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Brief Report

Patient knowledge and beliefs about knee osteoarthritis after ACL injury and reconstruction

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Running Head patient knowledge of osteoarthritis after ACL injury

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ABSTRACT

Objective To explore 1) patients' knowledge and beliefs about osteoarthritis (OA) and OA risk following anterior cruciate ligament (ACL) injury, 2) extent to which information about these risks is provided by health professionals, and 3) associations amongst participant characteristics, knowledge and risk beliefs and health professional advice.

Methods A custom-designed survey was conducted in Australian and American adults who sustained an ACL injury, with or without reconstruction, one to five years prior. The survey comprised three sections: 1) participant characteristics, 2) knowledge about OA and OA risk, and 3) health professional advice.

Results Complete datasets from 233 eligible respondents were analyzed. Most (n=164, 70%) rated themselves as being at greater risk of OA than healthy peers, although only 56% (n=130) were able to identify the correct OA definition. While most agreed that ACL (n=168, 73%) and/or meniscal injuries (n=181, 78%) increase the risk of OA, 65% (n=152) believed that ACL reconstruction reduced the risk of OA or did not know. Twenty seven percent (n=62) recalled discussing their OA risk with a health professional. Participants who were female, younger, had a lower body mass index or higher physical activity level were more likely to recognise meniscal tears and meniscectomy as risk factors of OA. History of professional advice was associated with beliefs about increased OA risks.

Conclusion Patients sustaining an ACL injury require better education from health professionals about OA as a disease entity and their elevated risk of OA, irrespective of whether they undergo surgical reconstruction or not.

Key words anterior cruciate ligament, health risk knowledge, survey, knee injury

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SIGNIFICANCE AND INNOVATION

- While people after ACL injury appeared to be aware of their increased risk of OA and the role of ACL and meniscal injury as risk factors, approximately two thirds of respondents mistakenly believed ACL reconstruction reduced the risk of OA or did not know.
- Only 27% of respondents recalled discussing their OA risk with a health care professional. This could suggest that health care professionals are themselves unaware of the increased OA risk and/or they do not adequately educate patients about this risk.
- The findings emphasise the need for improved patient education as an important component of OA prevention following ACL injury. Education should cover OA as a disease entity and highlight the increased risk of OA following ACL injury that is similar whether the injury is managed surgically or conservatively.
- Men, older people, those with a higher body mass index or lower physical activity level seemed less informed about OA and OA risks and may require more education.

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INTRODUCTION

Anterior cruciate ligament (ACL) injury, often combined with meniscal injury, commonly affects young, physically active people.[1,2] As a result of such injuries, up to 50% of individuals may rapidly develop knee OA within 2 decades of injury.[3] While ACL reconstruction is performed to restore mechanical stability and function of the ACL-injured knee, surgical management does not diminish the risk of subsequent knee OA.[3,4] Hence, individuals with an ACL injury, irrespective of how it is managed, are at higher risk of developing knee OA.

It is important that patients are educated about the long-term joint sequelae of their ACL injury so that they can make informed decisions about conservative/surgical ACL treatments as well as potential OA preventive strategies such as activity modification, muscle strengthening exercise and maintenance of a healthy weight.[5] Understanding the knowledge and beliefs about OA and OA risks of individuals who have sustained an ACL injury may assist in developing appropriate and effective educational strategies to mitigate the risk of developing OA.[6,7]

Therefore, we conducted a survey of adults with a previous ACL injury (with or without surgical reconstruction) in order to describe their (a) general knowledge of knee OA; (b) beliefs about their risk of developing knee OA; and (c) history of health professional advice including any recommended treatments aiming to reduce OA risks. Additionally, we examined associations between participant characteristics and strength of participants' knowledge and beliefs about OA and OA risks. Finally, we explored if receiving advice from a health professional about OA and managing OA risks associated with the knowledge and beliefs about OA and OA risks from ACL injured individuals.

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METHODS

This was a cross-sectional survey utilizing a convenience sample of participants from Australia and the United States (US). Respondents were recruited through social media, university communities and sporting clubs, gyms, physiotherapy clinics as well as referrals from health care providers. In the US sub-sample, participants were recruited from a cross-sectional biomechanics study.

Individuals between the ages of 18-45 years and diagnosed with an ACL injury (with or without surgical reconstruction) by a health professional within the past 1-5 years were eligible to complete the survey. We excluded individuals who had been diagnosed with OA in any joint or had a history of hip or knee joint replacement. Ethical approval was gained from the University of Melbourne and University of Northern Carolina at Chapel Hill Human Research Ethics Committees. Participants gave consent prior to completing the survey.

Survey

A custom-designed survey was administered online (either using Survey Monkey (www.surveymonkey.com) or a Qualtrics software platform (Qualtrics Research Suite, Qualtrics, LLC, Provo Utah)) and took approximately 15 minutes to complete (Appendix 1). The survey comprised three sections.

a) Part one collected participants' characteristics: sex, age, height, weight, level of education, and highest level of current physical activity as determined by the Tegner scale.[8]

b) Part two queried respondents' knowledge about OA, including perceived risk of developing knee OA when compared to an average person of the same age and sex, rated on a 6-point Likert scale (response options 'much less risk' to 'much greater risk' or 'do not know'), a multiple-choice question relating to the definition of OA, whether they believed

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having knee OA would be a major health concern to them, and a series of questions about potential risk factors for OA development. These latter questions were answered with a 5-point Likert scale (from 'strongly disagree' to 'strongly agree'). While beliefs regarding the OA risks following knee injury and surgery (i.e., ACL injury, meniscal (cartilage tear), meniscectomy, ACL reconstruction/repair) were of main interest, other risk factors were provided as distractors (i.e., muscle strength, gender, alcohol intake, overweight/obesity, smoking, family history, weather conditions and repetitive joint loading). Distractor questions were included to broaden the survey and reduce responder bias and to help gauge the extent to which respondents were truly knowledgeable about OA and OA risks following knee injury and/or surgery.

c) Part three ascertained whether a health professional had ever specifically discussed the risk of knee OA, and if so, which type of health professional (presented in a checklist) and whether any advice was given about prevention strategies, and if so, which strategy (presented in a checklist).

Data analysis

Descriptive statistics were calculated. Nominal and ordinal data were described as n (%), with 95% confidence intervals (CI) calculated around proportions. Other data were reported as mean (SD). Spearman's rho correlations (r_s) examined associations between continuous or categorical variables of participant characteristics and categorical variables of OA knowledge or beliefs and history of health professional advice. Fisher Exact tests were employed to compare constructs of interest between subgroups based on country of residence and history of ACL reconstruction. Level of significance was set at $\alpha<0.05$.

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RESULTS

Screening questions were completed by 534 people (493 Australian and 41 US participants) with 298 (56%) eligible and 233 (44%) with complete data sets (205 Australian and 28 US participants). The final cohort predominantly comprised male young adults who were normal to slightly overweight on average. The US participants (mean (SD) age of 21.4 (3.2)) were on average 10 years younger than Australian respondents (mean (SD) age of 32.2 (8.2)) (p<0.001) and were active at higher levels of physical activity than the Australian respondents (p=0.007). That is, a higher proportion of US participants (n=21, 91%) was involved in recreational sports when compared to Australian participants (n=148, 71%) whereas in 25% of Australian respondents (n=53), compared to none of the US sample, the highest level of physical activity comprised daily activities only. Additionally, more US participants had completed high school as the highest level of education (n=14, 61%) compared to Australian respondents (n=47, 22%) whereas more Australians (n=49, 23%) had completed vocational or technical training as opposed to US respondents (n=1, 4%) (p=0.017). Participant characteristics for the entire sample are presented in Table 1.

Fifty-six percent of participants (n=130) were able to identify the correct OA definition as "a condition that affects a number of structures around the joint and is characterised by the breakdown of the joint's tissues including cartilage". Of those that did not identify the correct statement (n=103, 44%), 11% (n=25) chose the definition of osteoporosis, 4% (n=8) chose fibromyalgia, 9% (n=20) chose inflammatory arthritis whereas the remaining 21% (n=50) either selected all or none of the answer options or did not know. The majority believed themselves to be at greater (n=112, 48%) or much greater risk (n=52, 22%) of developing knee OA compared to peers who had not sustained an ACL injury. This was supported by a considerable proportion of respondents agreeing that having an ACL injury (n=168, 73%) or

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meniscal (cartilage) tear (n=181, 78%) increases the risk of knee OA. While most people (n=195, 84%) agreed that having knee OA would be a major health concern, 29% believed that undergoing ACL reconstruction reduces one's chances of developing knee OA. Eighty-four respondents (36%) answered they did not know to what extent ACL reconstruction would affect OA development (Table 2).

Only 62 (27%) respondents recalled a health professional specifically discussing their risk of developing OA and of these, this information was obtained from an orthopaedic surgeon in 81% (n=50), a physiotherapist in 44% (n=27), a sports medicine physician in 11% (n=7) or a family doctor in 27% (n=17) of participants. Other professionals (nurse, chiropractor, athletic trainer) were consulted by 6% (n=4) of those who had received advice. Of these 62 participants, 52% (n=32) had consulted more than one type of health professional. Forty percent (n=25) of those that had discussed their risk reported that the health professional provided information about strategies to potentially reduce OA risks. Of these, strengthening exercises was recommended most often (n=23, 92%), followed by weight loss (n=10, 40%), activity modification (n=6, 24%), aerobic exercises (n=4, 16%), supplements including glucosamine or herbal treatments (n=5, 20%), orthotics (n=2, 8%), surgery (n=3, 12%), footwear (n=2, 8%), bracing (n=2, 8%)

Females, younger participants, and those with a lower BMI were more likely to recognise meniscal tears (females: r_s =0.2, p=0.002; BMI: r_s =-0.3, p<0.001; age: r_s =-0.2, p=0.010) or meniscectomy (females: r_s =0.2, p=0.005; BMI: r_s =-0.2, p=0.005; age: r_s =-0.2, p=0.016) as risk factors for knee OA. Participants with higher physical activity levels also tended to hold stronger beliefs that undergoing meniscectomy (r_s =-0.2, p=0.012) would put an individual at increased risk of OA. No significant associations were established between highest level of

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education and any of the OA knowledge or risk beliefs. If advice was gained from a health professional, beliefs about ACL injury (r_s =-0.2, p=0.001) or meniscectomy (r_s =-0.1, p=0.030) as OA risk factors were stronger and participants were more likely to rate themselves as being at greater risk of OA when compared to healthy peers (r_s =0.1, p=0.042).

Australian participants (n=73, 36%) were more likely to strongly agree that OA would be a major health concern compared to US respondents (n=2, 7%) (p=0.004). No other significant differences were established between countries or between participants that either underwent ACL reconstruction or were treated conservatively (Appendix 2).

DISCUSSION

It is well established that ACL injury with or without ACL reconstruction predisposes to OA [2,3,4,9,11], yet little is known about whether people who have sustained an ACL injury are aware of their increased risk of developing the disease. Whilst acknowledgement of this risk by afflicted individuals is necessary for them to uptake and adhere to prevention strategies, insight into patients' knowledge and beliefs about OA may also assist in improving patient education methods.

Only half the sample identified the appropriate definition of OA while the remainder either did not know or mistakenly believed OA was a condition such as osteoporosis, fibromyalgia or inflammatory arthritis. Nevertheless, we found that most respondents acknowledged being at a greater risk of developing knee OA and believed that having knee OA would constitute a major health concern to them. The majority agreed that ACL or meniscal tears and undergoing meniscectomy would increase one's risk of developing OA. However, approximately one third mistakenly believed ACL reconstruction reduced the risk of

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developing OA. Only a quarter of people had been informed about their increased risk of OA by a health professional, which is evidence of either insufficient education of patients by health professionals (possibly due to lack of knowledge by the health professionals themselves) and/or failure by patients to recall important preventative information provided at time of injury and/or surgery. Our findings highlight the need for better education of both health professionals and patients about OA as a disease entity and OA risks following ACL injury and ACL reconstruction. While patients may be opting for surgery on the false belief that it will reduce their risk of OA, education should cover the elevated risk of OA irrespective of conservative or surgical treatment.

Apart from information provided by health professionals to our cohort, we did not enquire further about the source of the respondents' knowledge. Australian participants may have correctly answered the questions about OA and OA risks by inference from the study information provided in the patient information sheets. The study information explained we were testing knowledge and beliefs about knee OA following ACL injury which may have suggested to respondents OA should be a concern to them. While US participants completed the questionnaire as part of an ongoing biomechanics study that did not specifically address OA risk, most participants, however, identified muscle strength, weight gain and frequent joint loading as risk factors of knee OA. This suggests that their knowledge may also have been obtained from sources other than the study information. Furthermore, Matava et al.[10] queried 210 respondents and confirmed that the risk of future OA following ACL reconstruction was the second most important concern for the lay public. Our findings concur that most of the respondents acknowledge that having OA would be a major health concern to them. This concern was more likely expressed by Australian rather than US participants

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possibly because the Australian respondents were older and may have been more familiar with or exposed to the burden of OA in their environment.

Since 36% of participants did not know whether ACL reconstruction would affect the risk of OA development and an additional 29% believed it reduced the risk, our findings suggest that health professionals may not be informing patients that the rates of OA are in fact similar in knees managed surgically compared with those managed conservatively. While history of professional advice may be prone to recall bias amongst participants, health professionals may also be unaware of this risk. Alternatively, health professionals may find it difficult to adequately advise patients in the absence of any interventions proven to mitigate the risk of OA in this population.[11] In line with the current recommendations for the conservative and non-pharmacological management of knee OA [12], health professionals most often recommended weight loss and strengthening exercise as potential prevention strategies. Nevertheless, health professionals have a duty of care to disclose this information about long-term joint health for patients to make informed decisions. In fact, our data confirm that advice given by a health professional improves a patient's understanding of the potential OA risk.

Being aware of health risks may render an individual more likely to undertake prevention strategies.[5,6] As this survey substantiated, particularly, men, older patients, people with a higher BMI and those with lower physical activity levels may require more dedicated information. Interestingly, these characteristics have previously been suggested as risk factors of knee OA or full-thickness cartilage defects after ACL injury and/or reconstruction [9,13-15] providing additional support that patients meeting these criteria should be adequately informed about their risk of OA development in the longer-term. Regardless of whether

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patients are well-informed, future research should also evaluate to what extent well-informed individuals actually adhere to prevention guidelines in the longer term.

Another limitation of this study is the non-representative sample. Although we expanded our sample with US respondents, this subset was small and, thus our results cannot necessarily be generalised to all people with an ACL injury including individuals in other countries. Additionally, 80% of respondents were treated with ACL reconstruction. Larger samples involving more participants who have not undergone ACL reconstruction are required to ascertain any differences in OA knowledge and beliefs between those opting for conservative management and those undergoing surgery. Finally, since no suitable questionnaire existed, a custom-designed survey was used.

In conclusion, people after ACL injury, with or without reconstruction, seem aware of their higher risk of developing knee OA. However, up to two thirds of respondents either believed that ACL reconstruction would decrease their risk of OA or did not know. While this suggests that health care providers are failing to educate patients about the risk of OA following ACL injury and reconstruction (possibly due to their own lack of knowledge), those that were given relevant advice seemed better in gauging OA risks. Future investigation should also elucidate clinicians' knowledge and beliefs about OA risks and how to best educate both patients and clinicians.

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REFERENCES

1. Joseph AM, Collins CL, Henke NM, Yard EE, Fields SK, Comstock RD. A multisport epidemiologic comparison of anterior cruciate ligament injuries in high school athletics. J Athl Train 2013;48(6):810-7.

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2. Quisquater L, Bollars P, Vanlommel L, Claes S, Corten K, Bellemans J. The incidence of knee and anterior cruciate ligament injuries over one decade in the Belgian Soccer League. Acta Orthop Belg 2013;79(5):541-6.

3. Lohmander LS, Englund PM, Dahl LL, Roos EM. The long-term consequence of anterior cruciate ligament and meniscus injuries: osteoarthritis. Am J Sports Med 2007;35(10):1756-69.

4. Luc B, Gribble PA, Pietrosimone BG. Osteoarthritis prevalence following anterior cruciate ligament reconstruction: a systematic review and numbers-needed-to-treat analysis. J Athl Train 2014;49(6):806-19.

5. Bennell K, Hunter DJ, Vicenzo B. Long-term effects of sport: preventing and managing OA in the athlete. Nat Rev Rheumatol 2012;8(12):747-52.

6. Janz NK, Becker MH. The Health Belief Model: a decade later. Health Educ Q 1984;11(1):1-47.

7. Burgener M, Arnold M, Katz JN, Polinski JM, Cabral D, Avorn J, et al. Older adults' knowledge and beliefs about osteoporosis: Results of semistructured interviews used for the development of educational materials. J Rheumatol 2005;32(4):673-7.

8. Tegner Y, Lysholm J. Rating systems in the evaluation of knee ligament injuries. Clin Orthop Relat Res 1985;198:43-9

9. Seon JK, Song EK, Park SJ. Osteoarthritis after anterior cruciate ligament reconstruction using a patellar tendon autograft. Int Orthop 2006;30(2):94-8.

10. Matava MJ, Howard DR, Polakof L, Brophy RH. Public perception regarding anterior cruciate ligament reconstruction. J Bone Joint Surg Am 2014;96(10):e85.

11. Van Ginckel A, Verdonk P, Witvrouw E. Cartilage adaptation after anterior cruciate ligament injury and reconstruction: implications for clinical management and

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research? A systematic review of longitudinal MRI studies. Osteoarthritis Cartilage 2013;21(8):1009-24.

12. McAlindon TE, Bannuru RR, Sullivan MC, Arden NK, Berenbaum F, Bierma-Zeinstra SM, et al. OARSI guidelines for the non-surgical management of knee osteoarthritis. Osteoarthritis Cartilage 2014;22(3):363-88.
13. Li RT, Lorenz S, Xu Y, Harner CD, Fu FH, Irrgang JJ. Predictors of radiographic knee osteoarthritis after anterior cruciate ligament reconstruction. Am J Sport Med 2011;39(12):2595-603.
14. Rotterud JH, Sivertsen EA, Forssblad M, Engebretsen L, Årøen A. Effect of Gender and Sports on the Risk of Full-Thickness Articular Cartilage Lesions in Anterior Cruciate Ligament-Injured Knees A Nationwide Cohort Study From Sweden and Norway of 15 783 Patients. Am J Sport Med 2011;39(7):1387-94.
15. Lin W, Alizai H, Joseph GB, Srikhum W, Nevitt MC, Lynch JA, et al. Physical activity in relation to knee cartilage T2 progression measured with 3 T MRI over a period of 4 years: data from the Osteoarthritis Initiative. Osteoarthritis Cartilage 2013;21(10):1558-66.

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Table 1. Participant characteristics presented as n (%) unless otherwise stated

Participant Characteristic	N=233
Demographics	
Age (in mean (SD) years)	32.1 (8.5)
Body Mass Index (in mean (SD) kg/m^2)	26.8 (8.8)
Gender, females	70 (30)
ACL reconstruction in the past 5 years	186 (80)
Country of residence, Australia	205 (88)
Highest level of education completed	
Less than high school	5 (2)
High school or equivalent	61 (26)
Vocational/technical/trade school	50 (22)
Bachelor degree	85 (37)
Post graduate degree (i.e. Masters, Doctoral, professional degree)	21 (9)
Other	11 (4)
Highest level of physical activity currently participating in	
Competitive sports played at a world, Olympic or professional level	3 (1)
Competitive sports (e.g., track and field, field hockey, tennis/racquet sports, gymnastics, rowing, skiing or martial arts) played national or international level	5 (2)
Competitive sports (e.g., cycling or ice hockey) played at a national or international level	0 (0)
Recreational sports (e.g., running, field hockey, tennis/racquet sports, weight training, rowing, golf, yoga or gymnastics) at least 5 times per week	51 (22)
Recreational sports (e.g., swimming, skiing, ice hockey and cycling) at	24 (10)

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least 5 times per week	
Recreational sports at least twice weekly	68 (30)
Recreational sports once a week or less	26 (11)
Daily activities (e.g., gardening, climbing multiple flights of stairs, carrying loads, pushing/pulling a load, ability to run if late)	40 (17)
Daily activities (e.g., cleaning house, climbing 1 or 2 flights of stairs, walking carrying a light load)	12 (6)
Daily activities limited (e.g., do not take stairs, unable to carry loads)	1 (0)
Sick leave or disability because of health problems	3 (1)

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Table 2. Beliefs about self-perceived knee OA and risk of OA development by absolute counts and % (95% CI: lower bound, upper bound)

	Response				
	Much less	**Less**	**Same**	**Greater**	**Much greater**
Self-perceived risk of knee OA compared to healthy peers[†]	1 0% (0,1.3)	5 2% (0,4.3)	46 20% (15,25)	112 48% (42,55)	52 22% (17,28)

[†]7% (95% CI 4,11) answered this question as 'do not know'.

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Table 3. Knowledge and beliefs about knee OA and risk of OA development by absolute counts and % (95% CI: lower bound, upper bound)

	Response				
	Strongly disagree	**Disagree**	**Do not know**	**Agree**	**Strongly agree**
Having knee OA would be a major health concern	2 1% (0,2)	9 4% (2,6)	27 12% (8,16)	120 52% (45,58)	75 32% (26,38)
OA risk and knee injury/surgery	**Strongly disagree**	**Disagree**	**Do not know**	**Agree**	**Strongly agree**
ACL injury increases risk of OA	0 0%(0,0)	9 4% (2,7)	56 24% (19,30)	120 52% (45,58)	48 21% (16,26)
Meniscectomy increases risk of OA	0 0% (0,0)	4 2% (1,4)	59 25% (21,34)	109 47% (38,52)	61 26% (20,32)
ACL reconstruction reduces risk of OA	13 6% (3,9)	68 29% (23,35)	84 36% (30,43)	58 25% (19,30)	10 4% (2,7)
Meniscal tear increases risk of OA	0 0% (0,0)	9 4% (1,6)	43 19% (13,24)	148 64% (57,70)	33 14% (10,19)
OA risk and distractors	**Strongly disagree**	**Disagree**	**Do not know**	**Agree**	**Strongly agree**
Strong quadriceps reduce risk of OA	0 0% (0,0)	28 12% (8,16)	60 26% (20,31)	112 48% (42,55)	33 14% (10,19)
Overweight/obesity increases risk of OA	0 0% (0,0)	5 2 (0,4)	23 10 (6,14)	128 55 (48,61)	77 33 (28,39)
Repetitive joint loading	1	19	41	137	35

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increases risk of OA	0% (0,1)	8% (5,12)	18% (13,23)	59% (52,65)	15% (10,20)

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APPENDIX 1

Supplementary digital content 1_Survey Monkey OA Knowledge Questionnaire. Pdf

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APPENDIX 2

Comparison of OA knowledge and risk beliefs related to risk factors of knee injury and surgery between countries. Data are presented as absolute counts (n) and percentages (%)

Knowledge and Risk Beliefs		Australia	USA	*P*-value[¥]
OA definition	**Correct definition**	115 (55%)	15 (65%)	0.47
Having knee OA would be a major health concern	**Strongly Disagree**	2 (1%)	0 (0%)	0.014
	Disagree	5 (2%)	4 (17%)	
	Do not know	24 (11%)	3 (13%)	
	Agree	106 (51%)	14 (61%)	
	Strongly Agree	73 (35%)*	2 (9%)	
ACL injury increases risk of OA	**Disagree**	9 (4%)	0 (0%)	0.18
	Do not know	54 (26%)	2 (9%)	
	Agree	106 (51%)	14 (61%)	
	Strongly Agree	41 (20%)	7 (30%)	
Meniscectomy increases risk of OA	**Disagree**	4 (2%)	0 (0%)	0.20
	Do not know	57 (27%)	2 (9%)	
	Agree	95 (45%)	14 (61%)	
	Strongly Agree	54 (26%)	7 (30%)	
ACL reconstruction reduces risk of OA	**Strongly Disagree**	11 (5%)	2 (9%)	0.59
	Disagree	62 (30%)	6 (26%)	
	Do not know	77 (37%)	7 (8%)	
	Agree	52 (25%)	6 (10%)	
	Strongly Agree	8 (4%)	2 (9%)	

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Meniscal/cartilage tear increases risk of OA	**Disagree**	9 (4%)	0 (0%)	0.09
	Do not know	42 (98%)	1 (4%)	
	Agree	132 (89%)	16 (70%)	
	Strongly Agree	27 (82%)	6 (26%)	
Self-perceived OA risk compared to healthy peers	**Much less risk**	0 (0%)	1 (4%)	0.11
	Less risk	5 (2%)	0 (0%)	
	Same risk	40 (19%)	6 (26%)	
	Greater risk	99 (47%)	13(57%)	
	Much greater risk	49 (23%)	3 (13%)	
	Do not know	17 (8%)	0 (0%)	

[¥] *P*-values for Fisher Exact test main effects.* Column proportions differ significantly between countries at $p<0.05$. Percentages are rounded off.

Comparison of OA knowledge and risk beliefs related to risk factors of knee injury and surgery between respondents who were underwent ACL reconstruction and those who were treated conservatively. Data are presented as absolute counts (n) and percentages (%)

Knowledge and Risk Beliefs		ACL reconstruction	Conservative treatment	*P*-value[¥]
OA definition	**Correct definition**	106 (57%)	24 (51%)	0.41
Having knee OA would be a major health concern	**Strongly Disagree**	2 (1%)	0 (0%)	0.50
	Disagree	6 (3%)	3 (6%)	
	Do not know	21 (11%)	6 (13%)	
	Agree	100 (31%)	20 (43%)	

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	Strongly Agree	57 (31%)	18 (38%)	
ACL injury increases risk of OA	**Disagree**	8 (4%)	1 (2%)	0.30
	Do not know	40 (22%)	16 (43%)	
	Agree	100 (54%)	20 (43%)	
	Strongly Agree	38 (20%)	10 (21%)	
Meniscectomy increases risk of OA	**Disagree**	3 (2%)	1 (2%)	0.31
	Do not know	51 (27%)	8 (17%)	
	Agree	87 (47%)	22 (47%)	
	Strongly Agree	45 (24%)	16 (34%)	
ACL reconstruction reduces risk of OA	**Strongly Disagree**	9 (5%)	4 (9%)	0.53
	Disagree	57 (31%)	11 (23%)	
	Do not know	65 (35%)	19 (40%)	
	Agree	48 (26%)	10 (21%)	
	Strongly Agree	7 (4%)	3 (6%)	
Meniscal/cartilage tear increases risk of OA	**Disagree**	7 (4%)	2 (4%)	0.90
	Do not know	34 (18%)	9 (19%)	
	Agree	117 (63%)	31 (66%)	
	Strongly Agree	28 (15%)	5 (11%)	
Self-perceived OA risk compared to healthy peers	**Much less risk**	1 (1%)	0 (0%)	0.90
	Less risk	5 (3%)	0 (0%)	
	Same risk	37 (20%)	9 (19%)	
	Greater risk	91 (49%)	21 (45%)	
	Much greater risk	39 (21%)	13 (28%)	
	Do not know	13 (7%)	4 (9%)	

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[¥] *P*-values for Fisher Exact test main effects.* Column proportions differ significantly between countries at $p<0.05$. Percentages are rounded off.

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