



# Indonesian Version of the Anterior Cruciate Ligament-Return to Sport After Injury Questionnaire Through Cross-Cultural Adaptation, Validity, and Reliability Testing

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## ABSTRACT

**Background:** This study aimed to produce the Indonesian version of the Anterior Cruciate Ligament-Return to Sport After Injury (ACL-RSI) questionnaire and determine the value of content validity, construct validity, known-groups validity, and internal consistency reliability.

**Methods:** First, the ACL-RSI questionnaire was translated through a cross-cultural adaptation process. Six experts in related fields assessed the adapted questionnaire by giving scores on four criteria: relevance, clarity, simplicity, and ambiguity, which will be calculated into content validity value. Seventy-one participants who experienced ACL injury because of sporting activities and had undergone reconstruction who joined the online community for Knee Injury Patients Support Group filled out the ACL-RSI to determine the known-groups validity and internal consistency reliability. The participants also filled out the Indonesian version of the Knee Injury and Osteoarthritis Outcome Score (KOOS) as a comparison to test construct validity.

**Results:** The calculated content validity value obtained from the experts' scoring was  $S-CVI/Ave = 0.97$ . Construct validity between ACL-RSI and all KOOS subscales showed a strong positive correlation with  $r = 0.78-0.87$ . Two hypotheses for known-groups validity were proven, with the group that had returned to their specific sport having a better ACL-RSI score than the group that had not returned ( $70.2 \pm 10.0$  vs.  $49.3 \pm 18.8$ ,  $p < 0.001$ ), and the group planned to return to their specific sport as before the injury had a better ACL-RSI score than the group who did not intend to return ( $60.3 \pm 16.5$  vs.  $32.6 \pm 2.4$ ,  $p < 0.001$ ). Internal consistency ACL-RSI showed very good reliability with Cronbach's  $\alpha = 0.96$ .

**Conclusions:** The Indonesian version of ACL-RSI is valid and reliable for evaluating psychological readiness to return to sports after ACL reconstruction. However, a seemingly further similar study is necessary to fix the weaknesses in this study to produce a more representative Indonesian version of the ACL-RSI questionnaire.

**Keywords:** ACL-RSI, cross-cultural adaptation, Indonesia, reliability, validity.

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## BACKGROUND

Anterior cruciate ligament (ACL) injury is one of the most common injuries among athletes, especially during high-intensity sports that involve pivoting movements, rapid changes of direction, and jumping.<sup>1,2</sup> ACL injuries will be very detrimental to athletes because it takes a relatively long time to recover. Not all athletes can return to their pre-injury performance. In a systematic review by Nwachukwu (2019), of 2.175 ACL-injured athletes, 1.380 (63.4%) could return to sports with a mean postoperative duration of 17.2 months, and the other 795 could not return to sports. In the same study that included sports participation levels after reconstruction, 547 of 1.494 athletes (36.6%) could not achieve the same level of sports participation as before the injury.<sup>3</sup>

The duration of the ACL injury recovery and the variation in the level of sports participation after reconstruction is influenced by many factors, one

of which is the psychological response.<sup>4</sup> Negative psychological responses such as depression, anxiety, and low self-esteem that arise will greatly affect the ability to achieve previous levels of sports participation and quality of performance and increase the risk of re-injury. In contrast, positive psychological responses such as common fear, motivation, and self-confidence can speed up the injury recovery process and increase the likelihood of returning to sports at the same level of participation as before the injury.<sup>5</sup> Therefore, identifying psychological aspects during the recovery phase is as important as physical function examination, which has been the main focus.

ACL-RSI is a specific instrument measuring psychological readiness to return to sports after an ACL injury.<sup>6</sup> ACL-RSI, which comprises 12 questions, has been translated and tested for validity in a dozen languages, considering the importance

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of the outcomes measured from this questionnaire. However, there are no studies that publish the Indonesian version of the ACL-RSI. The original version of ACL-RSI may have different meanings in words that Indonesians do not understand due to cultural differences. Therefore, this study aims to translate ACL-RSI through standardized procedures and examine its validity and reliability to be used in clinical practice in Indonesia.

## METHODS

### Translation

The ACL-RSI questionnaire was translated into Indonesian according to the guidelines for cross-cultural adaptation.<sup>7</sup> It was translated by a physical therapist who comprehended ACL injury well and a professional translator who had more than six years of experience. They both spoke Indonesian and were fluent in English. Two translators did their respective translations and then discussed them to produce a mutually agreed version of the initial translation. The initial translation version was translated back into English by two translators who spoke English as their mother tongue and comprehended Indonesian well. This process was a back translation to ensure that the initial translation version described the content of the original version and did not have major inconsistencies or conceptual errors to prevent information bias. The initial, back, and original versions were then analyzed and assessed for content validity by six experts, including one hip and knee orthopedic specialist, two sports injury prevention experts, and three sports physical therapists. After being analyzed by experts, a pilot test for the adapted version of the ACL-RSI was carried out on 10 ACL patients who had the same characteristics as the study participants later.

The Commission for Research Ethics, Faculty of Medicine, Universitas Udayana/Central Public Hospital Sanglah Denpasar, stated that this study was ethically worthy under the number 1367/UN14.2.2.VII.14/LT/2021.

### Content Validity

This study used a content validity index (CVI) assessment. The group with six experts analyzed the translation results and provided scores of the criteria of relevance, clarity, simplicity, and ambiguity, which would be calculated into the value of the content validity index of each question (I-CVI) and the average score of CVI in the questionnaire (S-CVI/Ave).<sup>8,9</sup> Experts gave a score of 1 to 4 for each question on each criterion according to **Table 1**. In calculating the I-CVI of each question on each criterion, the sum of experts who scored 3 or 4

was divided by the total experts. Each I-CVI score of the four criteria for the same question was then summed up and divided by 4 to produce the final score for each question. To get S-CVI/Ave, the sum of I-CVI was divided by the total questions. The accepted CVI value for the number of six experts is a minimum of 0.83.<sup>9</sup>

### Participants

This study used a sample size of the respondent-to-item ratio of 5:1, which means the minimum number of participants required was 60. In reaching participants, we contacted the founders of the online community Knee Injury Patients Support Group for research permission and to collect data on ACL patients. The inclusion criteria set were diagnosed with an ACL injury because of sports and undergoing reconstruction within the last 3-24 months. Participants with bilateral ACL injuries, multi-ligament injuries, and revision surgery were excluded. Participants needed to include evidence of an injury diagnosis and documentation after undergoing reconstruction.

### Construct Validity, Known-Groups Validity, and Internal Consistency Reliability

In determining construct validity, we used Spearman's correlation for the ACL questionnaire, translated through a standardized procedure, and the Indonesian version of the Knee Injury and Osteoarthritis Outcome Score (KOOS). ACL-RSI consists of 12 questions developed based on three psychological responses related to the return to sport phase: emotions, confidence in performance, and risk assessment. Each question in the ACL-RSI has an 11-point Likert scale between 0 to 100.<sup>6</sup> While KOOS is used to subjectively assess knee function, short- and long-term symptoms in patients with a knee ligament injury, and osteoarthritis. KOOS has five subscales: symptoms, pain, daily activities, sports or recreation, and knee-related quality of life, with total questions amounting to 42 items.<sup>10</sup> The score on each KOOS subscale range from 0 to 100, where 0 shows extreme problems, and 100 indicates no problems. Interpretation Spearman's correlation coefficients 0.00-0.1 (negligible), 0.10-0.39 (weak), 0.40-0.69 (moderate), 0.70-0.89 (strong), 0.90-1.00 (very strong).<sup>11</sup>

For known-groups validity, we proposed the following two hypotheses to be tested using the Mann-Whitney: 1) The group of participants who had returned to sports had a better average ACL-RSI score than those who had not returned, 2) The group of participants who planned to return doing sports had a better average ACL-RSI score than participants who did not plan to return.

Internal consistency between questions in the ACL-RSI questionnaire to measure the same construct was determined by Cronbach's alpha value. Cronbach's alpha values range between <0.5 (unacceptable), 0.5-0.6 (poor), 0.6-0.7 (questionable), 0.7-0.8 (acceptable), 0.8-0.9 (good), >0.9 (excellent).<sup>12</sup>

## RESULTS

### Translation

Experts determined that the ACL-RSI version of the initial translation, back translation, and the original version did not have different meanings and concepts. However, there were some suggestions for changing the wording. In question 1, the word "tampil", which is "perform" in English, has a slightly different meaning in Indonesian when associated with the question sentence. The term "tampil" was changed to "mampu berolahraga" to give context to the question in the original version. The same thing also made changes to question 8, the phrase "bertahan dalam tekanan" was changed to "mampu menahan tekanan". After being assessed by experts, a pilot test was carried out. The pilot test results

showed all patients understood the questionnaire questions well. The translated questionnaire is in [Appendix 1](#).

### Content Validity

The results of the I-CVI calculation on each criterion: relevance, clarity, simplicity, and ambiguity, ranged between 0.83 and 1.00. Furthermore, the I-CVI mean score of the four criteria = 0.92 (question 12), 0.96 (question 4, 6, 7, 9, 10, 11), and 1.00 (question 1, 2, 3, 5, 8), so that all questions were valid in content. As for the value of S-CVI/Ave = 0.97. The results of content validity are shown in [Table 2](#).

### Participants

The data collection results from 99 participants who agreed to participate in the study; only 71 participants met the criteria. The average age of participants was  $26.1 \pm 4.8$  (17-38) years, with an unequal sex ratio of 69 males (97.2%) and two females (2.8%). Other data that stood out was that almost three-quarters of the total participants had a specific sport of football or futsal ([Table 3](#)).

### Construct Validity, Known-Groups Validity, dan Internal Consistency Reliability

Spearman's correlation coefficient results showed that ACL-RSI had a strong positive correlation with the KOOS subscales of symptoms, pain, daily activities, sports or recreation, and knee-related quality of life ([Table 4](#)). At the same time, the two hypotheses for known-groups validity were proven by significant differences between the group of participants who had returned and had not returned to sports ( $70.2 \pm 10.0$  vs.  $49.3 \pm 18.8$ ,  $p < 0.001$ ) and the group of participants who planned and did not plan to return to sports ( $60.3 \pm 16.5$  vs.  $32.6 \pm 2.4$ ,  $p < 0.001$ ) ([Figure 1](#)). For internal consistency reliability, the twelve questions of the adapted version had a Cronbach's alpha value of 0.96, which means "excellent".

## DISCUSSION

Psychological factors influence whether athletes can return to their sports after ACL reconstruction. In the Nwachukwu study (2019), 514 (64.7%) of 795 post-ACL reconstruction patients could not return to their sports due to psychological responses such as fear of re-injury (76.7%), lack of confidence in their knees (14.8%), depression (5.6%), and low motivation (2.5%).<sup>3</sup> These data illustrated that psychological response was a crucial factor that caused postoperative ACL patients could not to return to their previous sports. Therefore, it is strongly recommended to screen for psychological

**Table 1. Criteria for measuring content validity(8)**

Score	Relevance	Clarity	Simplicity	Ambiguity
1	Not relevant	Not clear	Not simple	Doubtful
2	Item need some revision	Item need some revision	Item need some revision	Item need some revision
3	Relevant but need minor revision	Clear but need minor revision	Simple but need minor revision	No doubt but need minor revision
4	Very relevant	Very clear	Very simple	Meaning is clear

**Table 2. The results of content validity**

Item	Relevance	Clarity	Simplicity	Ambiguity	I-CVI
1	1.00	1.00	1.00	1.00	1.00
2	1.00	1.00	1.00	1.00	1.00
3	1.00	1.00	1.00	1.00	1.00
4	1.00	1.00	1.00	0.83	0.96
5	1.00	1.00	1.00	1.00	1.00
6	1.00	1.00	1.00	0.83	0.96
7	0.83	1.00	1.00	1.00	0.96
8	1.00	1.00	1.00	1.00	1.00
9	1.00	1.00	1.00	0.83	0.96
10	1.00	1.00	1.00	0.83	0.96
11	0.83	1.00	1.00	1.00	0.96
12	0.83	1.00	1.00	0.83	0.92
			S-CVI/Ave		0.97

conditions after ACL reconstruction to determine the appropriate rehabilitation program.

The ACL-RSI questionnaire can specifically identify the psychological impact of patients on returning to sports after ACL reconstruction. In this study, the ACL-RSI questionnaire was translated through a cross-cultural adaptation process into

Indonesian and then assessed for content validity. Content validity is a type of validity based on expert judgment to determine how each question in an instrument is relevant and representative of the construct to be measured.<sup>9</sup> The assessment by six experts showed that the content validity values for the ACL-RSI items were accepted, whether for each question or overall. This means that the content of the adapted version is valid. For construct validity, known-groups validity, and internal consistency reliability, participants with predetermined criteria filled out the adapted version of the ACL-RSI questionnaire, KOOS, and demographic data.

The mean age of the participants was  $26.1 \pm 4.8$  years, with a range of 17 to 38 years. These data are quite in line with the epidemiological study of the incidence of ACL injury within a decade by Schilaty (2017), where the incidence of primary ACL injury was highest in the age group of 17-35 years (64.9%).<sup>13</sup> The number of participants by gender is very different in this study, with men dominating. The enormous difference is most likely because of the growing culture in Indonesia, where men still dominate the opportunity to do sports. This assumption is reinforced by Berliana's study (2021) on gender issues in masculine sports in Indonesia. Her study revealed that sport is seen as a competitive activity more suitable for men or masculinity. This issue is also influenced by family factors that are reluctant to allow girls to do strenuous sports. In addition, if women do strenuous sports, it is feared that their body shape will change, or they can develop characteristics like men.<sup>14</sup> Although further evidence is needed, this generally describes the conditions in Indonesia where women's participation in arduous sports is not as massive as that of men so that it can affect the number of incidents of female ACL injuries, where ACL injuries occur in high-intensity sports.

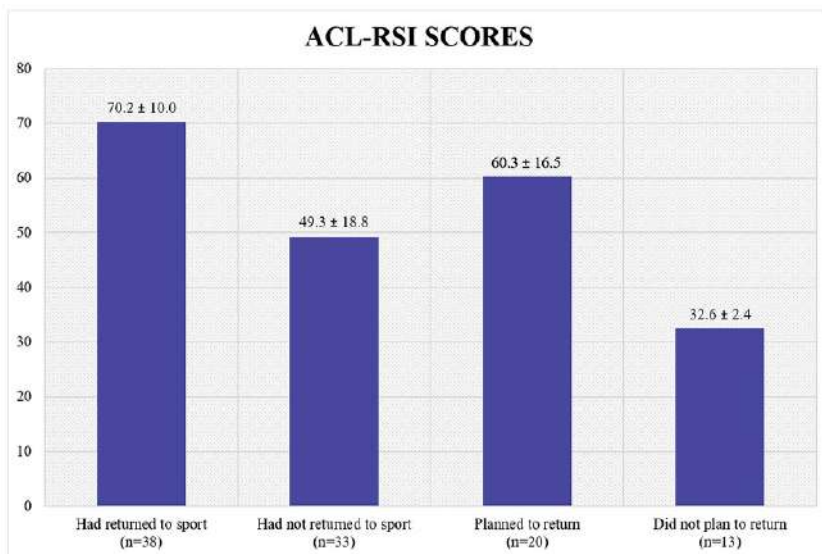
Another striking difference in this study is in the specific sports that the participants do. Most participants have a particular sport of football or futsal (74.5%), and a small proportion is of basketball (7.0%), badminton (4.2%), martial arts (4.2%), volleyball (4.2%), athletics (2.8%), and others (2.8%). The more participants in the specific sport of football or futsal depict, these two sports are more popular. Fuller's study (2015) stated that playing football is one of the most popular activities performed by millions of people, especially youths, in their spare time. He concludes that football cannot be separated from everyday life.<sup>15</sup> Likewise, with the popularity of futsal in Indonesia, which is played on the professional team and in different levels of schools, communities, and universities.<sup>16</sup> Because of the popularity of football and futsal,

**Table 3. Demographic data and clinical characteristics of the participants**

Characteristics	Mean $\pm$ SD or n (%)
Age (years)	26.1 $\pm$ 4.8
Range	17-38 years
Gender	
Males	69 (97.2%)
Females	2 (2.8%)
Height	170.1 $\pm$ 4.8
Weight	68.5 $\pm$ 7.8
BMI (kg/m <sup>2</sup> )	23.7 $\pm$ 2.5
Normal	60 (84.5%)
Overweight	11 (15.5%)
Duration after reconstruction (months)	10.8 $\pm$ 5.9
Had returned to specific sports	14.5 $\pm$ 5.0
Had not returned to specific sports	6.7 $\pm$ 3.7
Injured knee	
Right	35 (49.3%)
Left	36 (50.7%)
Specific sports	
Football/futsal	53 (74.6%)
Basketball	5 (7.0%)
Badminton	3 (4.2%)
Martial arts	4 (4.2%)
Volleyball	5 (4.2%)
Athletics	2 (2.8%)
Others	3 (2.8%)
Grouping for known-groups validity	
Had returned to specific sports	38 (53.5%)
Had not returned to specific sports	33 (46.5%)
Planned to return to specific sports	20 (60.6%)
Did not plan to return to specific sports	13 (39.4%)

**Table 4. ACL-RSI and KOOS subscales mean score and Spearman's coefficient correlation results**

	Mean $\pm$ SD	<i>r</i>	<i>P</i>
ACL-RSI (Id)	60.5 $\pm$ 18.0		
KOOS Symptoms	73.1 $\pm$ 22.5	0.82	0.000
KOOS Pain	76.4 $\pm$ 20.2	0.87	0.000
KOOS Daily Activities	78.9 $\pm$ 20.0	0.84	0.000
KOOS Sports or Recreation	63.0 $\pm$ 25.9	0.78	0.000
KOOS Knee-Related Quality of Life	69.4 $\pm$ 20.6	0.80	0.000



**Figure 1.** ACL-RSI scores between groups

where both sports have a high intensity that involves pivoting and cutting movement, jumping, and even collisions, the tendency for ACL injuries is even greater, as shown in the results of demographic data.

In construct validity, the validity that assesses the extent to which the relationship between two measurements with similar constructs, which is theoretically related,<sup>17</sup> the scores of ACL-RSI and each KOOS subscale were positively correlated with a significance value of  $p < 0.001$ . This study's findings are similar to previous studies that tested construct validity by comparing the values of ACL-RSI with KOOS, as in studies on the translation of ACL-RSI into other languages.<sup>18-22</sup> However, the level of correlation in this study was stronger than in the previous studies. In the Kvist (2012), the highest correlation value obtained was 0.72 between ACL-RSI and KOOS knee-related quality of life. In this study, the positive correlation value obtained between ACL-RSI and KOOS symptom subscale was  $r = 0.82$ , ACL-RSI and KOOS pain subscale  $r = 0.87$ , ACL-RSI and KOOS daily activity subscale  $r = 0.84$ , ACL-RSI with the KOOS sports or recreation subscale  $r = 0.78$ , and ACL-RSI with the KOOS knee-related quality of life subscale  $r = 0.80$ .

The strong correlation between ACL-RSI scores and the KOOS sub-scales may be because of several factors, such as the small sample size, duration, and physical condition after reconstruction. In this study, the number of samples used was based on a 5:1 respondent-to-item ratio, so the minimum number of samples was 60. The data collection results showed that only 71 participants met the criteria, which is a poor sample size.<sup>23</sup> Indeed, there is no absolute rule regarding the number of samples

required for questionnaire validation research. However, the larger sample size will be better than the small sample size. Because the tendency to get high correlation coefficient results is due to the small sample size.<sup>23,24</sup>

Regarding the duration and physical condition after ACL reconstruction, the average time to return to sports ranged from 6 to 12 months. Meanwhile, physical conditions such as persistent knee symptoms such as pain, swelling, stiffness, instability, and weakness also cause individuals not to return to their sport.<sup>25</sup> Based on the data collection and analysis results, there were indications of variability in the participants' post-reconstruction duration. The average post-ACL reconstruction duration was  $10.9 \pm 5.9$  months with a variance of 35.2, a maximum of 24 months, and a minimum of 3 months, so the range was 21 months. This standard deviation and variance reflect that each participant's post-reconstruction duration was far from the average.

In more detail, the group that had returned to sports ( $n=38$ ) had an average post-ACL reconstruction duration of  $14.5 \pm 5.0$  months, and the group that had not returned to sports ( $n=33$ ) had an average post-ACL reconstruction duration of  $6.7 \pm 3.7$  months. These groupings indicate the possibility of differences in physical function conditions, especially in the knee, which makes it possible or not for individuals to return to their specific sports. Knee physical function can affect the psychological response, so if the individual has stable and good knee function, the psychological response experienced is also the same and vice versa.<sup>25, 26</sup> This can cause a strong correlation of the ACL-RSI score with each subscale KOOS.

Known-groups validity is the ability of an instrument to distinguish the measurement results of two groups that logically have different levels of the construct being measured.<sup>27</sup> The adapted version of ACL-RSI has known-group validity, which is proven by its ability to distinguish psychological readiness between groups of individuals who had returned and had not returned to specific sports and between groups of individuals who planned and did not plan to return to their sports. It also supports that the construct in the questionnaire domain is valid.

The twelve questions of the adapted version also have excellent internal consistency reliability with Cronbach's alpha,  $\alpha = 0.96$ , the same value as Bohu (2015)<sup>19</sup> and Chen (2017).<sup>22</sup> This value shows that the questions on the questionnaire have very good consistency or reflect the same basic construct. In other words, the questions in the questionnaire are correlated.<sup>28</sup>

There are several limitations to this study. First, the sample size was relatively small, with only 71 participants. This may allow the results to be not representative. Furthermore, this study has a high probability of gender bias because most participants were male. However, based on assumptions and the growing sports culture in Indonesia, ACL injuries tend to be experienced by men more. A further similar study with a larger sample size and a comparable gender between males and females is highly expected. The following limitation is that this study only used the Indonesian version of the KOOS questionnaire to compare the ACL-RSI to determine the value of construct validity. There were no commonly used questionnaires to approximate ACL-RSI in Indonesian during the study period, such as the Lyshom knee score and the Tegner activity scale. In addition, data collection was carried out online. Even though the participants have shown evidence of an injury diagnosis and documentation after ACL reconstruction, it would be better if the participants were obtained directly from a health facility so that the data could be more accurate, thus supporting the study's validity.

## CONCLUSIONS

The ACL-RSI questionnaire was successfully translated into an Indonesian version and had an accepted content validity value (S-CVI/Ave = 0.97), a strong construct validity ( $r = 0.78-0.87$ ), a proven known-groups validity ( $p < 0.001$ ), and excellent internal consistency reliability (Cronbach's alpha = 0.96). The Indonesian version of the ACL-RSI can be used as part of a psychological examination after ACL reconstruction, a physical and functional examination, consideration of biological healing of ligament tissue, and contextual and concomitant factors to determine whether patients can return to their sport. However, a seemingly further similar study is necessary to fix the weaknesses in this study to produce a more representative Indonesian version of the ACL-RSI questionnaire.

## CONFLICT OF INTEREST

The authors state that there are no conflicts of interest.

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## AUTHOR CONTRIBUTIONS

MI compiled the study design, data collection,

analysis, and drafted the manuscript; AW, IMM, and NWT participated in data collection, literature search, drafting, and revising the manuscript. All authors have read and approved the final version of the manuscript.

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## Appendix 1. The Indonesian version of ACL-RSI

## KUESIONER ACL-RSI VERSI INDONESIA

Nama:		Tanggal:											
Instruksi: beri tanda pada nilai yang paling menggambarkan kondisi Anda sehubungan dengan kalimat pertanyaan.													
1	Apakah Anda yakin bahwa Anda mampu berolahraga pada tingkat partisipasi olahraga Anda sebelumnya?												
	Tidak yakin sama sekali	0	10	20	30	40	50	60	70	80	90	100	Sangat yakin
2	Apakah menurut Anda, lutut Anda cenderung akan kembali mengalami cedera karena Anda berpartisipasi dalam olahraga Anda?												
	Sangat mungkin	0	10	20	30	40	50	60	70	80	90	100	Sangat tidak mungkin
3	Apakah Anda gugup ketika melakukan olahraga Anda?												
	Sangat gugup	0	10	20	30	40	50	60	70	80	90	100	Tidak gugup sama sekali
4	Apakah Anda yakin bahwa lutut Anda tidak akan goyah ketika melakukan olahraga Anda?												
	Tidak yakin sama sekali	0	10	20	30	40	50	60	70	80	90	100	Sangat yakin
5	Apakah Anda yakin dapat melakukan olahraga Anda tanpa mengkhawatirkan kondisi lutut Anda?												
	Tidak yakin sama sekali	0	10	20	30	40	50	60	70	80	90	100	Sangat yakin
6	Apakah Anda merasa frustrasi untuk harus mempertimbangkan kondisi lutut Anda sehubungan dengan olahraga yang Anda lakukan?												
	Sangat frustrasi	0	10	20	30	40	50	60	70	80	90	100	Tidak frustrasi sama sekali
7	Apakah Anda khawatir lutut Anda akan kembali mengalami cedera karena Anda melakukan olahraga Anda?												
	Sangat khawatir	0	10	20	30	40	50	60	70	80	90	100	Tidak khawatir sama sekali
8	Apakah Anda yakin bahwa lutut Anda mampu menahan tekanan?												
	Tidak yakin sama sekali	0	10	20	30	40	50	60	70	80	90	100	Sangat yakin
9	Apakah Anda takut mencederai lutut Anda tanpa sengaja saat melakukan olahraga Anda?												
	Sangat takut	0	10	20	30	40	50	60	70	80	90	100	Sangat tidak takut
10	Apakah pikiran tentang harus menjalani operasi dan rehabilitasi mencegah Anda untuk melakukan olahraga Anda?												
	Sepanjang waktu	0	10	20	30	40	50	60	70	80	90	100	Tidak sama sekali
11	Apakah Anda yakin dapat tampil dengan baik dalam olahraga Anda?												
	Tidak yakin sama sekali	0	10	20	30	40	50	60	70	80	90	100	Sangat yakin
12	Apakah Anda merasa tenang saat melakukan olahraga Anda?												
	Tidak tenang sama sekali	0	10	20	30	40	50	60	70	80	90	100	Sangat tenang