s) 2021. Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article’s Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article’s Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/. The Creative Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated in a credit line to the data.
[1]. While these subjective outcome measures do not fully replace conventional clinical or radiographic parameters, they provide alternative insights into satisfaction, function and quality of life from patients’ perspectives. Recently, goals of health care have shifted towards a more value-oriented approach, and PROMs have been proven to be most suitable for obtaining patient-centric data. The Forgotten Joint Score-12 (FJS-12) is one such PROM that gained popularity after being introduced in 2012 [2]. This score is based on the concept that the primary goal of total knee arthroplasty is for patients to ‘forget’ their artificial joint while performing various everyday tasks. The FJS-12 has been validated in knee arthroplasties, anterior cruciate ligament (ACL) reconstruction surgery and, more recently, in the assessment of patellar dislocation, exhibiting a low ceiling effect and greater sensitivities to marginal differences as compared with other outcome measures [3–5]. PROMs depend on populationspecific normative reference ranges to make objective comparisons against. In addition to comparing pre- and post-operative outcomes, these normative ranges also allow clinicians to objectively analyse how close to ‘normal’ patients perceive their joints post-intervention by comparing against a ‘healthy’ control group. A previous study done in the USA has established the normative FJS-12 scores across a general population, but the sampling did not exclude knees with pathology [6]. Therefore, the aim of this study was to obtain FJS-12 scores in young Asian adults without existing knee pathologies to describe the normative percentiles and distribution, to increase the interpretability of FJS-12. We compare our data of normative values with other study populations in the literature.

**Patients and methods**

We conducted a cross-sectional study across healthy Asian adults. Participants were invited from an online link via various social media platforms, and the survey was conducted electronically. We calculated a sample size of 177 based on the formula for quantitative variables, using the previously published normative standard deviation for FJS of 34 with a standard normal variate of 1.96, a 5% chance of type 1 error and a precision of 5% [7]. We excluded participants who had sought previous medical consultation, physiotherapy or traditional medicine for prior knee symptoms, regardless of whether a pathology was diagnosed. Demographic data, occupation, type of sport played and FJS-12 scores were collected. The FJS-12 questionnaire was scored using a 5-point Likert scale with raw scores converted into a 0–100-point scale. Higher scores represented better outcomes suggesting the ‘forgotten joint phenomenon’. Normative values for the FJS-12 were presented as mean, standard deviation (SD) and percentiles for the total sample. Age-specific, sex-specific groups and BMI-specific groups based on Asian BMI standards were analyzed. Student’s *t*-test and one-way ANOVA were applied to compare means between groups to test for statistical significance. In addition, we used Pearson’s coefficient to investigate the relationship of FJS-12 with BMI and age.

**Statistical analysis**

All statistical analysis was performed with SPSS Statistics for Windows, version 26.0, Armonk, NY: IBM Corp Released 2019. Descriptive and comparative statistical analyses were performed. Variables were compared with either independent *t*-test or one-way ANOVA test depending on the number of groups present. *p* < 0.05 was considered statistically significant, and confidence intervals (CI) were calculated.

**Results**

**Demographic data**

There were 242 responses, of which 70 responses were excluded for having sought treatment for previous knee symptoms, leaving 172 responses that met our inclusion criteria. The average age of participants in our study was 28.1 ± 10.5 years (range 14–70 years) with 83 (47.7%) participants falling into the age 21–25 years category. Average BMI was 21.9 ± 3.3 kg/m² (range 14.7–36.3 kg/m²).

The nature of participants’ occupations fell into three main categories, where students formed the majority (57.4%). Other categories of work were semi-active occupations (sales personnel, events, engineers, healthcare workers) and desk-bound jobs (administrators, bankers). Other than the 14 (8.1%) participants who reported being sedentary, the rest of the participants played a wide variety of sports. The sport being played most often by each participant is represented in Table 1.

**FJS-12 scores**

The average FJS-12 score was 62.8 ± 25.6 (95% confidence interval for mean 59.0–66.7). The median FJS-12 was 63.5 with a range of 4.2–100. Nine participants (5.2%) scored the maximum score possible, and 56 (32.6%) participants scored below the midpoint score of 50. The percentiles for each subgroup of participants are presented in Table 2. Notably, males aged 46–70 years old scored the highest average FJS-12 score of 73.4 ± 5.5, and females aged 31–45 years old scored the lowest FJS-12 score of 57.1 ± 25.1. Males aged 26–30 years of age showed the largest interquartile range of 63.6. Participants with BMI < 18.5 had the poorest 90th percentile FJS-12 score of 79.6, and females aged 46–70 years old had the poorest 10th percentile FJS-12 score of 10.8 (Figs. 1, 2). The only
A breakdown of scores for individual questions showed that participants noticed their knees least during showering and were most aware of their knees during hiking, climbing stairs and standing for prolonged durations (Table 3). We applied Student’s t-test comparing males with females and found no statistically significant difference between scores for individual questions or overall scores. The question with the greatest difference in scores between men and women investigated knee awareness while doing housework or gardening, with females scoring 2.17 as opposed to 2.54 for males ($p = 0.075$, CI $-0.786$ to $0.038$). Cronbach’s coefficient $\alpha$ for all 12 questions was calculated to be 0.94.

Interestingly, we observed that women reported similar FJS-12 scores across all age groups, while men reported better scores with increasing age. This is similar to what Giesinger and other previous arthroplasty studies reported, taking into account even those with knee pathology [2, 6]. Bremner-Smith reported other functional knee scores (Oxford Knee Score, Bristol Knee Score, American Knee Society Score) in a normal population, and found a similar negative correlation between age and scores especially when taking into account ‘function’ [12]. We hypothesize that the better scores in older age groups may reflect either an overall decrease

| Sport participation (172) | N  | %  |
|---------------------------|----|----|
| Not active (14)           | 14 | 8.1|
| Running (25)              | 25 | 14.5|
| Field sports (33)         |    |    |
| Cricket                   | 4  | 2.3|
| Frisbee                   | 1  | 0.6|
| Snowboarding              | 2  | 1.2|
| Soccer                    | 24 | 14.0|
| Softball                  | 1  | 0.6|
| Touch rugby               | 1  | 0.6|
| Court sports (56)         |    |    |
| Badminton                 | 16 | 9.3|
| Basketball                | 17 | 9.9|
| Floorball                 | 1  | 0.6|
| Netball                   | 11 | 6.4|
| Tennis/squash             | 7  | 4.1|
| Volleyball                | 4  | 2.3|
| Indoor sports (37)        |    |    |
| Bouldering/rock climbing  | 3  | 1.7|
| Dance                     | 14 | 8.1|
| Gym                       | 8  | 4.7|
| Kickboxing/MuayThai       | 8  | 4.7|
| Shooting                  | 1  | 0.6|
| Spin/cycling              | 1  | 0.6|
| Yoga                      | 2  | 1.2|
| Water sports (7)          |    |    |
| Swimming                  | 7  | 4.1|

Distribution. The distribution curve for FJS-12 scores is shown in Fig. 3.

Discussion

This was the first study to document normative FJS-12 knee scores of a young Asian population. We presented mean values, age and BMI-stratified values according to gender. The key finding is that, even by surveying participants who had not sought medical treatment for their knees, only a very small number of patients (5.2%) attained the maximum score of 100. A similar study by Giesinger et al. was conducted for a general population in the USA; however, despite their inclusion of knees with pathology, they reported 37.2% of participants attaining maximum scores [6] and an average FJS-12 score of 63.4±35.1 (18–39 years old). Behrend et al. analysed FJS-12 scores in patients post-ACL reconstruction against matched healthy control participants [3]. The healthy control group had FJS-12 scores of 88.7±15.0 in a population averaging 31.1 years of age. Another study conducted by Ladurner et al. analysed FJS-12 scores in patients with first-time patellar dislocations against healthy control patients with no previous knee treatment or surgery [4]. His control group had a total FJS-12 score of 87.6±16.6 in a population averaging 29.9 years of age. The lower average FJS-12 scores and fewer participants attaining maximum scores in our study may be attributed to four issues. Firstly, knee osteoarthritis is more prevalent amongst Asians as compared with our Western counterparts as reported by the Beijing osteoarthritis study [8]. Secondly, the Asian population has significantly different cultural habits and functional demands such as sitting cross-legged, squatting and kneeling for chores, hygiene and religious activities, leading to increase loads on the knee [9]. Thirdly, Asians have different thresholds for pain, as reported by Ahn, who noted Asians to have higher risk for clinical pain, heightened sensitivity and depression due to symptomatic knee osteoarthritis [10, 11]. Lastly, cultural differences may play a role in health-seeking behaviours and perception of pain and dysfunction between populations [9].
| Table 2 Gender, age, occupation and body mass index normative data for FJS-12 knee |
|-----------------------------------------------|
|                                | Mean  | SD  | 10th | 25th | 50th | 75th | 90th |
| Total sample (172)             | 62.8  | 25.6| 27.1  | 41.7  | 63.5  | 85.4  | 95.8  |
| Gender p = 0.157              |       |     |       |       |       |       |       |
| Female (89)                   | 60.1  | 25.8| 25.0  | 40.6  | 62.5  | 84.4  | 93.7  |
| Male (83)                     | 65.7  | 25.2| 28.7  | 43.7  | 68.7  | 89.6  | 95.8  |
| Age (years) p = 0.706         |       |     |       |       |       |       |       |
| 14–20 (17)                    | 68.2  | 25.6| 32.1  | 44.8  | 70.8  | 92.7  | 100.0 |
| 21–25 (83)                    | 64.4  | 24.3| 32.1  | 43.7  | 64.6  | 85.4  | 95.8  |
| 26–30 (27)                    | 58.7  | 28.7| 18.7  | 33.3  | 62.5  | 87.5  | 95.0  |
| 31–45 (29)                    | 60.5  | 24.0| 27.1  | 39.6  | 62.5  | 81.2  | 95.8  |
| 46–70 (16)                    | 60.1  | 30.5| 14.2  | 27.1  | 69.8  | 82.8  | 95.6  |
| Female/age (years) p = 0.895  |       |     |       |       |       |       |       |
| 14–20 (6)                     | 62.1  | 28.7| 27.1  | 41.1  | 53.1  | 95.3  | 100.0 |
| 21–25 (40)                    | 62.9  | 24.4| 31.4  | 41.7  | 63.5  | 85.4  | 93.5  |
| 26–30 (13)                    | 59.1  | 24.1| 15.0  | 47.9  | 62.5  | 76.0  | 91.2  |
| 31–45 (18)                    | 57.1  | 25.1| 22.9  | 34.9  | 54.2  | 74.5  | 98.1  |
| 46–70 (12)                    | 55.8  | 34.3| 10.8  | 18.7  | 59.4  | 89.6  | 98.1  |
| Male/age (years) p = 0.713    |       |     |       |       |       |       |       |
| 14–20 (11)                    | 71.6  | 24.6| 33.7  | 43.7  | 83.3  | 91.7  | 99.2  |
| 21–25 (18)                    | 65.7  | 24.4| 29.6  | 43.7  | 66.7  | 89.6  | 95.8  |
| 26–30 (14)                    | 58.3  | 33.3| 15.6  | 28.6  | 55.2  | 92.2  | 100.0 |
| 31–45 (11)                    | 66.1  | 22.2| 29.6  | 52.1  | 62.5  | 83.3  | 95.8  |
| 46–70 (4)                     | 73.4  | 5.5 | 68.7  | 69.3  | 71.9  | 79.2  | 81.3  |
| Occupation p = 0.293          |       |     |       |       |       |       |       |
| Students (94)                 | 65.4  | 24.4| 33.3  | 43.2  | 67.7  | 88.0  | 95.8  |
| Desk-bound occupation (46)    | 60.6  | 25.9| 22.2  | 41.7  | 60.4  | 81.8  | 96.4  |
| Semi-active occupation (23)   | 63.8  | 25.6| 24.5  | 45.8  | 64.6  | 85.4  | 97.5  |
| BMI (kg/m²) p = 0.204         |       |     |       |       |       |       |       |
| BMI < 18.5 (17)               | 57.7  | 15.8| 37.1  | 44.8  | 56.2  | 67.7  | 79.6  |
| BMI 18.51–22.9 (98)           | 66.3  | 24.3| 30.8  | 45.8  | 70.8  | 87.5  | 95.8  |
| BMI 22.91–27.4 (47)           | 59.4  | 29.4| 15.6  | 28.6  | 55.2  | 91.7  | 95.8  |
| BMI 27.41–36.3 (10)           | 53.5  | 30.0| 11.4  | 22.4  | 53.1  | 87.0  | 93.5  |
| Female/BMI (kg/m²) p = 0.004  |       |     |       |       |       |       |       |
| < 18.5 (14)                   | 56.1  | 16.4| 36.4  | 41.1  | 55.2  | 63.5  | 84.4  |
| 18.51–22.9 (59)               | 66.1  | 24.3| 27.1  | 45.8  | 66.7  | 85.4  | 93.7  |
| 22.91–27.4 (14)               | 39.3  | 27.7| 6.2   | 22.9  | 33.3  | 44.8  | 96.9  |
| 27.41–36.3 (2)                | 58.3  | 50.1| 22.9  | 58.3  | 93.8  | –     | –     |
| Male/BMI (kg/m²) p = 0.471    |       |     |       |       |       |       |       |
| < 18.5 (3)                    | 65.3  | 11.8| 52.1  | 52.1  | 68.7  | 75.0  | –     |
| 18.51–22.9 (39)               | 66.5  | 24.6| 31.2  | 41.7  | 70.8  | 89.6  | 97.9  |
| 22.91–27.4 (33)               | 68.0  | 26.0| 29.6  | 44.8  | 77.1  | 94.8  | 95.8  |
| 27.41–36.3 (8)                | 52.3  | 28.1| 10.4  | 26.6  | 53.1  | 79.1  | 91.7  |

BMI: body mass index. Number of participants shown in brackets for each subgroup. FJS-12: Forgotten Joint Score-12. Variables analysed with either t-test or one-way ANOVA, and p values represented.

![Fig. 1](image_url) FJS-12 of total population, males and females in different age groups, represented in a line graph. FJS-12 Forgotten Joint Score-12
in strenuous activities that incite knee symptoms or an improvement in happiness and psychological wellbeing with advancing age [13]. In addition, by excluding participants who had sought medical consultation for knee symptoms, this also causes a selection bias and eliminates those with severe symptoms. In our study, males also reported better scores compared with females for the FJS-12, although not statistically significant. Giesinger agreed that overall, males scored better than females and attributed this to sex selection bias in physical activity patterns [6]. Noyes and Lysholm scores in uninjured athletes have also been reported to be worse in females compared to males [14]. There may be a few explanations for these findings. Firstly, the female gender has been shown to be a risk factor for osteoarthritis of the knee as well as the progression of radiographic changes [15]. Secondly, it has been reported that males typically have higher muscle mass and extensor mechanism strength, which could

| Table 3 | Individual questions in the Forgotten Joint Score-12 and corresponding scores on a scale of 0–4 |
|---------|-------------------------------------------------------------------------------------------------|
| Question                                                                 | Score            |
| Are you aware of your knee joint…                                                                                           |
| 1. … in bed at night                                                                                                       | 3.12 ± 1.12      |
| 2. … when you are sitting on a chair for more than 1 h?                                                                     | 2.70 ± 1.32      |
| 3. … when you are walking for more than 15 min?                                                                            | 2.73 ± 1.27      |
| 4. … when you are taking a bath/shower?                                                                                   | 3.37 ± 0.90      |
| 5. … when you are travelling in a car?                                                                                     | 2.91 ± 1.19      |
| 6. … when you are climbing stairs?                                                                                         | 2.09 ± 1.38      |
| 7. … when you are walking on uneven ground?                                                                                | 2.47 ± 1.36      |
| 8. … when you are standing up from a low-sitting position?                                                                  | 2.12 ± 1.41      |
| 9. … when you are standing for long periods of time?                                                                     | 2.10 ± 1.39      |
| 10. … when you are doing housework or gardening?                                                                           | 2.35 ± 1.37      |
| 11. … when you are taking a walk/hiking?                                                                                   | 2.08 ± 1.39      |
| 12. … when you are doing your favourite sport?                                                                             | 2.11 ± 1.39      |

Fig. 2 FJS-12 total population, males and females in different BMI ranges, represented in a line graph. FJS-12 Forgotten Joint Score-12. BMI body mass index

Fig. 3 Histogram plot of FJS-12 scores of participants
play a protective role in the biomechanics of the knee [16]. Thirdly, Fillingim demonstrated that females exhibit a greater sensitivity to pain stimuli as compared with males, and since the FJS-12 is based on patient-reported outcomes, this reduces scores further [17, 18]. Additionally, housework is typically performed by women in Asian communities, and this may explain the disparity in scores between genders for that question.

The normative FJS-12 scores did not follow a normal distribution, like other PROMs (Tegner activity scale, Lysholm score, Oxford Knee Score, Knee Society Score, Knee Injury and Osteoarthritis Outcome Score, Western Ontario and McMaster Universities Index) [19, 20]. This finding contrasts with the previously published study of patients post ACL surgery that showed a normal distribution of FJS-12 [21]. We postulate that, if we had included knees with pre-existing pathologies, the scores may have gravitated towards a normal distribution.

Limitations
Our study has some limitations. Firstly, there may have been participants with knee symptoms but who may not have sought medical attention. This would mean that those who had a high threshold to seek medical attention were included, and this could explain the high number of poor FJS-12 scores we found, especially in the younger age groups. Secondly, the age ranges outside 21–25 years were not as well represented. This may be a reflection of our data collection method. Further studies may be necessary to better define FJS-12 scores across other age groups outside of this range.

Conclusion
Having normative values provides opportunities for benchmarking and comparing individuals against age- and gender-matched peers in the general population. Knowledge of normative values of FJS-12 scores would aid evaluating and tracking progress in patients recovering from injuries or undergoing post-surgery rehabilitation, to determine if they return to ‘normal’ post intervention.

Abbreviations
PROM: Patient-reported outcome measures; FJS-12: Forgotten Joint Score-12; ACL: Anterior cruciate ligament; BMI: Body mass index.

Supplementary Information
The online version contains supplementary material available at https://doi.org/10.1186/s43019-021-00122-2.

References
1. Ahern S, Ruseckaitė R, Ackerman IN (2017) Collecting patient-reported outcome measures. Intern Med J 47:1454–1457. https://doi.org/10.1111/imj.13633
2. Behrend H, Giesinger K, Giesinger JM, Behrend H (2012) The ‘Forgotten Joint” as the ultimate goal in joint arthroplasty. Validation of a new patient-reported outcome measure. J Arthroplasty 27:430-436.e1. https://doi.org/10.1016/j.arth.2011.06.035
3. Behrend H, Zdravkovic V, Giesinger JM, Giesinger K (2017) Joint awareness after ACL reconstruction: patient-reported outcomes measured with the Forgotten Joint Score-12. Knee Surg Sport Traumatol Arthrosoc 25:1454–1460. https://doi.org/10.1007/s00167-016-4357-x
4. Ladurner A, Giesinger K, Zdravkovic V, Behrend H (2020) The Forgotten Joint Score-12 as a valuable patient-reported outcome measure for patients after first-time patellar dislocation. Knee 27:406–413. https://doi.org/10.1016/j.knee.2019.12.004
5. Robinson PG, Rankin CS, Lavery J et al (2018) The validity and reliability of the modified Forgotten Joint Score. J Orthop 15:480–485. https://doi.org/10.1016/j.jor.2018.03.029
6. Giesinger JM, Behrend H, Hamilton DF et al (2019) Normative values for the Forgotten Joint Score-12 for the US general population. J Arthroplasty 34:650–655. https://doi.org/10.1016/j.arth.2018.12.011

Acknowledgements
Not applicable.

Author’s information
Dr. Lee Jia Ying is a Medical Officer in the department of Orthopaedic Surgery at Singapore General Hospital. Her interests include sports-related injuries and dance-related injuries.

Authors’ contributions
L.J.Y. and Y.W.W. were the main authors who collected the data, performed statistical analyses, and wrote the manuscript. C.Z.Y. and the senior author PC provided guidance, insights and valuable feedback on the manuscript. All authors read and approved the final manuscript.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

Availability of data and materials
All data generated or analysed during this study are included in this published article and its Additional file 1.

Declarations

Ethics approval and consent to participate
Ethics approval and consent to participate for this study was sought under Singhealth Centralised Institutional Review Board, and an exemption was granted in lieu of the anonymized survey collection type and unidentifiable data. Reference number for this study is 2019/2050.

Consent for publication
All the above authors have given consent for publication for the journal Knee Surgery and Related Research.

Competing interests
The authors have no conflicts of interests to declare.

Author details
1 Department of Orthopaedic Surgery, Singapore General Hospital, 20 College Road, Academy Level 4, Singapore 169856, Singapore. 2 University of New South Wales, Sydney, Australia.

Received: 2 August 2021 Accepted: 19 October 2021
Published online: 30 October 2021
7. Charan J, Biswas T (2013) How to calculate sample size for different study designs in medical research? Indian J Psychol Med 35:121. https://doi.org/10.4103/0253-7176.116232
8. Zhang Y, Xu L, Nevitt MC et al (2001) Comparison of the prevalence of knee osteoarthritis between the elderly Chinese population in Beijing and whites in the United States: the Beijing osteoarthritis study. Arthritis Rheum 44:2065–2071. https://doi.org/10.1002/1529-0131(200109)44:9<3c2065::AID-ART2065>3.0.CO;2-Z
9. Sathiyamoorthy T, Ali SA, Kloseck M (2018) Cultural factors influencing osteoarthritis care in Asian communities: a review of the evidence. J Community Health 43:816–826
10. Ahn H, Weaver M, Lyon DE et al (2017) Differences in clinical pain and experimental pain sensitivity between Asian Americans and Whites with knee osteoarthritis. Clin J Pain. https://doi.org/10.1097/AJP.0000000000000378
11. Ahn H, Weaver M, Lyon D et al (2017) Depression and pain in Asian and white Americans with knee osteoarthritis. J Pain 18:1229–1236. https://doi.org/10.1016/j.jpain.2017.05.007
12. Bremner-Smith AT, Ewings P, Weale AE (2004) Knee scores in a “normal” elderly population. Knee 11:279–282. https://doi.org/10.1016/j.knee.2003.06.001
13. Steptoe A, Deaton A, Stone AA (2015) Subjective wellbeing, health, and ageing. Lancet 385:640–648. https://doi.org/10.1016/S0140-6736(13)61489-0
14. Demirdjian AM, Petrie SG, Guanche CA, Thomas KA (1998) The outcomes of two knee scoring questionnaires in a normal population. Am J Sports Med 26:46–51. https://doi.org/10.1177/03635465980260012401
15. Yoo JJ, Kim DH, Kim HA (2018) Risk factors for progression of radiographic knee osteoarthritis in elderly community residents in Korea. BMC Musculoskelet Disord. https://doi.org/10.1186/s12891-018-1999-z
16. Fransen M, Su S, Harmer A et al (2014) A longitudinal study of knee pain in older men: Concord Health and Ageing in Men Project. Age Ageing 43:206–212. https://doi.org/10.1093/ageing/aft188
17. Fillingim RB (2000) Sex, gender, and pain: women and men really are different. Curr Rev Pain 4:24–30. https://doi.org/10.1007/s11916-000-0006-6
18. Bartley EJ, Fillingim RB (2013) Sex differences in pain: a brief review of clinical and experimental findings. Br J Anaesth 111:52–58. https://doi.org/10.1093/bja/aet127
19. Briggs KK, Steadman JR, Hay CJ, Hines SL (2009) Lysholm score and Tegner activity level in individuals with normal knees. Am J Sports Med 37:898–901. https://doi.org/10.1177/0363546508330149
20. Marot V, Murgier J, Carrozzi A et al (2019) Determination of normal KOOS and WOMAC values in a healthy population. Knee Surg Sport Traumatol Arthrosc 27:541–548. https://doi.org/10.1007/s00167-018-5153-6
21. Lee JY, Low YM, Jiang L et al (2020) The Forgotten Joint Score-12 in anterior cruciate ligament injuries. J Orthop 21:117–121. https://doi.org/10.1016/J.JOR.2020.03.029

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.