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Applied nutritional investigation

Development of a reliable and valid nutritional knowledge questionnaire for urban South African adolescents

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Abstract

Objectives: We wanted to develop a valid and reliable nutritional knowledge test for urban South African adolescents who were participating in the Birth-to-Twenty cohort study. The questionnaire was intended for use every second year, from ages 13 to 14 y until age 20 y.

Methods: The initial steps involved the development of a conceptual framework and identification of nutritional concepts in collaboration with nutritional experts, and this defined the construct of the questionnaire. The South African national teaching curriculum objectives for nutritional education and other relevant issues were selected as the desired concepts, and most items were phrased in accordance with the recently developed South African Food-Based Dietary Guidelines. Thereafter, 140 items (questions) were developed and in turn assessed by an expert panel, and the result was that only 88 items remained. This was done to ensure content and face validity of the items. The 88 items were constructed into a questionnaire and piloted for appropriateness and understanding by adolescents, ages 13 to 14 y, as a means of assessing face validity by non-experts. The edited preliminary questionnaire (still with 88 items) was administered to a nutrition expert group ($n = 71$) versus a non-expert group ($n = 82$), referred to as sample 1, for the purposes of performing item analysis and assessing construct validity of the questionnaire. The result of the analysis, a 63-item questionnaire, was administered to adolescents at three school grade levels, 8 ($n = 128$), 10 ($n = 143$), and 12 ($n = 98$), referred to as sample 2, which was representative of the grades in which the Birth-to-Twenty group will be in when the questionnaire is administered. The questionnaire was administered to the sample to assess its content validity and internal consistency reliability. The final questionnaire had 60 items, and its construct, content, and internal consistency reliability were reassessed.

Results: The final 60-item questionnaire displayed a significant difference ($P < 0.0001$) in the mean scores of the expert and non-expert groups tested. It had internal consistencies (Cronbach's α) of 0.71, 0.79, and 0.82 for grades 8, 10, and 12 respectively, and an overall value of 0.77 for all groups combined. However, it was less than 0.7 for most grade 8 pupils and for all grades at a historically disadvantaged school.

Conclusion: A nutritional knowledge questionnaire with construct, face, and content validities and internal consistency was developed for use in South African adolescents to evaluate their nutritional knowledge. Internal consistency was low in children at a disadvantaged school and those in grade 8 compared with multiracial groups at a multiracial school. It is recommended that pupils at disadvantaged schools be assisted by trained interviewers when taking the test.

Keywords: Adolescents; Nutrition knowledge; Questionnaire development; Validity; Reliability

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Introduction

The Birth-To-Twenty (BTT) cohort study is a longitudinal study that is following the physical and psychological development of children from birth to age 20 y. The BTT cohort ($n = 3273$) was recruited at birth from the Soweto-Johannesburg area and includes mostly black, but also white, Indian, and "colored" children. The group has been assessed at different ages on various social, environmental, psychological, educational, and biological aspects [1].

The study, although continuing with its original objectives, in 2003 included an additional objective, namely an evaluation of determinants that predispose to chronic diseases of lifestyle, in adolescents who were then 13 to 14 y old [1]. In this regard, poor dietary habits are an essential determinant for the development of most chronic diseases, and nutritional knowledge has been identified as an important factor that influences dietary habits of adolescents [2]. To determine dietary habits, it is essential to use a well-developed, effective nutritional knowledge assessment instrument (*instrument* refers to any object that can be used to assess a specifically identified aspect in or of an individual. The words *instrument*, *test*, *questionnaire*, and *tool* are used interchangeably in the text).

The main criteria that an effective assessment and evaluation instrument needs to meet are those that incorporate appropriate levels of reliability and validity testing [3]. As a consequence, a validated nutritional knowledge test that had a measured reliability would be the ideal instrument to assess the knowledge of the BTT participants. Currently in South Africa, there seem to be only three published nutritional knowledge tests that have been developed with validity and reliability ensured. One of these test questionnaires assesses the nutritional knowledge of white adults [4] and two assess health professionals' knowledge of nutritional [5] and other lifestyle risk factors for the development of chronic diseases of lifestyle [6].

Although researchers in moderate- and high-income countries such as the United States have developed numerous knowledge tests for different groups including adolescents [3,7–12], these tests are not suitable for use in the BTT study because the focus and content of such questionnaires and the specific target groups are not compatible with the BTT research aims and target group. Hence, a clear need for a valid and reliable nutritional knowledge test for the adolescent BTT group was evident.

Formulating a conceptual framework on which to base the entire questionnaire and its concepts is the initial step in developing a questionnaire. An item pool based on the concepts is then developed, for which evaluation by an expert panel and item analysis serve as the bases for selection of the most suitable items [7–9]. The questionnaire can then undergo further analysis when predefined types of validity and reliability can be assessed.

The questionnaire development process

The process applied in the development of the questionnaire is summarized in Figure 1.

Development of a conceptual framework and identification of concepts

To define the construct of the questionnaire (i.e., nutritional knowledge) appropriately, the process commenced with the development of a conceptual framework of relevant sections of nutritional knowledge to be measured. As a departure point, we reviewed the "conceptual framework of nutritional problems and causal factors in adolescence" by the World Health Organization (WHO) [2]. This framework provides an indication of how different factors, including environmental, political, social, and individual, can lead to nutritionally related problems in adolescents in developing countries. The framework was subsequently adapted for the South African adolescent population after an extensive review of the relevant literature [13–17]. The review involved identifying nutritional issues relevant to South African adolescents by means of electronic and hard copy journal articles, reputable Web sites, and South African government agencies and departments. In addition, electronic mail and verbal correspondence with experts from educational institutions provided information.

Because there is a paucity of research data relating to South African adolescents, most of the nutritional issues considered for the framework were derived from issues that had been identified for younger South African children that were thought to perpetuate into adolescence. Further, issues related to adolescents in other countries that appeared to be relevant for South African adolescents were included.

The most common nutritionally related problems among younger South African children (1 to 9 y) were identified from the National Food Consumption Survey, which was undertaken in 1999 [13]. These problems were found to be an inadequate dietary energy intake that led to underweight and stunting in addition to deficiencies in micronutrients such as iron, vitamin A, iodine, calcium, and zinc. Further, available data on black urban female adolescents (15 to 18 y) [14] indicated that sugar intake made a fairly high contribution (14.6%) to daily energy intake compared with the WHO recommendation of less than 10%. Because of the association of a high sugar intake with certain conditions such as dental caries, micronutrient dilution, and obesity [15], sugar intake was included as a potential problem that adolescents need to know about.

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