

ORIGINAL SCIENTIFIC PAPER

Adaptation of the Oslo Sports Injury and Health Problems Questionnaire to the Bahasa Version and Its Application for Athletes Surveillance

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Abstract

The Oslo Sports Trauma Research Center (OSTRC) questionnaire on injuries and health problems is one of the recommended methods for monitoring athletes' health problems, but until now it has not been available and validated in a Bahasa version. This study aims to develop the OSTRC Questionnaire into Bahasa and assess its application in adolescent athlete surveillance. The research process is divided into two stages; The adaptation and validity assessment according to ISPOR rules involving 42 adolescent athletes for 2 weeks and the second stage is 8 weeks of surveillance involving 46 adolescent athletes. Results of the analysis found that the Bahasa version of the OSLO Questionnaire for shoulder, knee, ankle, and health problems has good validity and reliability with Cronbach- α 0.905, 0.940, 0.933, and 0.840 respectively. The intraclass correlation coefficient for health problems was 0.905, the shoulder region was 0.94, the knee region was 0.933 and the ankle region was 0.840, with all p-values <0.001. The sensitivity of the health problems questionnaire reached 97.6% and specificity 99.4%, while the sensitivity of the injury questionnaire reached 100% and specificity reached 99.4%. The Bahasa version of OSLO Sports Trauma Research Center Injury and Health Problems is valid and reliable and shows high sensitivity and specificity to detect and separate athletes with injuries or health problems.

Keywords: injury surveillance, health surveillance, injury, OSTRC Bahasa Version, adolescent athlete

Introduction

Theisen et al. (2014) said in the last decade, the number of adolescent athletes has grown rapidly. Several studies (Patel et al., 2017; Theisen et al., 2014) revealed that the incidence of sports injuries at the age of 12-19 years reached 1.3-3.0/1000 hours of activity for racket sports, 2.0-3.8/1000 hours for individual sports, and 4.6-6.5/1000 hours for team sports activities, with 40% of injuries experienced being overuse injuries. Other studies (Carragher et al., 2019; Theisen et al., 2014) also mentions that a total 31.1% of injuries cause time loss of 7-28 days and 68.9% take 7 days to recover from illness. Injuries and illness cause impaired athlete development and Application (Carragher

et al., 2019; Theisen et al., 2014). The International Olympic Committee (IOC) recommends carrying out regular monitoring of health problems to reduce the risk of athlete illness and injury (Engbreetsen et al., 2014). One method the IOC recommends is the Oslo Sports Trauma Research Center (OSTRC) questionnaire as a self-reported tool to monitor athletes' health problems (Engbreetsen et al., 2014). This questionnaire has 4 questions that can assess participation, modification, performance, and symptoms experienced by athletes when there are health problems (Clarsen et al., 2014). OSTRC questionnaire can also be used for Para-athletes (Hirschmüller et al., 2021). This ability has made many countries adapt and develop surveillance systems using



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the OSTRC injury and health questionnaire, including French, German, Danish, Japanese, Thai, and Persian. (Beaudart et al., 2023; Hirschmüller et al., 2017; Jorgensen et al., 2016; Kaewkul et al., 2021; Mashimo et al., 2021; Mirkarimpour et al., 2018). Until now in Indonesia, there is no self-reported questionnaire for monitoring athletes' health condition, so this study aims to adapt and validated the OSTRC questionnaire to the Bahasa version and assess its application in monitoring the health problems of adolescent athletes in Indonesia.

Methods

Procedures

The OSTRC questionnaire was developed by Clarsen et al, consists of four questions with a total score range of 0 to 100, with details of questions 1 and 4 having 4 answer choices with answer scores A=0, B=8, C=17, D=25, and questions 2 and 3 have answer scores of A=0, B=6, C=13, D=19 and E=25 (Clarsen et al., 2013). In 2020 the OSTRC questionnaire underwent improvement in reporting methods, namely; question 1 is used to assess participation, question 2 to assess modification, question 3 to assess Application, and question 4 to assess pain, with each answer score for the 4 questions being A=0, B=8, C=17, D=25 (Clarsen et al., 2020), so the answer score range is between 0-100, this score is also called the severity score. For this study, the latest update of the 2020 OSTRC questionnaire was used to be adapted into a Bahasa version. This study is divided into 2 stages, namely; (1) the adaptation and validity stage and (2) the surveillance stage. The adaptation process stage is carried out based on the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) guidelines for Translation and Cultural Adaptation (TCA) (Wild et al., 2005). The adaptation and translation process were carried out in five stages, namely; Stage 1; forward translation: using 2 independent translators (T1 and T2) who translate the English version of OSTRC into Bahasa. Stage 2; reconciliation: The translated texts (T1 and T2) in the Bahasa version were then combined by the research team into a Bahasa version of the manuscript, which was then assessed for suitability of meaning and meaning in the language by the 3rd translator who is a Bahasa expert and became the initial version of the OSTRC questionnaire in Bahasa Indonesia (T123). Stage 3; back translation review and harmonization: The language version of the OSTRC questionnaire (T123) was again translated into English by the research team and reassessed for the suitability of the language version, the original version, and the back-translated version by the 4th independent translator (T1234). Stage 5: Cognitive debriefing until proofreading is carried out by the 5th translator, to assess the suitability of the meaning and meaning with the original text, so that the Bahasa version of the final questionnaire text is produced. This questionnaire will then be tested for validity and reliability on adolescent athletes, which will be done by filling out the questionnaire twice over 7 days. In this stage, the injury questionnaire was divided into three regions; shoulder, knee, and ankle.

The surveillance stage was carried out for 8 weeks on adolescent athletes at the Cibubur Youth Athlete Sports Center. Every 7 days researcher will send a questionnaire via a messaging application to the athlete. In this stage, athletes are free to report the location and number of injuries they have experienced.

Participants

Sample size calculations for the validity stage were calculated based on the ratio of subjects to items to be validated (Anthoine et al., 2014; Osborne & Costello, 2004). For this study, a ratio of

10:1 was used, so the injury and health questionnaire required a minimum of 40 subjects. For the surveillance stage, sample size calculation was calculated using the equation formula from Haldun Akoglu's study (Akoglu, 2022), with a significance level of 0.05 and test power of 0.90, so the surveillance stage required a minimum of 19 subjects, and in this stage, the researcher used the population at Cibubur Youth Athlete Sports Center, with a total of 50 athletes. The subject inclusion criteria for this research are: (1) Athletes aged 13-18 years, (2) Have ever participated in a sports club or sports school, (3) Have participated in training at a sports club or sports school. Subject exclusion criteria for the validity stage are: (1) Did not fill out the questionnaire completely, (2) Did not fill out the questionnaire at the specified time, and (3) Refused to confirm the condition. Meanwhile, the exclusion criteria at the surveillance stage are: (1) Not filling out the questionnaire for 2 consecutive weeks, (2) Refusing to confirm the condition. A total of 42 athletes took part in the validity stage. However, only 40 athletes completed this stage. Two athletes were excluded because they only completed the questionnaire once and refused to continue. At the surveillance stage, only 46 athletes had completed this stage, for a reason; two athletes entered the national team, one athlete withdrew from the Cibubur Youth Athletes Sports Center and one athlete was excluded because he did not fill out the questionnaire for 2 consecutive weeks.

Measurement

In the first and second stages of the research, the Questionnaire will be given online every Saturday morning and the deadline for completion is 14.00 on Sunday. Athletes will be reminded 4 times, namely; on Friday afternoon, Saturday afternoon, Saturday evening, and Sunday afternoon. All participants who reported injuries and illnesses were confirmed and recorded by the medical team. The medical team does not know the athlete's questionnaire answers.

Statistics

The validity test was carried out using the Pearson Correlation test and reliability was assessed from the Cronbach's α and intraclass correlation coefficient (ICC) values, with the expected Cronbach's α value being more than 0.6 and the intraclass correlation coefficient (ICC) value being more than 0.8 (Koo & Li, 2016). All reports from the surveillance stage were used to assess the application of the questionnaire. The application will be evaluated using the receiver operating characteristic curve (ROC) and the area under the ROC curve (AUC). Therefore, an AUC of 0.81 to 0.9 is considered excellent, and greater than 0.9 is considered outstanding in distinguishing injured from uninjured, and ill or not ill subjects. Data were prepared and analyzed using the SPSS 18 series.

This research has passed an ethical process review from the Ethical Committee of the Faculty of Medicine, University of Indonesia – Cipto Mangunkusumo Hospital (approval no: KET-840/UN2.F1/ETIK/PPM.00.02/2022).

Result

There were no problems in the translation process questionnaire from English to Bahasa in both the forward and backward translation. However, all suggestions from linguists and the research team were carefully considered, so there were slight changes, such as: adding the words practice or competition to the second question that assesses performance. The characteristics of athletes who completed the validity stage are shown in Table 1.

Table 1. Characteristics of athletes in the adaptation and validation stages

Variable	N	%
Gender:		
Male	23	57.5
Female	17	42.5
Type of sports:		
Pencak silat	6	15
Athletics	5	12.5
Archery	4	10
Sepak takraw	4	10
Pétanque ball	3	7.5
Taekwondo	3	7.5
Basketball	2	5
Handball	2	5
Volleyball	2	5
Cricket	2	5
Karate	2	5
Synchronized swimming	2	5
Wushu	2	5
Water polo	1	2.5

The validation test was carried out from the results of 40 athletes with a range of 13-18 years, using the Pearson Correlation Test between the score of each answer compared to the total severity score. The r value from the Pearson Correlation Test was compared with the r table value seen via $df=N-2$, so the $r_{table} = 0.264$. If the calculated r result is greater than the table r value, then the OSTRC Bahasa version questionnaire is considered valid. The results of the Pearson

Correlation Test are shown in Table 2.

Reliability was assessed by test-retest carried out within 7-day intervals, the entire questionnaire showed very good test-retest reliability values, with an intraclass correlation coefficient value; health problems 0.905 (95% CI; 0.846-0.945), shoulder region 0.94 (95% CI; 0.902-0.965), knee region 0.933 (95% CI; 0.891-0.961) and ankle region 0.840 (95% CI; 0.740-0.908). The internal consistency (IC) of the OSTRC question-

Table 2. Item-total correlation and effect of removing items on internal consistency

OSTRC Bahasa Version	Item-total correlation (r)*	Cronbach's α if the item deleted
Health problems:		
Question 1 (Participation)	0.915	0.862
Question 2 (Modification)	0.881	0.893
Question 3 (Performance)	0.931	0.846
Question 4 (Symptoms)	0.829	0.908
Shoulder region:		
Question 1 (Participation)	0.989	0.88
Question 2 (Modification)	0.677	1
Question 3 (Performance)	0.989	0.88
Question 4 (Symptoms)	0.989	0.88
Knee region:		
Question 1 (Participation)	0.984	0.879
Question 2 (Modification)	0.899	0.938
Question 3 (Performance)	0.628	0.938
Question 4 (Symptoms)	0.739	0.875
Ankle region:		
Question 1 (Participation)	0.984	0.645
Question 2 (Modification)	0.899	0.736
Question 3 (Performance)	0.628	0.875
Question 4 (Symptoms)	0.739	0.853

*Pearson correlation test result

naire on injury and health problems Bahasa version was also determined from 40 athletes. The results showed that the OSTRC injury questionnaire in the Bahasa version had very good internal consistency for the three regions; shoulder, knee, and ankle regions. Cronbach's α of the OSTRC injury questionnaire for the shoulder, knee, and ankle regions were 0.940, 0.933, and 0.840 respectively. Meanwhile, the Bahasa version of the OSTRC health problems questionnaire also had a very good internal consistency with Cronbach's α 0.905. At this stage, testing was also carried out by assessing Cronbach's α if one of the question items was removed and if changes in Cronbach's α were still within the acceptable range for both language versions of the OSTRC questionnaire. If the item was removed for the knee region questionnaire, there were 2 items (question number 2 and 3), and the ankle region also had 2 items (question

number 3 and 4) which slightly changed Cronbach's α greater than Cronbach's α of all items. This result showed that no item disproportionately influences the overall assessment reliability. The results of Cronbach's α calculations are shown in Table 2. Overall, the Bahasa version of the OSTRC questionnaire, which assesses health problems, shoulder region, knee region, and ankle region, had very good validity and reliability.

In the second stage, the final version of the OSTRC Bahasa version was applied for surveillance for 8 weeks. Athletes who took part in the surveillance stage were different from athletes who took part in the adaptation and validation stages. The athlete characteristics who completed the second stage; age range 14-18 years, length of time practicing sports 8.45 ± 2.61 years, all the athletes in the regular training program, and other characteristics are described in Table 3.

Table 3. Characteristics of athletes who finish the surveillance stage

Variable	N	%
Gender:		
Female	27	58.7
Male	19	41.3
Type of sports:		
Badminton	13	28
Pencak silat	7	15.2
Taekwondo	6	13
Swimming	6	13
Athletics	5	11
Archery	5	11
Weightlifting	3	6.6
Gymnastic	1	2.2

Table 4. Characteristics of questionnaire answers

Questions	Health Problem		Injury	
	N	%	N	%
Question 1 (Participation):				
Answer A (score 0)	307	84.57	307	81.2
Answer B (score 8)	42	11.58	59	16.6
Answer C (score 17)	8	2.20	5	1.3
Answer D (score 25)	6	1.66	7	1.9
Question 2 (Modification):				
Answer A (score 0)	335	92.28	338	89.4
Answer B (score 8)	16	4.41	28	7.4
Answer C (score 17)	7	1.93	4	1.1
Answer D (score 25)	5	1.38	8	2.1
Question 3 (Performance):				
Answer A (score 0)	325	89.54	320	84.7
Answer B (score 8)	25	6.89	40	10.6
Answer C (score 17)	6	1.66	11	2.9
Answer D (score 25)	7	1.93	7	1.9
Question 4 (Symptoms):				
Answer A (score 0)	311	85.68	309	81.7
Answer B (score 8)	39	10.75	50	13.2
Answer C (score 17)	11	3.04	17	4.5
Answer D (score 25)	2	0.56	2	0.5

During 8 weeks of surveillance, 36 (78.2%) athletes filled out the questionnaire 8 times, and 10 (21.8%) athletes filled out the questionnaire 7 times. The level of adherence every week was between 91.66-100%, with average adherence in the surveillance period reaching 97.32%. During the surveillance period, there were 378 reports from the injury questionnaire, consisting of 307 reports of no injuries and 71 reports of injuries. Examinations carried out by the medical team found 69 confirmed reports of injury and 2 reports of no injury. The median injury severity score reached score 32, with a score range of 16 to 100. Meanwhile, for health problems, 363 reports were found, consisting of 307 reports of no health problems and 56 reports of having health problems. A confirmation examination of 56 reports of health problems found 42 reports confirmed as having illness and 14

confirmed had no illness. The median severity score of illness reached score 32, with a score range of 8 to 100. Mann-Whitney test showed a statistically significant difference in severity score between athletes with injury and non-injury as well as severity score between athletes with illness and no illness ($p < 0.001$). An overview of the questionnaire answers is presented in Table 4.

For the application in the surveillance stage, the AUC value of the Bahasa version of the OSLO health problems questionnaire score was 0.973 (95% CI; 0.956-0.989) with $p < 0.0001$ and the AUC value of the Bahasa version of the OSLO injury questionnaire score was 0.996 (95% CI; 0.990- 1) with $p < 0.0001$. The Receiver Operating Characteristic (ROC) curve and Area Under Curve (AUC) for the Bahasa Version of the OSTRC Questionnaire are shown in Figure 1.

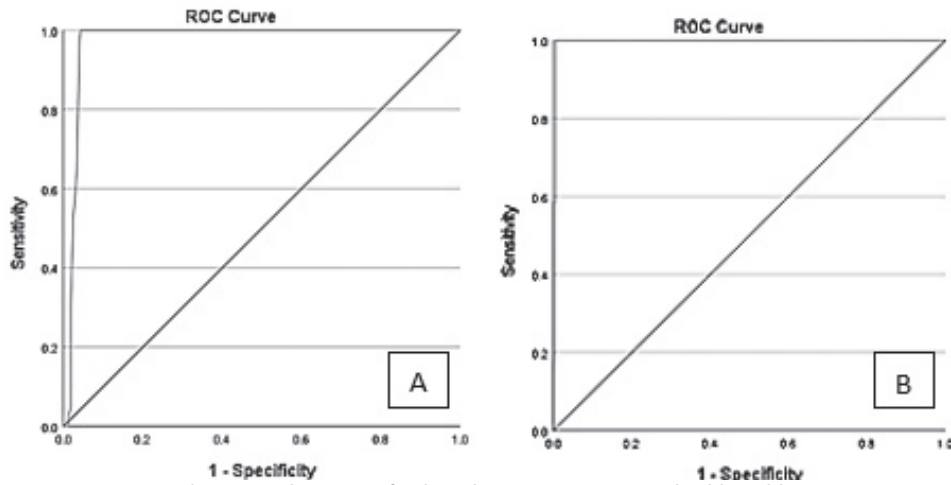


FIGURE 1. The ROC and Area AUC for the Bahasa Questionnaire: A; health problems, B; Injury

The application of the OSTRC Injury and Health Problems Questionnaire Bahasa version also evaluated the cut-off value of the severity score in the illness and injury group. The cut-off value of the health problems questionnaire was 12, which had

a sensitivity of 97.6% and a specificity of 96% and the cut-off value of the injury questionnaire was 8, with a sensitivity of 100% and a specificity of 99.4%. Details of the curve intersection points are shown in Figure 2.

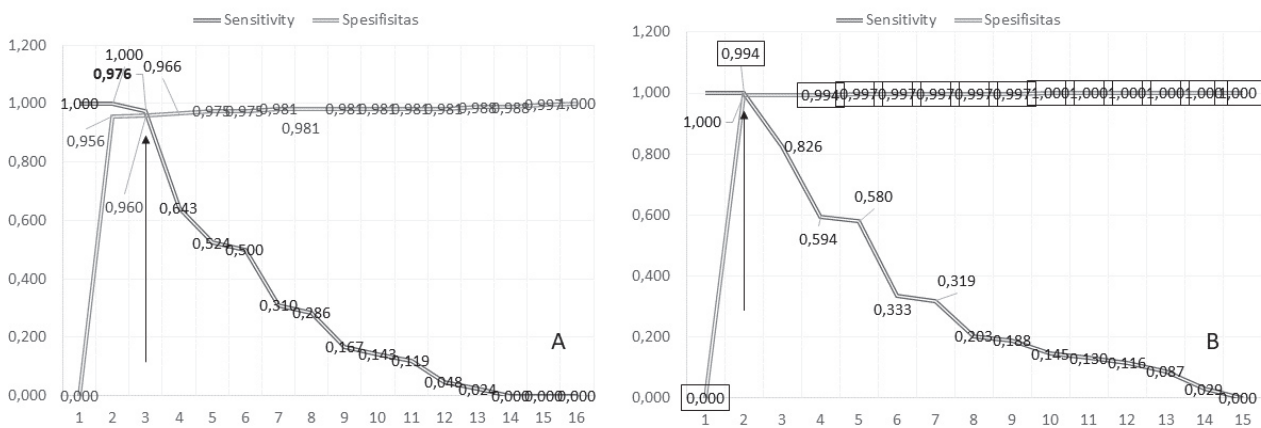


FIGURE 2. ROC cut-off point curve for A: health problems questionnaires and B: injury questionnaires

Discussion

The Bahasa version of the OSTRC Health Problems and Injuries Questionnaire has good validity and reliability in identifying health problems and injuries. This assessment is seen from two things, namely: (1) Validity and reliability test and (2) Sensitivity and specificity. The validity of this study was assessed by the r-value from the Pearson Correlation Test

which reached: (1) health problems ($r = 0.829$ to 0.931), shoulder region ($r = 0.677$ to 0.989), knee region ($r = 0.628$ to 0.984), and ankle region ($r = 0.628$ to 0.984). The reliability of the questionnaire assessed using Cronbach's Alpha reached the range of 0.840 to 0.940 , and also the intraclass correlation coefficient reached the range of 0.840 to 0.940 . These results are in accordance with Julie Gallagher et al, regarding self-reported

measurement for injury and illness for athletes which must have a Cronbach's Alpha between 0.7-0.95, as well as assessing reliability based on intra-class correlation coefficient (ICC) ≥ 0.7 (Gallagher et al., 2017). The grouping of injury areas into three regions was also carried out based on research from Kaewkull et al and research from Nagano et al (Kaewkul et al., 2021; Mashimo et al., 2020), and according to Ben Clarsen et al as the developer of the initial version of the OSLO questionnaire stated that the validity and reliability values of the OSLO questionnaire would not have a significant difference between the divisions of injury areas (Clarsen et al., 2013, 2014). The addition of open questions regarding the location of injury or illness is very necessary, this is because each sport has different characteristics of injury and illness locations (Clarsen et al., 2013, 2014). The time for filling out the questionnaire every 7 days in this study is still within the appropriate time range, based on Streiner et al regarding the health means measurement scale, which revealed that periodic reporting of subjective measurement results must be carried out with a minimum duration of 3 days to a maximum of 14 days, this aims to minimize the occurrence of recall bias (Streiner et al., 2015).

The Bahasa version of OSTRC has good performance in separating athletes who experience health problems with a sensitivity of 97.6% and a specificity of 96% and also separates injured athletes with a sensitivity of 100% and a specificity of 99.4% based on ROC and AUC. From the literature review, only a study from (Kaewkul et al., 2021) also assessed the sensitivity and specificity of OSTRC after being adapted to the Thai version, and the results of the (Kaewkul et al., 2021) study

also had high sensitivity and specificity in separating health problems and injuries. Clarsen et al in their original method, recommend preventing direct comparison of data between the results of the OSTRC questionnaire, this is because there are bound to be differences in the data collection process and operational definitions of injury or illness. The sensitivity and specificity of this study cannot be compared with other studies (Clarsen et al., 2013, 2014). The strengths of this study are (1) The first research to validate the OSTRC in the Bahasa version, (2) the Bahasa version of the questionnaire only consists of 4 questions, which makes it easier for athletes to report their health conditions periodically, (3) the Bahasa version of the questionnaire is easy to adapt to various sports without changing the questionnaire's ability to screen for health conditions. However, the Indonesian version of the OSTRC Questionnaire is a new option for regular monitoring of health problems and injuries in athletes. In the future, it is important to determine methods and operational definitions of illness and injury comprehensively, this is to obtain continuous data.

Conclusion

Based on the results of this research, it was found that the validity and reliability of the Bahasa version of the OSTRC questionnaire were very good. Apart from that, the Indonesian version of OSTRC can screen for athletes' health conditions, which can be seen through the ability to separate injured or ill athletes through the severity score. If the severity score is ≥ 8 , it is an early indicator of the possibility that the athlete will experience health problems (injury or illness).

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Conflict of interest

The authors declare no conflict of interest. OSTRC Bahasa versions are available from the corresponding author on request.

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