

# Reliability and Validity of Nutrition Knowledge Questionnaire for Adults

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## ABSTRACT

**Objective:** To determine the validity and reliability of a nutrition knowledge questionnaire for adults in California.

**Methods:** A convenience sample of adults was recruited for cognitive interviews. A mail-based survey of 400 randomly selected addresses was used to assess internal consistency (Cronbach  $\alpha$ ). Researchers assessed content validity (Student *t* test) and test–retest reliability (Pearson correlation) in a convenience sample of university students who had previously taken a college nutrition course, compared with students who had not.

**Results:** Twenty adults participated in cognitive interviews, 94 adults returned the mailed questionnaire, and 48 university students participated in validity and reliability testing. Cronbach  $\alpha = .91$  and test–retest  $r = 0.95$ , demonstrating internal consistency reliability and test–retest reliability. Students who had taken a college-level nutrition course scored significantly higher compared with students who had not ( $P < .001$ ), demonstrating construct validity.

**Conclusions and Implications:** Findings show that the questionnaire is a valid and reliable nutrition knowledge measure for use in California and may be of use in other places.

**Key Words:** nutrition knowledge, validated instruments, questionnaires (*J Nutr Educ Behav.* 2015;47:69-74.)

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## INTRODUCTION

The high prevalence of overweight and obesity in the US has become one of the most pressing public health concerns in the nation. Over two thirds of adults are overweight or obese, rendering the majority of the adult population at increased risk for a number of chronic diseases.<sup>1</sup> The influences on behaviors that contribute to this issue are multifaceted and complex and range from the personal, such as knowledge or preferences, to environmental or community factors,

to social and cultural norms and values.<sup>2</sup> Improving nutrition knowledge and encouraging behavior change are some of many avenues being explored by researchers. According to Social Cognitive Theory, behavioral capability requires knowledge to perform a behavior.<sup>3</sup> Accordingly, inadequate nutrition knowledge may be a barrier to adopting healthful behaviors and maintaining a healthful weight. Nutrition knowledge consists of declarative knowledge, or knowledge of facts and processes, as well as procedural

knowledge, the knowledge of how to perform a task.<sup>4</sup> Both are needed in making healthful choices. Although not all studies have found a connection between nutrition knowledge and behavior, positive associations have been reported between nutrition knowledge and consumption of fruits and vegetables,<sup>5</sup> more frequent use of nutrition facts labels,<sup>6</sup> increased likelihood of minimizing salt intake, and choosing foods high in fiber.<sup>7</sup> Nutrition knowledge also has been reported to mediate the relationship between socioeconomic status and diet quality.<sup>5,8</sup> The impact of nutrition knowledge can also have effects beyond the individual level; studies have reported that maternal nutrition knowledge is associated with child dietary quality.<sup>9,10</sup> A recent systematic review concluded that overall there is weak correlation between nutrition knowledge and dietary intake.<sup>11</sup> However, studies using more rigorously validated instruments were more likely to have a significant, positive correlation. The authors concluded that studies using well-designed and well-validated

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nutrition knowledge and dietary intake instruments were needed.

Many intervention studies have focused on improving nutrition knowledge to lay a foundation to support healthful behavior change. However, to establish the baseline level of knowledge and measure changes in knowledge, reliable and valid tools are necessary to measure knowledge.<sup>12</sup> Questionnaire validation cannot guarantee that conclusions drawn are correct, but it is important to determine the validity of a questionnaire before its use to make it more likely that the results generated using the questionnaire are relevant. The purpose of the current study was to develop and validate a nutrition knowledge questionnaire for use in the general population of English-literate adults aged  $\geq 18$  years in California, with the potential to be used across the US.

## METHODS

### Preliminary Questionnaire Development

Development of the questionnaire began with a pool of items from previous questionnaires (Figure).<sup>13-16</sup> The majority of questions were obtained from the General Nutrition Knowledge Questionnaire.<sup>13</sup> The authors chose this questionnaire because it measures general nutrition knowledge in adults in several domains. Because this questionnaire was written for use in a United Kingdom (UK) population, questions were modified to be appropriate for an American audience. New questions were written based on the *Dietary Guidelines for Americans, 2005* (DGA)<sup>17</sup> and *MyPyramid*,<sup>18</sup> which were current at the time the questionnaire was developed (2009–2011). The initial pool contained 108 items divided into 4 domains of knowledge: Familiarity with MyPyramid and the DGA, Nutrient Content of Foods, Everyday Food Choices, and Diet and Disease Relationships. The pool of questions

was intended to be much larger than the final number of items to be included in the questionnaire to allow for the removal of questions less useful in measuring nutrition knowledge. A committee consisting of nutrition faculty, postdoctoral scholars, and registered dietitians reviewed the questionnaire for content. Based on their suggestions, questions were eliminated or reworded and new questions were added. The Everyday Food Choices section of the questionnaire was eliminated because the committee determined that adequately describing food items to allow respondents to be able to choose between them required the questions to be too long, whereas using shorter descriptions would render the questions too vague. Before the following phases of development, the University of California–Davis Institutional Review Board approved the study as exempt.

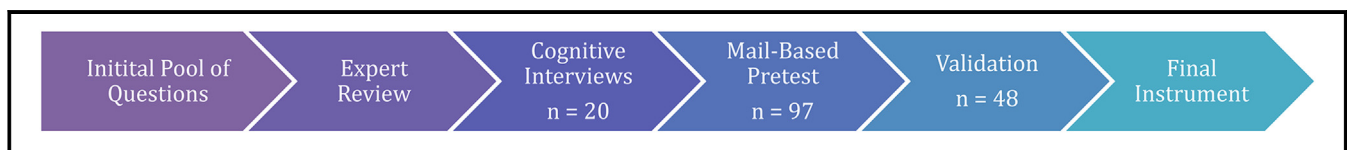
A convenience sample of 20 adults in 5 counties in California (Contra Costa, Fresno, Sacramento, San Diego, and Tulare) was recruited to participate in cognitive interviews. A concurrent think-aloud method was used in the cognitive interviews.<sup>19</sup> Participants were first acclimated to the cognitive interview process with a warm-up question. After this, the interviewer read each question aloud and participants verbalized their thought process as they answered the question. All interviews were recorded and notes were taken during the interviews. Study staff listened to the interviews until interviews no longer yielded new information in the interpretation of questions. Questions were modified as needed to reduce ambiguity.

Analysis of cognitive interview data directed subsequent modifications to the questionnaire. After this, a mail-based pretest was used. Data from the pretest were used to reduce the number of questions before the questionnaire was tested for validity and reliability. A total of 400 addresses

were randomly selected from the US Postal Service Delivery Sequence File for the State of California. The US Postal Service Delivery Sequence File is a database containing all deliverable addresses in the US and covers up to 97% of US households.<sup>20</sup> Following the method of Dillman et al,<sup>21</sup> an advance letter was sent to the sampled addresses, followed by a packet containing the questionnaire and a stamped, return-addressed envelope. A reminder postcard was sent to all addresses 2 weeks later and a second packet was sent to non-respondent addresses 2 weeks after that.

### Validity and Reliability

The researchers used data from the pretest to determine internal consistency reliability of the revised questionnaire before the next phase of testing. A convenience sample of university students was recruited in fall, 2010 and spring, 2011 through fliers and classroom announcements to test the questionnaire for construct validity and test-retest reliability. The questionnaire was administered to participants individually or in groups of 2 or 3. Participants completed the questionnaire twice, with approximately 2 weeks between the first and second administration of the questionnaire, to evaluate the test-retest reliability of the questionnaire. The authors chose the time interval between administration of the questionnaires based on the concept that the length of time should be long enough that respondents did not remember previously chosen answers, but short enough that new knowledge was unlikely to be acquired.<sup>22</sup> Respondents self-reported whether they had previously taken a college-level nutrition class; these data were used to compare knowledge scores for construct validity. Students who had taken at least 1 college-level nutrition class before were expected to have higher nutrition knowledge



**Figure.** Stages of questionnaire development. Revisions took place after each stage.

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