



# Exploratory and confirmatory factor analysis of the Willingness to Eat Whole Grains Questionnaire: A measure of young adults' attitudes toward consuming whole grain foods



Georgianna Tuuri <sup>a,\*</sup>, Melissa Cater <sup>b</sup>, Brittany Craft <sup>c</sup>, Ariana Bailey <sup>c</sup>, Derek Miketinas <sup>c</sup>

<sup>a</sup> School of Nutrition and Food Sciences, Louisiana State University and Louisiana State University Agricultural Center, Baton Rouge, LA 70803, USA

<sup>b</sup> Department of Agricultural and Extension Education & Evaluation, Louisiana State University and Louisiana State University Agricultural Center, Baton Rouge, LA 70803, USA

<sup>c</sup> School of Nutrition and Food Sciences, Louisiana State University, Baton Rouge, LA 70803, USA

## ARTICLE INFO

### Article history:

Received 27 January 2016

Received in revised form

15 June 2016

Accepted 16 June 2016

Available online 18 June 2016

### Keywords:

Attitude toward whole grains

Questionnaire

Factor analysis

Young adults

Whole grains

## ABSTRACT

Whole grains are recommended by dietary guidelines because of their health-promoting properties, yet attitudes toward consuming these foods have not been examined. This study developed and validated a questionnaire to estimate willingness to consume whole grain foods. Focus group interviews with high school students and input from nutrition educators produced a list of 10 whole grain items that were included in the “Willingness to Eat Whole Grains Questionnaire”. Young adult university students 18–29 years of age indicated their willingness to consume each of the whole grain foods using a 4-point, Likert-type scale with responses ranging from “always unwilling” to “always willing” and a fifth option of “never eaten”. Participants’ age, race/ethnicity, and gender were collected. Data were examined using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and test-retest reliability. The EFA test ( $n = 266$ ; 65% female; 69% white) using principal axis factoring returned a single factor that included all survey items and explained 58.3% of the variance. The CFA ( $n = 252$ ; 62% female, 74% white) supported a single-factor solution:  $\chi^2 = 80.57$  (35); RMSEA = 0.07; Comparative Fit Index = 0.92; Tucker-Lewis Index = 0.90; and SRMR = 0.05. The questionnaire, administered on two occasions separated by two weeks to 36 university students, demonstrated good test-retest reliability ( $r = 0.87$ ,  $p < 0.0001$ ). The “Willingness to Eat Whole Grains Questionnaire” had good face validity when used with a young adult population and will be a useful tool to help nutrition educators examine attitudes toward consuming nutrient-rich whole grain foods.

© 2016 Elsevier Ltd. All rights reserved.

## 1. Introduction

Dietary guidelines encourage the consumption of health-promoting whole grains, yet little is known about personal attitude toward eating these foods (U.S. Department of Health and Human Services [HHS] & U.S. Department of Agriculture [USDA], 2015; World Health Organization, 2004). Individuals who

consume more whole grain foods have less risk for type 2 diabetes mellitus, obesity and cardiovascular disease. The 2015–2020 U. S. Dietary Guidelines recommend that half of all grain products consumed be whole grains (Flint et al., 2009; HHS & USDA, 2015; Jacobs, Meyer, Kushi, & Folsom, 1999; Koh-Banerjee et al., 2004; Liu et al., 1999; McKeown et al., 2009; Montonen, Knekt, Järvinen, Aromaa, & Reunanen, 2003; Schulze et al., 2007; van de Vijver, van den Bosch, van den Brandt, & Goldbohm, 2009; Wang et al., 2007). Despite these recommendations, most individuals consume far fewer than the suggested number of whole grain servings daily (Larson, Neumark-Sztainer, Story, & Burgess-Champoux, 2010; O’Neil, Nicklas, Zhanovet, & Cho, 2010; Reicks, Jonnalagadda, Albertson, & Joshi, 2014). Food intake data from the 2009–2010 U.S. National Health and Nutrition Examination Survey indicated that

\* Corresponding author. School of Nutrition and Food Sciences, 255 Knapp Hall, Louisiana State University and Louisiana State University Agricultural Center, Baton Rouge, LA 70803, USA.

E-mail address: [gtuuri@agcenter.lsu.edu](mailto:gtuuri@agcenter.lsu.edu) (G. Tuuri).

only 2.9% of children and adolescents and 7.7% of adults consumed at least three whole grain ounce equivalents per day (Reicks et al., 2014).

Personal attitude influences food choices and is hypothesized to be a preliminary factor that predicts consuming a healthier diet (Aggarwal, Monsivais, Cook, & Drewnowski, 2014; Azjen, 1991; Kearney et al., 2001; Prochaska & Velicer, 1997; Saba & DiNatale, 1998). Attitude partially mediates the relationship between education level and dietary intake of items promoted by dietary guidelines such as fruits and vegetables, seafood and whole grains (Le et al., 2013). It also predicts shoppers' diet quality persistently at every grocery store price point (Aggarwal et al., 2014).

A thorough review of the literature revealed existing questionnaires that probe knowledge of whole grains, usual whole grain food choices, whole grain food choice self-efficacy, liking of whole grain foods, and dietary intake (Bruening et al., 2012; Burgess-Champoux, Chan, Rosen, Marquart, & Reicks, 2008; Burgess-Champoux, Marquart, Vickers, & Reicks, 2006; Siega-Riz et al., 2011). Each of these questionnaires contributed to the literature by examining specific attitudes toward consuming healthy diets (e.g., self-efficacy), yet no instrument existed that allowed the exploration of willingness to consume whole grain foods. Willingness is a foundational concept of change and may also be defined as inclined or ready to do something (Prochaska & Velicer, 1997). Having a valid and reliable instrument capable of estimating willingness to consume whole grain foods will allow nutrition educators to target participants who are the most willing to change and to document movement toward change as a result of participating in nutrition intervention programs. The purpose of this study was to develop and establish the psychometric properties of a questionnaire to estimate willingness to consume whole grain foods.

## 2. Methods

### 2.1. Participants

The target population for this study was young adults and youth in late adolescence. The accessible population included public university and high school students. In order to generate survey items, a convenience sample of high school students enrolled in a summer 4-H camp participated in focus group interviews. The survey was then distributed to young adult university students 18–29 years of age. Parent consent and child assent were obtained from the camp participants, and university students provided written consent prior to participating. Females who were pregnant and individuals who did not meet the age requirement were excluded from taking the survey. The study was approved by the Louisiana State University Agricultural Center Institutional Review Board.

### 2.2. Survey development

When willingness to consume a variety of more- and less-healthy foods was investigated by our research group using exploratory factor analysis, whole grain items were found to robustly cluster together into a single factor (unpublished data). In order to target attitude toward eating these foods recommended by dietary guidelines (World Health Organization, 2004; U.S. Department of Health and Human Services [HHS] & U.S. Department of Agriculture [USDA], 2015) and increase the explained variance, a survey containing only whole grain items was developed. A list of commonly consumed whole grain foods was

gathered from focus group interviews with high school students and input from nutrition educators. The list of whole grain foods generated through the focus group process was compared with the 23 whole grain items provided as part of the Choose My Plate campaign (U.S. Department of Agriculture [USDA], 2015). Since the purpose of this study was to develop a questionnaire that represented the scope of whole grain foods available while reducing the cognitive burden of responding to an exhaustive list of items, researchers used input from both the focus group interviews and nutrition educators to select the final list of whole grain items. The final questionnaire contained the following items: whole wheat roll, whole grain/brown rice, whole grain breakfast cereal, whole wheat toast, whole grain granola bar, whole wheat pasta, whole grain tortilla, whole wheat hamburger bun, multi-grain crackers, and whole wheat bagel. Willingness to consume each item was evaluated using a 4-point Likert-type scale with responses ranging from “always unwilling” to “always willing,” and a 5th option of “never eaten” (Likert, 1932). The final survey instrument was administered using a standard protocol to young adult college students in a variety of undergraduate university classes (see Appendix A).

### 2.3. Data analysis

Demographic information, including participant age, race/ethnicity, and gender, were collected and analyzed using descriptive statistics. Data were analyzed using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), internal consistency reliability and test-retest reliability. Principal axis factoring with promax rotation was selected for the exploratory portion of this study. Principal axis factoring is appropriate in studies seeking latent constructs (Tabachnick & Fidell, 2007). While the intent of this study was to develop a unidimensional scale, appropriate *a priori* decisions had to be made in the event that two or more constructs emerged. Promax rotation was selected to allow for correlated factors since all of the items probed willingness to eat whole grain foods, and the researchers believed that potential sub-constructs should be correlated. Both factor-loading accuracy and stability in EFA are influenced by sample size. Observation-to-item ratio and communalities were used as conventional and data-driven methods of determining if the sample was large enough to reduce sampling error and to reliably estimate correlations. Conventional wisdom suggested a 20-to-1 observation-to-item ratio while data-driven methods suggested a need for communalities at least in the range of 0.5 (Hair, Black, Babin, & Anderson, 2009; MacCullum, Widaman, Zhang, & Hong, 1999). Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy were used to determine if there was enough correlation among items to warrant factor analysis. A significant *p*-value for Bartlett's test of sphericity is an indication that sufficient correlation exists among items; however, it is highly sensitive to large sample sizes (Tabachnick & Fidell, 2007). Thus, the KMO measure of sampling adequacy was also used with values greater than 0.6 deemed sufficient (Tabachnick & Fidell, 2007). Multicollinearity among items was assessed by inspecting the correlation matrix for values exceeding 0.9 and by establishing that the determinant exceeded zero (Field, 2009). An extracted eigenvalue cut off of 1.0 was used to determine the number of factors (Hair et al., 2009).

For the confirmatory factor analysis, univariate outliers were identified by examining *z*-scores for each construct; scores greater than 3.29 (two-tailed;  $p < 0.001$ ) were considered outliers.

Download English Version:

<https://daneshyari.com/en/article/7307136>

Download Persian Version:

<https://daneshyari.com/article/7307136>

[Daneshyari.com](https://daneshyari.com)