Psychometric evaluation of tests for anthropometric, physical or physiological characteristics and game-specific skills commonly used in rugby union to distinguish between talented and less talented adolescent players: a systematic review protocol
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Review question(s)
The aim of this review is to systematically evaluate literature in order to identify tests for anthropometry, physical or physiological characteristics and game-specific skills needed in youth rugby.

The specific objectives are:

1. To determine the commonly used tests to measure anthropometric variables, physical or physiological characteristics and rugby-specific skills in the literature

2. To determine the psychometric properties of the identified tests for the specified three group of attributes

Searches
A computerised, systematic literature search will be conducted in PubMed, MEDLINE, Scopus, Africa Wide Information, and Academic Search Premier via EBSCO host, Web of Knowledge via EBSCO host and CINAHL databases.

In accordance with recommendations for systematic reviews on measurement properties, a hand search will be done on the reference lists of included articles to identify additional relevant studies. In addition, the Science Citation Index for citation searching will also be used to search for articles.

There has been an exponential increase in the volume of scientific research on rugby after the sport attained professional status in 1995. Hence, this review will include articles published in the last 25 years between January 1, 1990 and December 31, 2015.

Types of study to be included
Study design: Because one of the main principles of a systematic review is to include all available evidence (van Tulder et al, 2003), there will be no restrictions on the type of study to be included in the review.

Condition or domain being studied
This systematic review is on rugby. But, this review is being developed with the ultimate aim of developing a multi-dimensional test battery which will be used to screen or identify adolescent rugby players at high risk of developing an injury. The test battery will consist of tests for anthropometric, physical or physiological characteristics and rugby-specific skills proven to be psychometrically sound in the literature and that are able to distinguish between talented adolescent rugby players free of rugby related injuries from less talented players prone to injuries.

Participants/ population
Participants: Rugby is played competitively and professionally from secondary school to senior club level worldwide (Van Gent and Spamer, 2005; Brown et al, 2012). Studies to be included in this systematic review should have detailed information about the participants. Studies reported for adolescents considered from above 10 years (Ayamiyi et al,
through to adults will be considered.

**Intervention(s), exposure(s)**
Rugby players have to exhibit a blend of anthropometric, physical, physiological and exceptional rugby specific skills to cope with the demands of the game (Van Gent and Spamer, 2005). To be included in this review, studies should clearly report at least on one of these qualities (anthropometry, physical or physiological and rugby specific skills). In addition, studies should provide detailed information on the procedure used to measure any of the aforementioned qualities and the instrument used in measuring in their methods section.

Explicitly expressed in the text of the studies to be included in this review, should be information at least on one psychometric property used to evaluate the test/instrument and the results obtained in the study

**Comparator(s)/ control**
None

**Context**
Sport context: Although rugby union differs from rugby league in rules and patterns of play (Coughlan et al, 2011), the physical demands, the physiological responses during play and the technical skills are similar. In this review, studies involving adult or adolescent rugby players will be included. The search will also be extended to include rugby league.

**Outcome(s)**

**Primary outcomes**
The primary outcome measure for the systematic review will be anthropometric, physical/motor or physiological characteristics and the rugby-specific skills that are crucial in protecting talented or elite adolescent rugby players from sustaining rugby-related injuries. Factors such as increased body mass, agility, flexibility, muscular strength and power, balance, coordination, endurance and game specific skills such as passing and kicking have been implicated in the literature to be important in a quest to understand the epidemiology of rugby related injuries among rugby players.

**Secondary outcomes**
None

**Data extraction, (selection and coding)**
After identification of relevant articles, the principal investigator (MC) will extract the following data from each article selected into a Microsoft Excel data collection form: the publication details (author, title, year of publication), methodology (study design, target population, sample characteristics, sample size, setting, sport context), outcome measure(s) under study (anthropometry, physical/ motor, physiological qualities or game specific skills), test (s) used (name, procedure, and equipment needed), psychometric property reported and the results (reliability, internal consistency, measurement error/smallest detectable difference, content validity, construct validity, responsiveness). We will further describe how each psychometric property was determined. All data extracted will be checked for accuracy and random errors by a second independent author (BE).

**Risk of bias (quality) assessment**
The COSMIN checklist will be used for assessing the methodological quality of all the studies to be included in the review. Inclusion of studies that have significant risks of bias will be discussed among reviewers. For articles eligible in the review but requiring a subscription fee, contact will be made with the corresponding authors requesting for hard copies.

**Strategy for data synthesis**
A quantitative, descriptive synthesis is planned.

**Analysis of subgroups or subsets**
None planned

**Dissemination plans**
Presentation at conferences and in the department of health and rehabilitation sciences quality assurance presentations
at the University of Cape Town.

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**Anticipated or actual start date**
01 December 2015

**Anticipated completion date**
15 January 2016

**Funding sources/sponsors**
None

**Conflicts of interest**
None known

**Language**
English

**Country**
Zimbabwe

**Subject index terms status**
Subject indexing assigned by CRD

**Subject index terms**
Adolescent; Anthropometry; Humans; Physical Examination; Psychometrics; Recreation

**Stage of review**
Ongoing

**Date of registration in PROSPERO**
01 December 2015

**Date of publication of this revision**
01 December 2015
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<th>Stage of review at time of this submission</th>
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<td>Preliminary searches</td>
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