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Psychometric assessment of a new self-report instrument for measuring health, quality of life and physical activity

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ABSTRACT

Background: Questionnaires for self-ratings of the own fitness and health were recommended in the past.
Aim: To test a new self-report instrument for measuring health, quality of life and physical activity in comparison with the SF-12 Health Survey.
Methods: A total of 180 subjects (27.6 ± 11.3 years, 57 % male, 43 % female) completed the SF-12 and the Fitness and Health questionnaire used at the German Sport University Cologne (FHQC). The participants reported their self-rated health, quality of life and fitness via ratings based on a Likert-type scale and gave information about their daily leisure time physical activities. Statistical analyses were performed by item analysis statistics, associations via Spearman correlations and differences between groups via Mann-Whitney-U-Test.
Results: The FHQC revealed an acceptable reliability of 0.7 (Cronbach's Alpha), mean item discriminatory power was 0.3 and item difficulty 73.3 for all participants. Item analysis showed a two-factor based solution with acceptable results (Mental and physical component score (MCS, PCS). Spearman rank correlation reflected significant associations ($p < .01$) between SF-12 and FHQC total (r_{sp} (172) = 0.7, $p < .01$), PCS (r_{sp} (175) = 0.6, $p < .05$) and MCS points (r_{sp} (172) = 0.5, $p < .01$).
Conclusion: Overall, the FHQC revealed a moderate, replicable and acceptable validation of the FHQC when compared with the SF-12 questionnaire in the European working population and among students that can be used as supplementary tool in research studies, worksite health promotion or practical context for measuring quality of life, physical activity and health.

1. Introduction

Constructs like health, quality of life and physical activity are closely linked to each other, which can be made clear when defining each of the constructs:

The Constitution of the World Health Organization (WHO, 2006) defines health as …["*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. The enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, and political belief, economic or social condition*"].

Quality of life is the general well-being of individuals and societies, outlining negative and positive features of life. It observes life satisfaction, including everything from physical health, family, education, employment, wealth, religious beliefs, finance and the environment. It has a wide range of contexts, including the fields of international development, healthcare, politics and employment. An assessment of health-related quality of life is effectively an evaluation of the quality of life and its relationship with health. Health-related quality of life is a measurement method for assessing the effectiveness and benefit of a therapy or therapeutic procedure in which the subjective view of the patient is at the focus of interest (Barcaccia, 2013; Bottomley, 2002; Sjogren & Thulin, 2004).

Physical activity is defined as the involvement of participants in leisure time physical activities and recreational and/or competitive sports measured in hours per week. According to the WHO, physical

Ethics

The study was approved by the local ethics committee of the German Sport University Cologne, Germany (Number: 099-2016) and has therefore been performed in accordance with the ethical standards laid down in the 1975 Declaration of Helsinki. All subjects provided informed written consent prior to participation in the study and agreed to anonymous use of their data. The participation was voluntary. Withdrawal was possible at any time without any disadvantages for the participant.

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activity is, besides nutrition and recovery, another pillar to define health. Regular physical activity is one of the keystones in chronic disease prevention and increased sedentary time is associated with higher risk of premature all cause and cardiovascular disease mortality (Healy et al., 2008; Lee et al., 2012; Thorp et al., 2010). Thus health, quality of life and physical activity or sports are linked closely to each other, each of them building in important part for the overall well-being.

A widely, used tool in research are questionnaires, mostly due to financial and effort reasons when compared to face-to-face interviews or other interventions (Kokkinis, Galanaki, & Malikiosi-Loizos, 2017). They also provide a convenient way of gathering information from a target population, especially for studies involving large sample sizes. Surveys for self-ratings of the own fitness and health status were recommended in the past and have also shown positive agreements to practical, physiological testing methods (Aadahl & Jorgensen, 2003; Aadahl, Kjaer, Kristensen, Mollerup, & Jorgensen, 2007; Borodulin, Laatikainen, Salomaa, & Jousilahti, 2006; Holtermann et al., 2015; Keith, Clark, Stump, Miller, & Callahan, 2014; Martinez-Gomez et al., 2012; Ortega et al., 2013; Ronda, van Assema, & Brug, 2001).

There already exist questionnaires to measure health-related quality of life or fitness. To name only a few, the Global Physical Activity Questionnaire (GPAQ) (Bull, Maslin, & Armstrong, 2009), the KIDSCREEN for children (Ravens-Sieberer et al., 2007; Ravens-Sieberer et al., 2014) and adolescents questionnaire or International Fitness Scale (IFIS) (Merellano-Navarro, Collado-Mateo, García-Rubio, Gusi, & Olivares, 2017) are worth mentioning. As a short form of the SF-36, the 12-item SF-12 questionnaire is a widely used and validated tool and standard method for assessing health-related quality of life with mental, physical and social aspects. The SF-36 health questionnaire, originally developed in the US, is described in detail elsewhere (Bullinger et al., 1998; Gandek et al., 1998). It reproduces the SF-36 physical and mental health summary measures with 12 items (6 items each for the PCS and MCS), accounts for more than 90% of the variance of the PCS and MCS of the SF-36 and has been translated into over 40 different languages.

The working group of Sen et al. (2012) used the SF-12 questionnaire as it is planned in this study and determined the quality of life after coronary artery surgery of 3312 patients compared to younger patients. The obtained results showed that patients in the octogenarian group had a mental component summary measures (MCS) of 48.4 ± 10.0 points compared to 50.42 ± 9.63 points in the control group. The physical component score (PCS) was 37.6 ± 10.6 points for patients in the group of octogenarians and 42.4 ± 10.9 in the control group, reflecting that the control group rated their physical and mental quality of life higher than the patients. Their investigation proved as well that the SF-12 questionnaire is a reliable tool in research studies to measure quality of life, explaining the choice of questionnaire in our study.

Ortega et al. (2011) investigated the usefulness of the IFIS to correctly rank adolescents into physical fitness levels; the capacity of the IFIS for predicting cardiovascular disease risk; and the reliability of the IFIS in adolescents and summarized that the questionnaire is able to correctly rank adolescents according to their measured physical fitness levels. Furthermore, adolescents reporting a good/very good overall fitness, physical cardiorespiratory fitness or speed agility have a more favorable cardiovascular profile. The listed literature above underlines the importance of measuring health, fitness, quality of life or physical fitness in research studies which justifies the psychometric assessment of a new self-report instrument.

To summarize, there are already validated surveys, measuring health, fitness, quality of life or physical fitness separately. However, particularly for the evaluation of the SF-36 or SF-12 and the majority of questionnaires, a fee-based license is necessary, creating an economical effort. Also, the SF 36 does not detect information about physical activity. Yet, regular physical activity is one of the keystones in chronic disease prevention and increased sedentary time is associated with higher risk of premature all cause and cardiovascular disease mortality (Healy et al., 2008; Lee et al., 2012; Thorp et al., 2010).

A questionnaire that combines the components health, health-related quality of life and physical activity does not exist and is an indispensable necessity, justifying the investigation of a new questionnaire, the Fitness and Health questionnaire used at the German Sport University Cologne (FHQC). For the first time, it detects information about these constructs in one single questionnaire, which lacks in other surveys so far. This investigation is important, because it contributes to the understanding of the prevention of physiological and mental health issues, and may detect noticeable problems or striking situations in individuals. The questionnaire is available without a license, free of charge and adds items concerning anthropometrical data, smoking habits, physical activity and other lifestyle factors as well as self-ratings reflecting the current health status, quality of life, fitness status, work-life balance and job performance.

Due to a cost-efficient, fast and non-invasive method, the FHQC may be a useful, supplementary tool in research studies, other health contexts or in practical contexts for measuring physical activity and health. It could be used in the framework of worksite health management, e.g. as an overview of the physical and psychological health status of employees and staff members, which might be important for the long-term success of a company.

The purpose of the study was to evaluate a new instrument that combines three constructs health, health-related quality of life and physical activity in one single questionnaire. A psychometric and factorial validation as well as the assessment of the reliability of the FHQC questionnaire were performed in comparison with the SF-12.

2. Materials and methods

2.1. Data and subjects

In a cross-sectional survey, $N = 180$ employees and university students (age: 27.6 ± 11.3 years, sex: 57 % male, 43 % female) were surveyed in Cologne, Germany. Data derive from two general questionnaires concerning self-estimations for health, fitness and health-related quality of life, collected in the second half of 2016. The empirical study meets the criteria of a quantitative research method and was performed via a questionnaire analysis. The investigation was advertised via postings on the notice board of the German Sport University Cologne for the recruitment of university students and employees of all working areas. The students had no advantages in their studies when participating in the study, e.g. by receiving additional credit points or grade bonus, etc. Also, the participated employees had no advantages in completing the questionnaires, such as financial incentives, etc. The surveys were conducted as a paper-pencil questionnaire and completed anonymously on a voluntary basis. Withdrawal was possible every time without any disadvantages. There were no exclusion criteria for participating in the survey.

The results were evaluated by the Institute of Cardiology and Sports Medicine, Germany. Among the participants were 52 employees from different areas of work (age: 41.7 ± 12.7, sex: 54 % male, 46 % female) and 128 students from the German Sport University Cologne (age: 22.0 ± 2.6, sex: 59 % male, 41 % female) (Table 1).

Subjects completed the SF-12 and FHQC questionnaire at the same time point measurement. In random order, half of the individuals first completed the SF-12, while the other half completed the FHQC and completed the other questionnaire afterwards. Both questionnaire versions were presented in German language. The study was approved by the local ethics committee of the German Sport University Cologne, Germany (Number: 099-2016) and has been registered at the German Clinical Trials Register (DRKS registration number: DRKS00010986). All subjects gave written consent about the participation of the study and agreed to the anonymous use of their data.