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Instrument to Measure Health Literacy About Complementary and Alternative Medicine

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Abstract

Background and Purpose—Health literacy is an essential skill for today’s health care consumers. The growth in use of complementary and alternative medicine (CAM) adds to the complexity of being sufficiently health literate. The purpose of this article is to describe the initial psychometric evaluation of the “Montana State University (MSU) CAM Health Literacy Scale,” a newly developed instrument to measure an individual’s health literacy about CAM.

Methods—Exploratory factor analyses, reliabilities, and conceptual considerations were used.

Results—The outcome is a 21-item instrument with Cronbach’s alpha of .753 and 42.27% explained variance. Convergent validity assessments revealed weak but significant correlations between the scale and measures of general health literacy.

Conclusions—The MSU CAM Health Literacy Scale has promise for use in future research and clinical endeavors.

Keywords

health literacy; complementary and alternative medicine; instrument evaluation; psychometric evaluation; CAM health literacy

Health literacy is defined as “the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Centers for Disease Control and Prevention, 2013). Health literacy is both an essential and complex skill that improves consumers’ ability to take an active role in decision making about their personal health care. The growth in the use of complementary and alternative medicine (CAM) among American consumers and the widespread availability of CAM has added to the complexity of being sufficiently health literate.

The purpose of this article is to describe the initial psychometric evaluation of the “Montana State University (MSU) CAM Health Literacy Scale,” a newly developed instrument to measure an individual’s health literacy about CAM. The need for the instrument, conceptual considerations, and instrument development process are briefly described. Next, the preliminary procedures to evaluate scale items, the factor structure, and the validity of the

instrument are described. Finally, the instrument is provided for use by others in research and clinical applications.

Through a series of studies on the use of CAM among older adults living in sparsely populated rural areas in the western United States, the authors found considerable CAM use particularly among those with chronic health conditions. Participants in these studies primarily used self-prescribed CAM and often had limited health literacy about the CAM therapies they used (Nichols, Sullivan, Ide, Shreffler-Grant, & Weinert, 2005; Shreffler-Grant, Hill, Weinert, Nichols, & Ide, 2007; Shreffler-Grant, Nichols, Weinert, & Ide, 2013a; Shreffler-Grant, Weinert, Nichols, & Ide, 2005). Concerns about research participants' health literacy arose in part because of their reliance on informal information sources about CAM. These sources included word of mouth information from relatives or friends, consumer marketing, or reading. They often did not tell their regular allopathic providers about their CAM use because of a perception that the providers were too busy to discuss CAM. Some participants attempted to use reputable sources of information, but it was clear that some used CAM products in an inconsistent manner and did not understand what the products did.

The need for education to improve CAM health literacy in this population became evident and an appropriate instrument to determine the effectiveness of an educational intervention was sought. The investigators found, however, that the available health literacy instruments measured consumers' reading and numeracy skills, not the broader range of knowledge and cognitive skills that are needed to act on health information and make informed self-management decisions in today's health care environment. The currently available instruments also did not assess health literacy demands on consumers within different health contexts such as CAM. Accordingly, the team developed and conducted a preliminary evaluation of an instrument specific to health literacy about CAM, the MSU CAM Health Literacy Scale.

CONCEPTUAL CONSIDERATIONS

The research team developed a conceptual model of CAM health literacy to guide the development of a measure of CAM health literacy (Shreffler-Grant, Nichols, Weinert, & Ide, 2013b). The model was constructed through a lengthy iterative process of deriving constructs, concepts, and empirical indicators from the literature and the research team's prior work, review and critique by experts, and extensive revision. The research team operationally defined CAM health literacy as the information about CAM needed to make informed self-management decisions regarding health. The desired outcome of CAM health literacy is informed self-management of health. The team theorized that consumers with higher levels of CAM health literacy are more informed self-managers of their health.

Because of the diversity of CAM practices and the need to limit the scope of knowledge to be assessed in an instrument, a decision was made early on to focus on biologically based practices and products. Biologically based CAM practices involve the use of substances found in nature, such as herbal products, dietary supplements, and vitamins. Accordingly,

the team developed the model and subsequent instrument that was focused on herbal products—some of the most commonly used CAM practices among the general public.

INSTRUMENT DEVELOPMENT PROCESS

The method used to guide instrument development and evaluation was the well-established scale development process of Robert DeVellis (2012). The initial step was to clearly determine what was to be measured, and this was accomplished by developing the conceptual model that was used as a guide. Next, the team developed multiple items for the instrument that fit with each of the empirical indicators in the conceptual model. A 4-point Likert response option with equally weighted items was chosen as the measurement format. The draft instrument was reviewed and critiqued by experts and focus groups to assist in evaluating content validity. Following this review, the draft instrument was administered by telephone interview to a sample of 600 randomly selected older adults.

EVALUATION OF ITEMS

The evaluation of the scale items was accomplished using data from 600 adult participants drawn randomly from a sampling frame of older adults (55 years and older) living in rural counties located in seven states: Idaho, Montana, North Dakota, Oregon, South Dakota, Washington, and Wyoming. In this study, rural counties were defined as those with populations of less than 100,000 people. Half the participants were drawn randomly from counties with populations of less than 100,000 to greater than 50,000 and the remaining half from counties with populations of 50,000 and less. Demographic information about the 600 participants is summarized in Table 1. Slightly more than half the participants were women. The participants averaged 68 years of age, most were currently married or partnered, and most were fairly well-educated. Most reported having used CAM in the past, and half indicated that they had one or more significant acute or chronic health problems.

The data were thoroughly checked, cleaned, and recoded as appropriate, and a series of analyses using IBM SPSS Version 21 was conducted. All of the analytic procedures described in the following text and the primary decisions to keep scale items were based on data from a random selection of half of the data set ($n = 300$). The analysis and decisions were subsequently validated by comparing the first half results with results from the second half and from the total data set ($N = 600$). Participants in the first and second halves of the data set were very similar in terms of demographics, use of CAM, and presence of a significant health problem (see Table 1). The mean score on the MSU CAM Health Literacy Scale achieved by the first half of the participants was 52.5 (range 30–68), which was slightly lower than 61.6 (range 25–82), the mean score for the second half. The mean score for all 600 participants in the total data set was 61.1 (range 25–82).

Psychometric evaluation focused on internal consistency reliability (Cronbach's alpha and item–total correlations) and dimensionality (exploratory factor analysis) to assess the contribution and performance of each item and to reduce the total number of scale items to a reasonable number. The version of the instrument administered to the 600 adult participants consisted of 54 items, which was intentionally longer than the anticipated final instrument.

Exploratory factor analysis procedures were implemented using principal components analysis with direct Oblimin rotation. Scree plots and parallel analysis (O'Connor, 2000; Patil, Singh, Mishra, & Donovan, 2007) were used to determine that three factors or components would be the most efficient model. Cronbach's alpha of the items in each component was examined as well as each item's contribution to alpha. To select the most appropriate items and to shorten the instrument, items with less than .3 factor loadings were deleted as well as others that were duplicates or had limited or negative contributions to alpha. Factor loadings on the three principal components are displayed in Table 2. The final 21-item instrument had a Cronbach's alpha of .753, and 42.27% explained variance in an analysis that included the first half of the data set ($n = 300$). Cronbach's alpha for the second half of the data set ($n = 300$) was .794, and alpha for the total data set ($N = 600$) was .778.

STRUCTURE OF INSTRUMENT

Reliabilities of each of the principal components yielded the following: Component 1 with seven items had an alpha of .697, Component 2 with six items had an alpha .527, and Component 3 with eight items had an alpha of .615. In the early conceptualization of CAM health literacy, the research team anticipated that scale items would cluster around dose, effect, safety, and availability—the primary concepts in the conceptual model. The primary concepts loaded across all three principal components but did not cluster as was conceptually anticipated. Items clustering on principal Component 1 primarily had to do with the concepts of safety and information; items clustering on principal Component 2 were a mixture of several concepts including effect, safety, and dose; and items clustered on principal Component 3 had to do with availability and quality. At this point in the development of this instrument, the individual principal components are not sufficiently clear to be considered subscales.

CONVERGENT VALIDITY ASSESSMENT

The research team conducted preliminary assessments of convergent validity by comparing scores on the MSU CAM Health Literacy Scale with scores on general health literacy measures. During the initial data collection ($N = 600$), a standard single question health literacy measure was included. The health literacy question, "How confident are you filling out medical forms by yourself?" has five response options ranging from *extremely confident* to *not confident at all*. This question has been found to have validity when screening for low levels of health literacy (Chew, Bradley, & Boyko, 2004). Although the MSU CAM Health Literacy Scale Score was not strongly correlated with this health literacy measure, the correlation was statistically significant ($r = .117$, $p = .05$).

To further assess convergent validity of the 21-item MSU CAM Health Literacy Scale, a convenience sample of community-dwelling older adults ($N = 110$) was recruited from two towns in Montana. Participants in this validity assessment averaged 68 years of age, 66% were women, 75% had more than a high school education, and 51% were married. Most (82%) said they had used CAM in the past, and 49.5% indicated that they had one or more significant acute or chronic health problems. Each participant completed a paper and pencil instrument packet, which included the 21-item MSU CAM Health Literacy Scale, the

Newest Vital Sign, the single-question health literacy measure described earlier, and a short list of demographic questions. The Newest Vital Sign is a six-item measure of general health literacy (Osborn et al., 2007). It was developed as a quick screening measure of health literacy, and the English language version has a reported Cronbach's alpha of >0.76 (Weiss et al., 2005). Face-to-face rather than telephone administration was necessary because the Newest Vital Sign was designed to be administered in person.

To conduct the convergent validity assessment, scores on the MSU CAM Health Literacy Scale were compared to scores on the Newest Vital Sign and the single-question health literacy measure. The correlation between scores on the MSU CAM Health Literacy Scale and the Newest Vital Sign was $r = .221$ ($p = .002$) and between the MSU CAM Health Literacy Scale and the single-question health literacy measure was $r = .284$ ($p = .003$). The possible range of scores on the MSU CAM Health Literacy Scale is 21–84. The validation assessment participants were fairly health literate as the mean actual score on the newly developed scale was 68.65 with a range of 53–81. The possible range of total scores on the Newest Vital Sign is 1–6, and the mean actual score was 4.76. On the single-question health literacy measure, 82% indicated that they were either extremely or quite confident filling out medical forms by themselves. In this validation assessment sample, the MSU CAM Health Literacy Scale responses had a Cronbach's alpha of .731, and the Newest Vital Sign, an alpha of .623.

DESCRIPTION OF CURRENT INSTRUMENT

The current MSU CAM Health Literacy Scale consists of 21 items. As noted earlier, the items in the instrument are focused on herbal products—a CAM therapy that is likely to be familiar to most consumers. A person's basic knowledge about the conceptual components of CAM Health Literacy, dose, effect, safety, and availability can be evaluated with the instrument. The full instrument is provided in the Appendix. The authors encourage investigators and clinicians to use the instrument for assessing CAM health literacy and provide feedback for use in the continuing development of the instrument. They request that no changes be made to the items in the scale when using the instrument.

Participants are instructed to place an *X* in the space provided in response to each statement based on their knowledge or understanding of the item's content. The four response options are the following: *Agree Strongly*, *Agree Somewhat*, *Disagree Somewhat*, and *Disagree Strongly*. The scoring of the MSU CAM Health Literacy Scale involves assigning a value of 1–4 for each response. For scale items Q.2, 3, 5, 11, 15, 16, 18, 19, 20, and 21, the best response is *Agree Strongly* and least correct response is *Disagree Strongly*, thus the coding of responses for these items is the following: 4 for *Agree Strongly*, 3 for *Agree Somewhat*, 2 for *Disagree Somewhat*, and 1 for *Disagree Strongly*. For scale items Q.1, 4, 6, 7, 8, 9, 10, 12, 13, 14, and 17, the best response is *Disagree Strongly* and the least correct response is *Agree Strongly*, thus the coding of responses for these items is the following: 1 for *Agree Strongly*, 2 for *Agree Somewhat*, 3 for *Disagree Somewhat*, and 4 for *Disagree Strongly*. Skipped or missing responses are assigned a value of 1. The total score is obtained by summing the values of the 21 items, with a possible range of 21–84. Higher scores indicate a greater level of CAM health literacy.

DISCUSSION

Based on the preliminary psychometric evaluation process described earlier, the research team now has a first generation knowledge-based instrument, the MSU CAM Health Literacy Scale, for use in measuring health literacy in a CAM context. Exploratory factor analyses, reliabilities, as well as conceptual considerations were used to determine which items to retain or delete. Assessments of convergent validity revealed weak but statistically significant positive correlations between the MSU CAM Health Literacy Scale and measures of general health literacy.

Concepts considered to be components of CAM health literacy in the team's original conceptual work are included in the 21-item instrument. The scale items, however, did not cluster on the principal components as expected. The items designed to measure dose, effect, safety, and availability were spread across all three principal components. The psychometric properties of the scale were found to be encouraging, but the individual principal components were not strong enough to be considered subscales.

Several limitations concerning the MSU CAM Health Literacy Scale deserve mention. The most significant concern is that the validity of the scale cannot be adequately evaluated, and for this reason, caution should be used in the interpretation of the results reported in this article. The MSU CAM Health Literacy Scale was designed to measure a construct that has not been measured to date; thus, there is no gold standard to use as a comparison for assessing validity. Although the validity assessment results reported earlier indicated that correlations between the scale and measures of general health literacy were statistically significant, the correlations in all cases were weak. It is possible that general health literacy instruments measure related but somewhat different constructs than the MSU CAM Health Literacy Scale. The general health literacy instruments available for use as a comparison are themselves limited in scope to the assessment of basic reading comprehension and numeracy skills (Institute of Medicine, 2004). As mentioned earlier in this article, health literacy involves the capacity to obtain, process, and understand basic health information needed to make appropriate health decisions. This capacity requires more complex knowledge and skills than basic reading and math.

The instrument was developed with older rural adults in mind; thus, its relevance for other population subgroups is unknown. The instrument is focused on biologically based CAM practices and products and would require further development to adapt it for use in assessing health literacy concerning other types of CAM. In addition, the instrument was developed and evaluated using several modes of administration such as telephone and self-administered paper/pencil format. No attempt, however, was made to compare or test these different methods to determine which is more appropriate.

IMPLICATIONS

Based on the preliminary psychometric evaluation described in this article, the MSU CAM Health Literacy Scale is a promising measure for use in future research and clinical endeavors. In contrast to the prevailing measures of general health literacy, this new

instrument can be used to evaluate health literacy in the context of self-administered or self-prescribed CAM such as herbal products. Today's health care consumers use CAM in abundance, particularly consumers with chronic health conditions. When they make decisions about allopathic care, consumers often have a health care providers' advice to guide their decisions, whereas CAM products and practices such as herbal products are often self-prescribed and used based on the recommendations of family, friends, or media advertisements (Institute of Medicine, 2005).

The current MSU CAM Health Literacy Scale was initially designed for research purposes to evaluate the effectiveness of an intervention to enhance CAM health literacy. Nurse investigators may find that the scale is useful in other studies in which knowledge about safe use of CAM products or knowledge that supports effective self-care and self-management practices are relevant. The scale may also have important practice applications if used as a screening tool for populations at risk for limitations in health literacy about CAM. Assessing clients' CAM health literacy can provide critical information for nurses and other health care clinicians who provide and plan care for individuals most likely to use CAM. If the assessment reveals a limited understanding of concepts central to CAM health literacy (dose, effect, safety, availability), appropriate education can be provided to promote informed use of CAM. Informed use of CAM can help support well-reasoned decision making regarding self-care and help avoid harm for individuals considering the use of CAM for health promotion or treatment of health problems.

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Appendix

MSU CAM Health Literacy Scale ©

Below is a list of statements about herbal products. Please place an **X** under **AGREE STRONGLY**, **AGREE SOMEWHAT**, **DISAGREE SOMEWHAT**, or **DISAGREE STRONGLY** for each statement.

		Agree Strongly	Agree Somewhat	Disagree Somewhat	Disagree Strongly
Q1	The federal government sets standards for the quality of herbal products.				
Q2	Herbal products come in a variety of forms, for example, liquid, lotion, pills.				

		Agree Strongly	Agree Somewhat	Disagree Somewhat	Disagree Strongly
Q3	Herbal products are readily available in a variety of stores.				
Q4	There is enough information on the herbal product label to make a well-informed choice about using it.				
Q5	Herbal products sold in the USA may be made in foreign countries.				
Q6	It does not matter how often an herbal product is taken.				
Q7	There is no need to inform a health care provider about taking herbal products.				
Q8	Herbal products do not have side effects.				
Q9	The law requires that the label on the herbal product contain information about what the product is supposed to do.				
Q10	If a famous person recommends an herbal product, it must work.				
Q11	The USP Verified mark means that there has been quality control in the manufacture of the herbal product.				
Q12	The words “organic” and “natural” mean the same thing.				
Q13	If an herbal product is helpful for a friend or family member it will help me.				
Q14	Herbal products can prevent most health problems.				
Q15	The way herbal products work in the body is often not known.				
Q16	It is important to know the correct amount of an herbal product to be used.				
Q17	There is plenty of good information about the quality of herbal products.				

		Agree Strongly	Agree Somewhat	Disagree Somewhat	Disagree Strongly
Q18	Many herbal products can be purchased over the Internet.				
Q19	There are few research studies showing that herbal products work.				
Q20	There is little research about the safety of herbal products.				
Q21	It is important to keep track of what happens after starting to take an herbal product.				

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TABLE 1

Demographic Information for Adult Respondent Sample Used to Evaluate Montana State University
Complementary and Alternative Medicine (CAM) Health Literacy Scale Items

Demographic Category	Total Sample (<i>N</i> = 600)	First Half of Total Sample (<i>n</i> = 300)	Second Half of Total Sample (<i>n</i> = 300)
Gender	55.8% women	52.8% women	58.8% women
Age	68.23 mean years (range 55–97 years)	68.38 mean years (range 55–94 years)	68.08 mean years (range 55–97 years)
Marital status	55.2% currently married or partnered	55.8% currently married or partnered	54.5% currently married or partnered
Education	52% >high school	49.5% >high school	54.4% >high school
Used CAM in the past	58% = yes	55.4% = yes	60.7% = yes
Significant health problem	52.4% = yes	54.1% = yes	50.7% = yes

TABLE 2

Principal Component Analysis Factor Structure and Loadings for Montana State University Complementary and Alternative Medicine Health Literacy Scale

Items	Component 1	Component 2	Component 3
There is plenty of good information about the quality of herbal products.	.714	—	—
There are few research studies showing that herbal products work.	.685	—	—
There is little research about the safety of herbal products.	.611	—	—
There is enough information on the herbal product label to make a well-informed choice about using it.	.589	—	—
The federal government sets standards for the quality of herbal products.	.509	—	—
The way herbal products work in the body is often not known.	.493	—	—
The law requires that the label on the herbal product contains information about what the product is supposed to do.	.405	—	—
If a famous person recommends an herbal product, it must work.	—	-.675	—
If an herbal product is helpful for a friend or family member, it will help me.	—	-.660	—
Herbal products can prevent most health problems.	—	-.646	—
There is no need to inform a health care provider about taking herbal products.	—	-.629	—
Herbal products do not have side effects.	—	-.617	—
It does not matter how often an herbal product is taken.	—	.368	—
Herbal products come in a variety of forms, for example, liquid, lotion, pills.	—	—	.651
Many herbal products can be purchased over the Internet.	—	—	.609
Herbal products are readily available in a variety of stores.	—	—	.522
Herbal products sold in the USA may be made in foreign countries.	—	—	.481
It is important to keep track of what happens after starting to take an herbal product.	—	—	.468
It is important to know the correct amount of an herbal product to be used.	—	—	.438
The words “organic” and “natural” mean the same thing.	—	—	.433
The USP Verified mark means that there has been quality control in the manufacture of the herbal product.	—	—	.415