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Italian Cross-Cultural Adaptation and Validation of the Improved Report of Oslo Sports Trauma Research Centre Questionnaires on Overuse Injuries and Health Problems

Simone Favaretto[1,3], Pier Damiano Bertini[2,3], Giuseppe Plebani[3], Daniele Maremmani[3], Roberto Napoli[3]

[1] *Physiotherapist, Treviso, Italy,*
[2] *Physiotherapist, Macerata, Italy*
[3] *Department of Medical, Surgical and Neuroscience Sciences, University of Siena, Siena, Italy*

CORRESPONDING AUTHOR:
Simone Favaretto
Physiotherapist
via Treviso 20
31059 Zero Branco
Treviso, Italy
E-mail: simone.favaretto@outlook.it

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SUMMARY

Purpose. The Oslo Sports Trauma Research Centre Overuse Injury Questionnaire (OSTRC-O2) and the Oslo Sports Trauma Research Centre questionnaire on health problems (OSTRC-H2) are two methods to record and monitor overuse injuries and health problems in athletes and their influence on sport participation and performance. The aim of this study is to translate, culturally adapt and establish the validity of the OSTRC-O2 and the OSTRC-H2 into the Italian context through the questionnaires administration and assessment of test-retest reliability.

Methods. The translated versions of the questionnaires were edited according international guidelines. A web-based survey was conducted to assess measurement properties of the two scales. OSTRC-O2.IT and OSTRC-H2.IT were sent to a population of heterogeneous athletes: patients completed the questionnaires two weeks after their first submission and the intraclass correlation coefficient ICC (2,1) was used to calculate test-retest reliability.

Results. Sample size for internal consistency was of 89 subjects and showed high Cronbach's alpha coefficient both for OSTRC-O2.IT (Cronbach's alpha 0.90) and OSTRC-H2.IT (Cronbach's alpha 0.93). Reliability sample size was of 39 subjects and ICC (2,1) was excellent for OSTRC-O2.IT, 0.78 (95%CI 0.65-0.87) and good for OSTRC-H2.IT, 0.72 (95%CI 0.54-0.84).

Conclusions. The study showed that OSTRC-O2.IT and OSTRC-H2.IT were valid, repeatable and ease of use within the Italian sport population.

KEY WORDS

Injury; overuse; questionnaire; sport injuries surveillance; translation; cultural adaptation.

INTRODUCTION

In epidemiological studies on injuries in sports, a common methodology to classify the injury mechanism and the type of injury is needed, in order to assess its entity and burden on the athlete (1, 2). A clear definition of overuse injuries in athletes (3-5) and an effective and standardized system for their monitoring is needed (1, 3, 4, 6-10). Although injury surveillance systems have been sufficiently implemented in most international sporting events and effective prevention strategies have been found, monitoring the health status of athletes outside the competition stages is still rare (9). In addition, there is a tendency to classify an injury on the basis of the "time loss" from competition or training: this implies that the athlete has suffered such an injury that is not in the condition to continue the match or to participate in the next training session (3-5, 7, 11). In this way, there is a tendency

to not record, by definition, overload injuries, *i.e.*, those that present gradual onset and symptoms that do not necessarily force the athlete to stop competition or training, but that require a modification of the participation in them, in terms of intensity and/or frequency (1, 3, 5, 7, 10-12).
In 2013, an alternative method to record overuse injuries has been developed (3). This consists of sending a questionnaire (the Oslo Sports Trauma Research Centre Overuse Injury Questionnaire – OSTRC-O) to all subjects who have sustained an injury to a specific body area during the course of the monitoring, to investigate the consequences in sports participation (1, 3, 7, 9, 13, 14). One of the main benefits of this method is that the degree of symptoms due to overuse can be specific for each athlete and monitored over time, and that the severity of the injury is measured by changes and/or limitations to the individual's sports participation and performance (3, 7).
In parallel with this new methodology, a second questionnaire has been developed to investigate, the influence of the athlete's general health status on sport participation (the Oslo Sports Trauma Research Centre questionnaire on health problems – OSTRC-H) (8). These questionnaires had a great success in the scientific community and have already been adapted and validated in different languages (1, 3, 4, 9, 13, 14).
In the following years, a process of revising of the questionnaires has been developed, including some language, structure, and logic changes to improve the athletes' experience and implement the quality of the collected data (OSTRC-O2 and OSTRC-H2) (7).
The primary goal of the present study is to translate and adapt the OSTRC-O2 and the OSTRC-H2 (OSTRC-O2.IT e OSTRC-H2.IT) to the Italian context.

MATERIALS AND METHODS

Instruments

The questionnaires used in the present study refer to the OSTRC-O2 and OSTRC-H2 versions, developed in Norway at the Oslo Sports Trauma Research Center (7). These questionnaires consist each one of 4 questions: the first, analyses a problem or an injury to a specific part of the body, extendable to any anatomical area, while the second refers to the most relevant health problem for the athlete at the time of administration (3, 7, 8).
The severity score for each questionnaire ranges from 0, which means optimal performance or health status, to 100 which refers to the worst condition.

Translation procedure

After obtaining the approval from the Committee on Ethical Research in the Humanities and Social Sciences (Protocol number n. 52/2022), the Italian translations (OSTRC-O2.IT e OSTRC-H2.IT) have been created according to the guidelines of Beaton *et al.* (15).
The translations from English to Italian were realized by two bilingual translators with Italian mother tongue.
They were independent of each other and had two different profiles to detect different meanings of some terms: the first was a physiotherapist with an MSc and familiar with the topic, while the second was a teacher with a bachelor's degree in English with no medical background. Once the translations and their comments were collected, a synthesis of the versions was prepared to make them homogeneous according to the construct.
The synthesis was approved by both translators and then was sent to two other translators, with English mother tongue and knowledge of Italian language, blinded to the project and with no medical background, in order to translate them into the original language. This process checked the validity of the translation to be sure that the translated versions covered the same topics of the original questionnaires.
Inconsistencies between the original English version and the backward translations were resolved in the second draft of the questionnaire by 3 physical therapists involved in the study project and all the former translators.
The final Italian versions, the Italian OSTRC-O.IT and OSTRC-H.IT (**appendix 1** and **2**) were pre-tested on 10 patients, who had similar characteristics of the study sample. Each participant was asked to give feedback to the corresponding author about the comprehensibility and acceptability of the questionnaires. All the pre-testing subjects highlighted good understanding of the questionnaires both in terms of language and administering modality.

Administration

Between June 2022 and December 2022, the OSTRC-O2.IT e OSTRC-H2.IT were administered to the sample population. Inclusion criteria were being older than 14 years and involved in sport participation at any kind of level: people with health problems, overuse injuries or physical limitations were also included. Exclusion criteria were being younger than 14 years and not involved in sport activity at the time of the research. Subjects were volunteers recruited from local sport clubs and physiotherapy facilities. All of them gave their informed consent to participate.
Patients were sent an e-mail with the OSTRC-O2.IT e OSTRC-H2.IT and were invited to fill the questionnaires online by using Google Sheets software. On completion of the questionnaires, anamnestic data were collected, such as age, gender, type of sport and its frequency and level of performance and in case of injury, body part injured and

how long subjects have been suffering for the problem under consideration.
After 2 weeks form the first assessment, the corresponding author sent a second e-mail with the same questionnaires, for reliability analysis. At the beginning of the second e-mail, patients were asked if their status had changed from the first assessment: only patients who flagged the answer "No difference" were included in the test-retest analysis. Patients returning the second e-mail after more than 16 days from the first submission were also excluded for the test-retest analysis.

Statistical analysis

Descriptive statistics were used to report patients' demographics in the form of means, standard deviation (SD), and percentages.
Internal consistency was tested using the Cronbach coefficient α, which ranges from 0 to 1 and synthesizes the internal correlations of all items in a scale. Values equal or above 0.7 indicate acceptable reliability (16). ICC was calculated for test-retest reliability (2-way random-effects model, single measurements and absolute agreement): reproducibility was considered to be "excellent" ($r > 0.75$), "good" ($0.75 < r < 0.40$), or "poor" ($r < 0.40$) (17). The 95% confidence interval (CI) for the ICC, was also calculated according to Shrout and Fleiss (18). All calculations were made by using Microsoft Excel 2016.

RESULTS

Patient characteristics

115 subjects were contacted by e-mail: 89 of them (mean age 23.3, SD 9.4 years) returned the questionnaires completed and were used for internal consistency analysis. Of the 89 questionnaires completed, 55 returned the OSTRC-O2.IT e OSTRC-H2.IT: of these, 39 reported no change from the first assessment and were useful for reliability analysis (mean age 24.1, SD 8.0 years). Demographic cohort data is listed in **table I** and absolute values of all scales are listed in **table II**. The internal consistencies of the four key questions in OSTRC-O2.IT showed Cronbach's alpha value of 0.90. The reliability analyses showed excellent reliability ICC (2,1): 0.78 (95%CI 0.65-0.87).
Internal consistency for the four key questions on the OSTRC-H2.IT showed a Cronbach's alpha value of 0.93.

Table I. Demographic participants data.

	Test	Re-test†
Sample size	89 (77.4)	39 (43.8)
Sex		
Male	41 (46.1)	14 (35.9)
Sport		
Volleyball	67 (75.3)	28 (71.8)
Rugby	7 (7.9)	1 (2.6)
Football	6 (6.7)	3 (7.7)
Athletics	4 (4.5)	2 (5.1)
Swimming	2 (2.2)	2 (5.1)
Martial arts	1 (1.1)	1 (2.6)
Dance	1 (1.1)	1 (2.6)
Bodybuilding	1 (1.1)	1 (2.6)
Sports level		
Recreational	28 (31.5)	17 (43.6)
Low competitive level (local, regional)	49 (55.1)	19 (48.7)
High competitive level (national, international)	12 (13.5)	3 (7.7)
Weekly frequency		
Occasionally	4 (4.5)	3 (7.7)
Twice or more, regularly for most of the year	85 (95.5)	36 (92.3)
Health problems or injuries		
Injuries	17 (19.1)	6 (15.4)
Body part problems	35 (39.3)	14 (35.9)
Health problems	3 (3.4)	2 (5.1)
None problems	34 (38.2)	17 (43.6)
Time from injury/problems		
< 1 week	4 (4.5)	0 (0.0)
< 1 month	8 (9.0)	1 (2.6)
> 1 month	19 (21.3)	7 (17.9)
> 1 year	27 (30.3)	14 (35.9)
Injured/problematic body part		
Knee	22 (24.7)	8 (20.5)
Ankle - foot	13 (14.6)	4 (10.3)
Back (cervical, thoracic, lumbar spine)	10 (11.2)	5 (12.8)
Shoulder	8 (8.9)	3 (7.7)
Wrist - hand	5 (5.6)	4 (10.3)
Elbow	3 (3.4)	1 (2.6)
Other	6 (6.7)	2 (5.1)
None problems	22 (24.7)	12 (30.7)

†2 weeks after administrated the test; *values reported as absolute numbers and percentages (%).

Table II. OSTRC-O2.IT and OSTRC-H2.IT scores*.

	Test	Re-test
Severity Index		
OSTRC – O2.IT	29.52 (30.36)	21.58 (25.57)
OSTRC – H2.IT	20.61 (29.86)	15.98 (26.49)

*Values reported as mean and SD.

Test-retest reliability was good, showing ICC (2,1): 0.72 (95%CI 0.54-0.84).

DISCUSSION

The OSTRC-O2 and OSTRC-H2 questionnaires were implemented because of the numerous citations and translations of the original versions (3, 7-9, 13, 14). At the moment there is no translated and validated version in the Italian language: the OSTRC-O2.IT and OSTRC-H2.IT of the present study make possible to use this new method of monitoring injuries and health problems of athletes also in the Italian setting. The translation was carried out scrupulously following existing guidelines (15), without encountering any notable obstacles: lexical discrepancies were resolved in favor of ease of reading and compilation by the athlete.

The main outcome of the 2 questionnaires is the Severity Index Score (SIS): the scale of values ranges from 0 to 100, where 0 indicates no problem while 100 indicates inability to participate and/or continue practicing sport due to injury or illness. This therefore allows clinicians and trainers to immediately notice the physical state of the athlete as higher values indicate greater impairment.

The peculiarity of these questionnaires is the ability to record not only the incidence of injuries or health problems that stop sport activities but also subacute disorders that limit trainings or competitions: this is very interesting because they could be the prodromal symptoms of a severe overuse injury or a full-blown illness for example. This underlines once again the importance of using questionnaires that include the concepts of injury and health instead of focusing merely on the time loss. It could be interesting to study the correlation of the SIS with other objective measures such as the number of training sessions, matches, training load and tests on physical and psychological readiness.

Test-retest reliability is essential to evaluate real score differences from systematic or transient detection errors. Some factors within the study influenced the changes, such as the time between test and retest: in the present study, a 14-days time interval has been chosen (15).

In the reliability study, only subjects who answered "No difference" at the initial question: "*What differences have you found since the last time you completed the following questionnaire on your state of health/injury?*" were included. The internal test-retest reliability ICC (2,1) proved to be excellent for the OSTRC-O.IT and good for the OSTRC-H.IT, respectively 0.78 and 0.72: similar values were found in the Danish translation (13).

The results obtained showed similar values between the Cronbach's alpha value of the OSTRC-O2.IT and OSTRC-H2.IT and the original scales in English of first production and administration (3, 8). The study has some limitations: first, although the questionnaires are generic and therefore adaptable to any sport, there is a clear prevalence of volleyball athletes in our sample. A higher representation of contact sports could have increased the prevalence of injuries during the administration period. The sample both for the validity and reliability assessment is large enough to keep the results valid: furthermore, it should be noted that males and females were included almost equally, so as to represent the entire Italian sport population.

CONCLUSIONS

The use of OSTRC-O2.IT and OSTRC-H2.IT has proved to be useful in monitoring the athlete. The main outcome, the Severity Index Score, is consistent with the extent of the injury. A high internal consistency and good to excellent reliability were found, making the questionnaires valid, repeatable and ease of use within the Italian sport population. The introduction and publication of these questionnaires in Italian would therefore improve the assessment and management of the athlete according to the type of physical and/or health problem.

Perspectives

Publication and adoption of the translated questionnaire is important to avoid the massive use of tools to record and to monitor overuse injuries and to demonstrate that the translation procedure was rigorous. The translations of the OSTRC-O2 and OSTRC-H2 into Italian versions were performed using rigorous methodology and culturally adapted to the Italian context. Further research should be used to improve the quality of the injuries monitoring over time (in season and off season) and also intra and inter operators. Further studies also might test the questionnaires to a sample of totally elite athletes.

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None.

DATA AVAILABILITY

Data are available under reasonable request to the corresponding author.

CONTRIBUTIONS

All authors contributed equally to this work.

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CONFLICT OF INTERESTS

The authors declare that they have no conflict of interests.

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SUPPLEMENTS

Appendix 1. The Italian version of a questionnaire for registration of overuse injuries (OSTRC-O2.IT).

Questionario su Infortuni da Overuse dell'Oslo Trauma Research Centre (OSTRC-O2)
Per favore rispondi a tutte le domande indipendentemente dal fatto che tu abbia riscontrato problemi a (inserisci la parte del corpo qui, es. ginocchia) o meno. Seleziona l'alternativa più appropriata per te, e nel caso tu non sia sicuro, prova a rispondere comunque nel modo migliore che puoi.
Il termine "problematica a (parte del corpo)" fa riferimento a (inserisci qui i sintomi comuni o le conseguenze dell'infortunio, es dolore, indolenzimento, rigidità, rumori articolari di click o di blocco, gonfiore, instabilità o senso di cedimento, blocchi articolari) o altri disturbi relativi a (parte del corpo).

Domanda 1 – Partecipazione
Hai avuto difficoltà nella partecipazione agli allenamenti o alle competizioni a causa dei problemi a (posizione anatomica) nel corso degli ultimi 7 giorni?
Piena partecipazione senza problematiche di (parte del corpo)
Piena partecipazione, ma con problematiche di (parte del corpo)
Partecipazione ridotta a causa delle problematiche di (parte del corpo)
Impossibilità a partecipare a causa delle problematiche di (parte del corpo)

Domanda 2 – Modifica dell'allenamento/competizione
In che misura hai modificato i tuoi allenamenti o competizioni a causa delle problematiche di (parte del corpo) nel corso degli ultimi 7 giorni?
Nessuna modifica
In misura ridotta
In misura moderata
In modo significativo

Domanda 3 – Prestazione
In che misura le problematiche di (parte del corpo) hanno influito sulle tue prestazioni nel corso degli ultimi 7 giorni?
Non hanno influito
In misura ridotta
In misura moderata
In modo significativo

Domanda 4 – Dolore
In che misura hai avvertito dolore a (parte del corpo) correlato al tuo sport nel corso degli ultimi 7 giorni?
Nessun dolore
Dolore lieve
Dolore moderato
Dolore acuto

Appendix 2. The Italian version of a questionnaire for registration of health problems (OSTRC-H2.IT).

Questionario su Problemi di Salute dell'Oslo Trauma Research Centre (OSTRC-H2)
Per favore rispondi a tutte le domande indipendentemente dal fatto che tu abbia riscontrato problemi di salute durante gli ultimi 7 giorni. Seleziona l'alternativa più appropriata per te, e nel caso tu non sia sicuro, prova a rispondere comunque nel modo migliore che puoi.
Un problema di salute è una qualsiasi condizione che consideri essere una riduzione rispetto al tuo normale stato di piena salute, a prescindere dalle sue conseguenze sulla tua partecipazione sportiva o sulle prestazioni, o che tu abbia già cercato aiuto medico. Questo può includere, ma non è limitato a, infortunio, malattie, dolore o disturbi di salute mentale.
Se hai diversi problemi di salute, per favore compila partendo dal problema peggiore che hai riscontrato negli ultimi 7 giorni. Avrai la possibilità di inserire altre problematiche alla fine del questionario.

Domanda 1 – Partecipazione
Hai avuto qualche difficoltà nella partecipazione agli allenamenti o alle competizioni a causa di infortunio, malattia o altri problemi di salute nel corso degli ultimi 7 giorni?
Piena partecipazione senza problemi di salute
Piena partecipazione, ma con un problema di salute
Partecipazione ridotta a causa di un problema di salute
Impossibilità a partecipare a causa di un problema di salute

Domanda 2 – Modifica dell'allenamento/competizione
In che misura hai modificato i tuoi allenamenti o competizioni a causa di infortunio, malattia o altri problemi di salute nel corso degli ultimi 7 giorni?
Nessuna modifica
In misura ridotta
In misura moderata
In modo significativo

Domanda 3 – Prestazione
In che misura l'infortunio, malattia o altro problema di salute ha influito sulla tua prestazione nel corso degli ultimi 7 giorni?
Non ha influito
In misura ridotta
In misura moderata
In modo significativo

Domanda 4 – Sintomi
In che misura hai avvertito sintomi o altro collegati ai problemi di salute nel corso degli ultimi 7 giorni?
Nessun sintomo o problema di salute
In misura lieve
In misura moderata
In modo severo