Peer-reviewed | Manuscript received: : March 22, 2016 | Revision accepted: July 07, 2016

Nutrition-specific health literacy: development and testing of a multi-dimensional questionnaire

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Summary

Nutritional knowledge, food skills, and an awareness of one's eating behavior are core competencies in the concept of nutrition-specific health literacy. There are very few instruments to measure this increasingly important concept in health and nutritional science. This study describes the stepwise development of a comprehensive questionnaire for the self-evaluation of nutrition-specific health literacy among adults. The questions were developed in accordance with a working definition and were assessed as to their applicability and comprehensibility in a two-stage pre-test among a target group. The final questionnaire comprises 16 questions and is currently being used for the first time in a Swiss intervention study in an occupational setting. Further validation (construct validity) will show whether this instrument is suitable for use in other studies.

Keywords: health literacy, nutrition literacy, food literacy, questionnaire, nutritional education, Public Health Nutrition

Citation
Krause C, Sommerhalder K, Beer-Borst S (2016) Nutrition-specific health literacy: development and testing of a multi-dimensional questionnaire. Ernahrungs Umschau 63(11): 214–220

This article is available online:
DOI: 10.4455/eu.2016.046

Introduction

The World Health Organization defines health literacy as the cognitive and social skills that motivate and enable individuals to adopt a lifestyle that is beneficial to their health [1]. Nutbeam distinguishes between three forms of health literacy (HL):

(1) Functional HL describes the ability to find and understand health-related information.
(2) Interactive HL describes the ability to exchange views about health issues in one's environment and to transfer the information received to one's own situation.
(3) Critical HL describes the ability to critically assess and question information in order to actively promote one's own and others' health [2, 3].

The concept of HL provides a basis for a more comprehensive understanding of everyday healthy actions, including eating behavior and physical activity [4]. The concept is therefore also of interest to nutritional science and education [5, 6]. Scientific literature uses the terms 'nutrition literacy' or 'food literacy' to describe this concept, albeit inconsistently. However, as both terms describe specific forms of HL [6, 7], this study has adopted the term 'nutrition-specific health literacy'.

Based on Nutbeam's concept, this term encompasses nutritional knowledge, food skills, the ability to communicate about nutritional issues and to critically reflect on one's eating behavior and the effects of consumption decisions [8, 9].

At present, there are only a few instruments which assess nutrition-specific HL. The present work describes the development and pre-testing of a German-language questionnaire which aims to measure nutrition-specific HL as a multi-dimensional concept. The questionnaire was developed as part of an intervention study to reduce salt consumption among Swiss workers. The study aims to promote nutrition-specific HL by means of a combined behavioral and environmental approach and to thereby positively influence individuals' selection of food [10].

Methodology

The questionnaire was developed and tested in a three-stage process (◆ Figure 1).

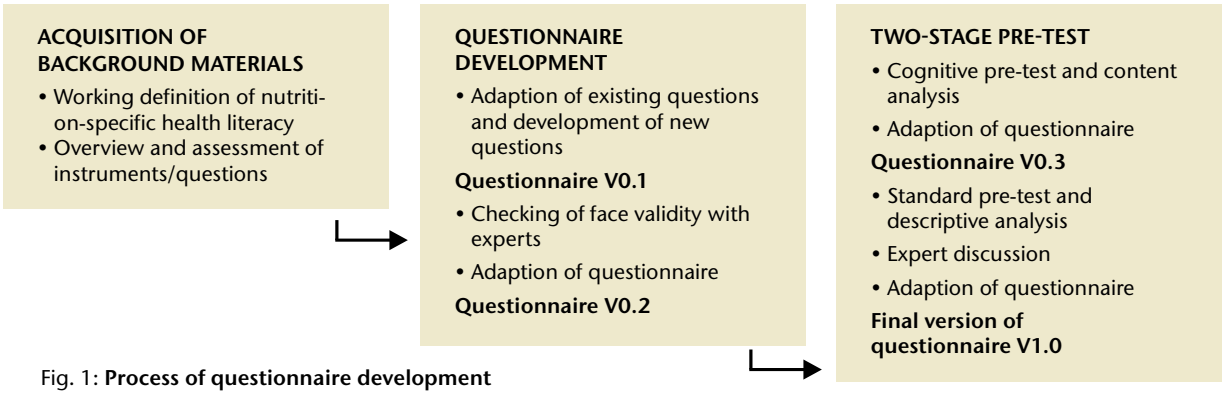

Fig. 1: **Process of questionnaire development**

Acquisition of background materials (stage 1)

In a first step, authors analyzed the definitions of nutrition literacy [9, 11] and food literacy [12–16] and their core elements, in comparison to established concepts of HL [2, 3, 17]. The authors produced a grid (◆ Table 1) which summarizes the definitions in twelve themes and assigns them to the three forms of HL (functional, interactive, critical). This grid provided a working definition which guided the development of the questionnaire.

A search of scientific publications in German, English and French (12/2014–03/2015; databases: PsychInfo, CINAHL, ERIC, MEDLINE, Web of Knowledge, Google Scholar; search terms: health literacy, nutrition literacy, food literacy, instrument, questionnaire, survey, valid*, reliab*) produced 110 validated instruments to measure general or nutrition-specific HL among adults. The instruments were subsequently assessed as to their suitability according to the evaluation criteria illustrated in ◆ Figure 2 (traffic light model).

24 instruments were classified as suitable (yellow/green), as they covered at least two forms of HL (functional and interactive or critical) or focused on nutrition.

Questionnaire development (stage 2)

All questions from the suitable instruments were listed and where possible assigned to the themes of the working definition (◆ Table 1). In the event that no suitable questions for a theme were available, new questions were developed. Questions which served to assess general HL in the original instrument were adapted to the subject of nutrition. The focus was always on a balanced and healthy nutrition. The questions were phrased in comprehensible language, avoiding the use of technical terms.

A research group of experts in nutrition, health literacy and questionnaire development checked the first version of the questionnaire (V0.1) in accordance with the working definition for face validity (face validity checks whether the questions are meaningful and appropriate and whether they fully capture the construct to be tested [18]). In an iterative process, changes were recorded by the authors and the adjusted questions were again discussed within the research group.

	Nutrition-specific HL themes	Forms of HL
1	Ability to acquire information about food, food preparation and the influence of nutrition on health	functional
2	Ability to understand information about food (e.g. nutrition labelling on food)	
3	"Having knowledge" of: • healthy nutrition (what does healthy nutrition involve?) • nutritional recommendations, food preparation, salt content	
4	Ability to prepare a balanced meal in accordance with available resources and financial means	
5	Ability to make a healthy choice	
6	Ability to talk about nutrition with friends and family	interactive
7	Ability to apply information one has read about nutrition to one's own situation	
8	Ability to assess nutritional information from different sources	critical
9	Ability to assess whether a food contributes to healthy nutrition; ability to distinguish between healthy and less healthy options	
10	Ability to understand the connection between nutrition and health	
11	Ability to advocate health promoting conditions	
12	Ability to understand nutrition and health related topics in the larger societal context	

Tab. 1: **Working definition of nutrition-specific health literacy (HL)**

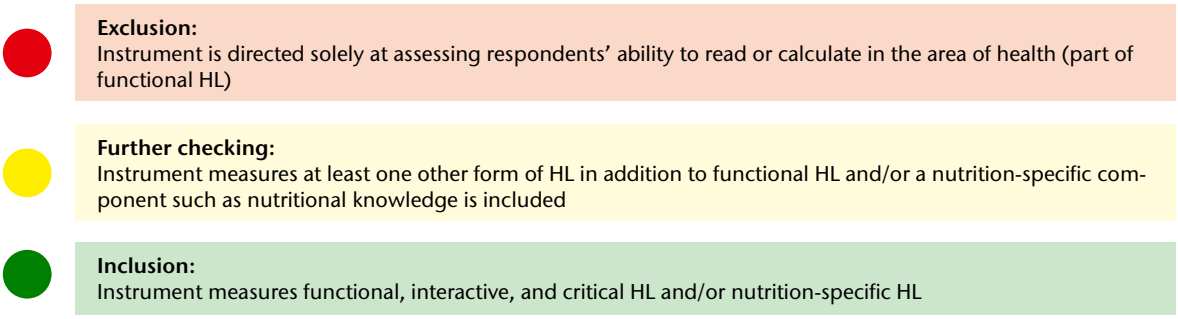

Fig. 2: **Evaluation criteria for inclusion and exclusion of instruments to measure health literacy (HL)**

Two-stage pre-test (stage 3)

The second version of the questionnaire (V0.2) was then pre-tested (cognitive pre-test) focusing on the quality of the individual questions, i.e. whether the target group understood the questions and the corresponding response formats [19].

To this end, an author carried out semi-structured interviews with 13 people who were recruited in a local administrative office and at the university. The Interview guideline determined the testing technique for each question. The interviewer primarily applied the techniques of probing and thinking aloud, to evaluate how specific terms and formulations were understood by the interviewees and what thought processes the interviewees used to arrive at their responses [19]. The maximum duration of the interviews was 60 minutes. All the interviews were recorded, transcribed, and summarized. As a result of this process, proposed changes were prepared and worked on by the three authors based on a consensus process and implemented in the third version of the questionnaire (V0.3).

The questionnaire was subsequently tested as part of the study survey among 110 students from the first and fifth semesters at a local university of applied health sciences. This approach (standard pre-test) helps to identify general problems and anomalies, as the respondents are expected to answer all the questions under the same conditions as those in the main survey [20].

The participants were invited to record any technical weaknesses, any difficulties they had in answering individual questions and any other anomalies as well as the time taken to fill in the questionnaire in an evaluation sheet which was given to them at the same time. The evaluation sheet underwent a qualitative analysis. The completed questionnaires were subjected to a descriptive data analysis. Questions with little variation in the chosen response categories or missing values and questions which caused the participants difficulties were revised.

Final adjustments were made as a result of a discussion with two external experts on questionnaire development, producing the final version of the questionnaire (V1.0).

Results

Questionnaire development

Version V0.1 of the questionnaire comprised 25 questions covering all the themes of the working definition. Six of the questions were newly developed by the authors based on the working definition; 19 questions were adapted from original sources. Aside from a knowledge question on the healthy plate model, a 4- or 5-point Likert scale was used as the response categories for self-assessment. The newly developed questions excluded a neutral mid-category to avoid confounding [21]; response categories for questions from other sources were carried over unchanged. The term 'healthy' was systematically used in connection with nutrition (e.g. healthy nutrition) and the term 'balanced' only in relation to a meal.

A face validity check led to a reduction in the number of themes from 12 to 11 and in the number of questions from 25 to 17, as they were considered either redundant or unanswerable. Theme 12 "Ability to understand nutrition and health related topics in the larger societal context" and the corresponding question were regarded as unanswerable due to a high dependence on situational context and was therefore removed. Questionnaire V0.2 comprised six new questions, eight questions from existing German-language instruments on general HL [22–24], which had been adapted to the field of nutrition (no. 1–2, 9–12, 15–16) (◆ Table 2), and three questions (no. 3, 5, 13) originating from an English-language instrument to measure nutrition literacy [25].

Two-stage pre-test

Cognitive pre-test

Four men and nine women (aged 27–67) from different educational backgrounds (eight with higher

education and five with a lower level of education) took part in the cognitive pre-test. As a result of this test, seven questions were adapted in language and content and one question was removed.

The pre-test method of thinking aloud showed that the participants did not understand three of the questions as intended. These questions were therefore supplemented with further information. This was particularly evident in the question on the comprehensibility of information from different sources (◆ Table 2, Question 2). The interviewees differentiated in their responses between the different sources as intended, but equated comprehensibility with quality for some of the named sources, and particularly for the question on the comprehensibility of information from one's personal environment. One participant said: *"That's quite bad, because they often have no idea, as they simply repeat anything they have heard" [original citation: "Das ist ganz schlecht, weil die häufig keine Ahnung haben, da wird einfach irgendwas nachgeschwätzt"]* (Participant no. 9). A note was added to the question, stating that the question referred only to the comprehensibility of the information.

The cognitive pre-test also showed that some terms were associated with another context as intended. The wording was therefore changed in four questions (e.g., participants understood Question 15 in a different temporal context; ◆ Table 2). The wording "How easy is it for you to judge how your eating habits relate to your health?" tended to be associated with the short-term reactions of the body rather than with the long-term effects of nutrition on health, i.e.: *"Depending on what I eat, what happens then in my body […] There are certain things that you eat then it's obvious, e.g. when you have diarrhea" [original citation: "Je nachdem was ich esse, was passiert dann im Körper […] Es gibt gewisse Sachen, die man isst dann ist es offensichtlich, z. B. wenn man Durchfall hat"]* (Participant no. 8). The term "long-term" was added to this question.

The participants felt that the two questions which either addressed the composition or preparation of a balanced meal were indistinct/synonymous. The question "How easy is it for you to prepare a balanced meal?" was thus removed. Some participants also stressed that their abilities were situationally, i.e. dependent on the respective context. Composing a balanced meal would, e.g., be easier if the fridge was full and more difficult if one was invited out or was expecting guests. Several questions were consequently extended to include the words "in general" or "on a normal day", in order to emphasize a general evaluation of abilities.

The technique of probing showed that the participants understood the terms 'healthy' and 'balanced'

	Question wording	Theme
1	When I have questions on healthy nutrition, I know where I can find information on this issue.	1
2	In general, how well do you understand the following types of nutritional information? This is not about the quality of the information but how well you understand it. (A) Nutrition information leaflets (B) Food label information (C) TV or radio program on nutrition (D) Oral recommendations regarding nutrition from professionals (E) Nutrition advice from family members or friends	2
3	How familiar are you with the Swiss Food Pyramid?	3
4	A balanced meal is composed of different foods. [...] Please check the image that best represents the proportion of a balanced meal.	3
5	I know the official Swiss recommendations about fruit and vegetable consumption.	3
6	I know the official Swiss recommendations about salt intake.	3
7	Think about a usual day: how easy or difficult is it for you to compose a balanced meal at home?	4/5
8	And if you are eating out on a usual day, in a restaurant, canteen, etc.: how easy or difficult is it for you to compose a balanced meal?	5
9	In the past, how often were you able to help your family members or a friend if they had questions concerning nutritional issues?	6
10	In the past, when you have had questions concerning nutritional issues, how often did you get information and advice from others (families and friends)?	6
11	There is a lot of information available on healthy nutrition today. How well do you manage to choose the information relevant to you?	7
12	How easy is it for you to judge if media information on nutritional issues can be trusted?	8
13	Commercials often relate foods with health. How easy is it for you to judge if the presented associations are appropriate or not?	8
14	How easy is it for you to evaluate if a specific food is relevant for a healthy diet?	9
15	How easy is it for you to evaluate the longer-term impact of your dietary habits on your health?	10
16	How easy is it for you to advocate a healthy nutrition? (A) In your family (B) In your circle of friends and acquaintances (C) At work (D) In your neighborhood (e.g. residential area, community)	10

Tab. 2: **Final questionnaire (V1.0) on nutrition-specific health literacy (HL)**

when used in connection with nutrition and/or a meal as intended. Most participants associated healthy nutrition with the food pyramid: *"Fruit, vegetables, and salad are important every day. Basically like in the food pyramid. Rich foods are permitted, but don't make up the main share." [Original citation: "Wichtig sind Früchte, Gemüse und Salat jeden Tag. Genussmittel sind erlaubt, machen aber nicht den Hauptteil aus. Eigentlich wie in der Lebensmittelpyramide"]* (Participant no. 11). The participants associated a balanced meal with *"eating a little of everything" [original citation: "ein bisschen von allem essen"]* (Participant no. 1), *"colorful and tasty" [original citation: "bunt und lecker"]* (Participant no. 5) and *"not too many calories and the portions should not be too big" [original citation: "nicht zu viele Kalorien und die Portion sollte auch nicht zu groß sein"]* (Participant no. 3).

Standard pre-test

63 of the 110 students (92% female) completed the questionnaire and evaluation sheet. The entire study questionnaire featured 68 questions, including 16 questions on nutrition-specific HL, and was answered in the expected 60 minutes (minimum 20, maximum 60 minutes). The non-item response rate for the questions on nutrition-specific HL was low at 6.3%; only four people did not answer one of the questions.

The descriptive analysis of the response distribution showed an acceptable variance within the predefined scales. In nine of the 16 questions, the answers were distributed among all the response categories; in five questions, one response category was not selected and in two questions, only three of the five response categories were selected. In general, a positive skewed distribution emerged. Most respondents assigned their responses to the two upper response categories; they rated their own nutrition-specific HL as good or very good, with the exception of the questions on critical assessment of information in the media (◆ Table 2, Question 12) and on commitment to healthy nutrition (Question 16). In Question 12, 38% responded with "fairly difficult". In Question 16, depending on context (A–D), up to 21% of respondents stated that commitment was "very difficult". In Context D, originally described as residential community, 46% selected the "don't know" category. Analysis of the evaluation sheet clarified that the term "residential community" was not fully understood; this was subsequently adjusted (◆ Table 2). The evaluation sheet referred to no other difficulties.

The final expert evaluation of the questionnaire led to no further changes in the wording of the questions, but to adjustments in the response categories for two questions, in order to improve user-friendliness and analyzability. An "I don't know/don't know" category was added to Questions 3 and 4; the "don't know" category was removed from Question 15. The final questionnaire (V1.0) comprised the 16 questions listed in ◆ Table 2.

Discussion

Nutrition-specific health literacy encompasses the skills and knowledge related to maintaining balanced, sustainable, and health promoting nutrition. The present questionnaire aims to ensure these competencies can be comprehensively measured so that their influence on eating behavior can be assessed.

Only a few instruments to measure HL currently exist which allow for the multidimensional nature of the concept and focus on nutrition as the field of application. A major criticism of existing instruments is their lack of theoretical basis and their somewhat poorly founded methodological development [7, 26]. Therefore, the presented questionnaire was established according to a multi-level, iterative process, based on guidelines for instrument development. From the outset, it was particularly important to have a broad working definition built on established concepts in order to embed the basic idea of validity (the instrument must measure what it intends to measure) [26].

The working definition showed that not all aspects of nutrition-specific HL are equally operationalizable. In particular, theme 12 (part of critical HL) "Ability to understand nutrition and health related topics in the larger societal context" proved to be too abstract for the formulation of a concrete question. As experienced by others, measuring critical HL is demanding and the wording of the question and the social context are particularly important for answering the question [27]. Assessing critical HL is therefore an important area for future research, as it is increasingly important to consumers with regard to the sustainable use of diminishing resources.

The cognitive pre-test proved to be the most important element to optimize the comprehensibility of questions among the target population. Difficulties in comprehension and context effects were revealed in seven of the 17 tested questions. Cognitive pre-testing is a key element in order to ensure that the questions are consistently understood in accordance with the intended meaning of the researchers [19]. The subsequent standard pre-test confirmed the improved comprehensibility and also gave an indication as to the use of the response categories. As in measuring general HL [28], a

clear tendency to positively assess one's own abilities was apparent. This observation should be taken into account in the interpretation of the results in the ongoing intervention study [10].

Limitations

The present results must be considered subject to existing limitations which affect question development and the applied pre-test process.
There is still some ambiguity in the definition of the concept of nutrition-specific health literacy. The terms 'nutrition literacy' and 'food literacy' have an ever increasing number of definitions in scientific literature and are not used distinctly. Despite careful research, existing definitions may have been overlooked. The same applies to the literature search for instruments which assess HL. It is probable that other measuring instruments were not published and therefore not identified. The two-stage pre-test was conceived and implemented according to methodological recommendations [20]. We may have selectively recruited persons who were informed and interested in nutrition, particularly for the cognitive pretest. However, the interviews were carried out in an occupational context during working hours and it is probable that a broader range of persons participated.

Outlook

The set of questions build a comprehensible instrument to measure nutrition-specific HL. Further psychometric testing is needed to evaluate the validity of the instrument. The questionnaire is currently used in the named intervention study and being checked for construct validity and for internal consistency. In particular, an explorative factor analysis aims to determine whether the questionnaire captures the three forms of nutrition-specific HL (functional, interact, critical). Only after this check is its use in further studies advisable.

Funding and study registration
This study was conducted in the frame of the project "Environmental and educational intervention in communal catering to lower salt intake in the Swiss working population."
Trial Registration: German Clinical Trials Register, DRKS 0000670 and Swiss National Clinical Trials Portal, SNCTP 000001142
Funding: Swiss National Science Foundation *(Schweizerischer Nationalfonds)* NRP69-145149 and Swiss Heart Foundation *(Schweizerische Herz Stiftung)*

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Conflict of Interest
The authors declare no conflict of interest.

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DOI: 10.4455/eu.2016.046

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Verlag: UMSCHAU ZEITSCHRIFTENVERLAG GmbH
Ein Unternehmen der ACM Unternehmensgruppe

Anschrift: ERNÄHRUNGS UMSCHAU im UMSCHAU ZEITSCHRIFTEN-VERLAG GmbH, Marktplatz 13, 65183 Wiesbaden, PF 5709, 65047 Wiesbaden, Tel.: 0611 58589-0, Fax: 0611 58589-269, E-Mail: kontakt@ernaehrungs-umschau.de (Verlag), eu-redaktion@mpm-online.de (Redaktion)

Herausgeber:
Prof. Dr. Helmut Heseker (hes), Universität Paderborn

Ehrenherausgeber:
Prof. Dr. med. vet. Helmut F. Erbersdobler (he), Christian-Albrechts-Universität zu Kiel

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Anzeigendisposition: Hannelore Kahl, Tel.: 0611 58589-230, Fax: 0611 58589-269

Zurzeit gilt Anzeigenpreisliste Nr. 58 vom 1.1.2016.

Anzeigenschluss am 20. des Vormonats. Für Stellenanzeigen am 27. des Vormonats.

Abo-/Leserservice: Albrecht König, Tel.: 0611 58589-262, Fax: 0611 58589-269, E-Mail: a.koenig@uzv.de

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Druck: Druckerei Chmielorz GmbH, Ostring 13, 65205 Wiesbaden-Nordenstadt

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Erklärung gemäß § 5 des Hessischen Pressegesetzes:
UMSCHAU ZEITSCHRIFTENVERLAG, Wiesbaden

ISSN 0174-0008
UMSCHAU ZEITSCHRIFTEN-VERLAG GmbH, Wiesbaden