Research Article

Development and Validation of the Guide for Effective Nutrition Interventions and Education (GENIE): A Tool for Assessing the Quality of Proposed Nutrition Education Programs

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ABSTRACT

Objective: To develop and validate the Guide for Effective Nutrition Interventions and Education (GENIE), a checklist of research-based quality indicators for nutrition education programs.

Design: A prospective test of criterion validity and inter-rater reliability of a new tool comparing expert assessments and trained reviewer GENIE scores of the same nutrition education proposals.

Participants: Ten nutrition education experts; 13 volunteer reviewers.

Variables Measured: GENIE's face, content, and criterion validity and inter-rater reliability compared using expert assessments and reviewer objective and subjective scores.

Analysis: Reviewer scores compared using Spearman correlation. Inter-rater reliability tested using intra-class correlation (ICC), Cronbach alpha, and ANOVA. Criterion validity tested using independent *t* test and point bi-serial correlation to compare reviewer with expert scores.

Results: Correlation found between total objective and total subjective scores. Agreement found between reviewers across proposals and categories considering subjective scores ($F = 7.21$, $P < .001$; ICC = 0.76 [confidence interval, 0.53–0.92]) and objective scores ($F = 7.88$, $P < .001$; ICC = 0.82 [confidence interval, 0.63–0.94]). Relationship was not significant ($r = .564$, $P = .06$) between expert and reviewer proposal scoring groups (high, medium, and low).

Conclusions and Implications: Results support the validity and reliability of GENIE as a tool for nutrition education practitioners, researchers, and program funding agencies to accurately assess the quality of a variety of nutrition program plans.

Key Words: nutrition education, program evaluation, behavior change, health outcomes, education models (*J Nutr Educ Behav*. 2015;47:308-316.)

Accepted March 8, 2015. Published online April 27, 2015.

INTRODUCTION

Nutrition education is a recognized method for improving dietary knowledge and behaviors.[1,2] Sims defined nutrition education as "any set of learning experiences designed to facilitate the voluntary adoption of eating and other nutrition-related behaviors conducive to health and well-being."[3] Although some practitioners consider nutrition education and nutrition counseling to be equivalent, the Academy of Nutrition and Dietetics' Nutrition Care Process Terminology for Registered Dietitian Nutritionists (RDNs), defines nutrition education as a domain separate from nutrition counseling.[4] Because nutrition counseling is frequently used with nutrition education, the 2 are considered together here.

Reviews of dietary change interventions have found that in addition to behavior change, nutrition education can improve physiological outcomes such as weight,[2,5] blood glucose control,[6] incidence of coronary heart disease,[7] and cholesterol concentration.[8] However, not all nutrition education programs achieve their goals. A recent review of interventions

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Conflict of Interest Disclosure: The authors' conflict of interest disclosures can be found online with this article on www.jneb.org.

A reviewer for this project (Karen Chapman-Novakofski) served on the JNEB staff as Editor-in-Chief. Review of this article was handled, exclusively, by an Associate Editor to minimize conflict of interest.

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http://dx.doi.org/10.1016/j.jneb.2015.03.003

intended to improve adherence to dietary advice found that many of the programs reviewed were of poor quality and showed variable success and limited sustained effects.[9] Eating behaviors are complex and are influenced by a multitude of internal and external variables.[10] For nutrition education interventions to achieve successful outcomes, effective nutrition education strategies must be identified and included by program planners[11]; however, these were not concisely identified in the past.

Nutrition education research is an active field focused on identifying effective methods for communicating science-based findings that result in improved behavior.[3,12] Although a number of researchers have attempted to identify what elements, such as motivational strategies, goal setting, and social support, lead to effective nutrition education,[12-17] these findings can be difficult for practitioners to synthesize and translate into programs with the potential for successful outcomes. Research findings need to be disseminated in a way that is simple and practical for both a scientific audience and those with less experience synthesizing and translating literature into practice. This translation gap led to the creation of the Guide for Effective Nutrition Interventions and Education (GENIE). The Guide for Effective Nutrition Interventions and Education is a checklist of research-based quality indicators for nutrition education programs. It was created with a dual purpose: (1) to help nutrition education program planners design, self-assess, and improve programs; and (2) to help funders differentiate between programs of varying quality and drive funding decisions. This article describes the development and validation of GENIE.

METHODS

Development of GENIE

An iterative process including a review of the nutrition literature was used to generate the draft of GENIE that was used as the starting point for validation in September, 2012. Three project staff with expertise in research and education performed searches within the National Institutes of Health PubMed database to identify literature that tied program elements to improved outcomes; in addition, seminal articles known to the authors were reviewed, and references cited in articles from both sources were reviewed.[1,10,13-24] Initially, GENIE was formatted as a checklist divided into 10 general categories; each category was made up of a varying number of related quality criteria. These quality criteria were extracted from the positive program elements that were identified from the literature.

This same checklist format was maintained for the final tool, although only 9 categories remained after the expert panel convened (Supplementary Material). Definitions elaborating on each quality criterion were provided in the checklist to ensure users understood the tool. Two possible scoring systems for the tool were conceived and tested for accuracy: (1) a simple objective system in which users would mark each of the quality criteria as either present or absent; and (2) a subjective system in which users would also rate each category with a value of 0 (absent), 1 (weak), 2 (moderate), or 3 (strong), informed by their objective scores but not specifically based on the number of fulfilled criteria within each category. This project was deemed not to be human subjects research by the Case Western Reserve University Institutional Review Board.

The validation process of GENIE was then completed in 2 parts in May and June, 2013. Part 1 centered on establishing the checklist's face and content validity, using an expert panel of 10 thought leaders in nutrition education and representing a wide variety of practice settings including food banks, state public health agencies, Veterans Affairs, obesity prevention initiatives, health marketing and behavior, nutrition education research, and federal health initiatives and programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children, Expanded Food and Nutrition Education Program, the Supplemental Nutrition Assistance Program and the President's Council on Physical Fitness. For part 2, 13 RDNs from the Academy's Dietetics Practice Based Research Network (DPBRN) representing a diverse group of experience and expertise in nutrition education were recruited to establish criterion and inter-rater reliability of the tool (Figure).

Part 1: Face and Content Validity

Project staff obtained nutrition education program proposals for evaluating

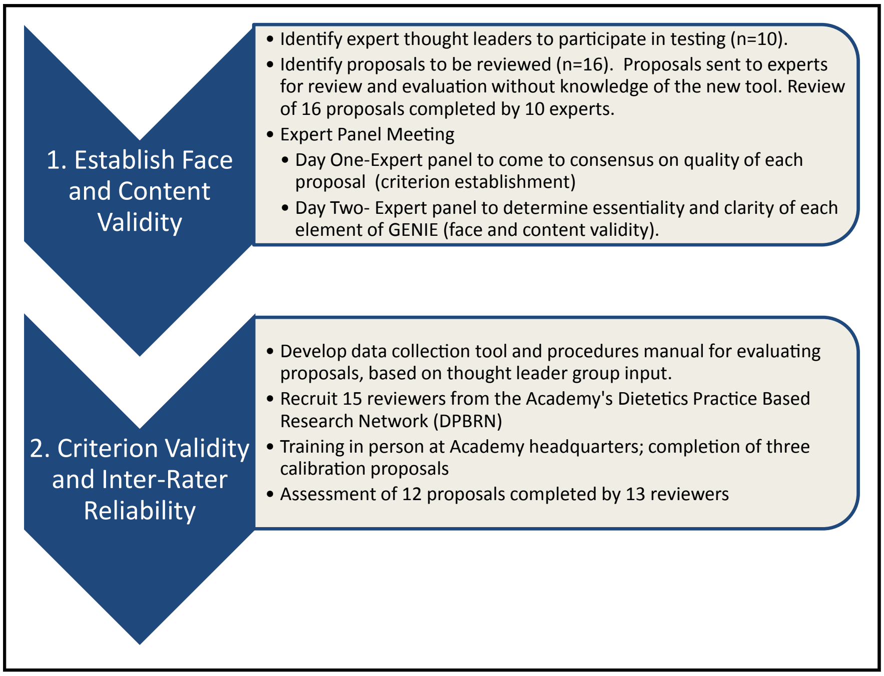

Figure. Steps in developing and assessing the Guide for Effective Nutrition Interventions and Education (GENIE) using expert panelist and volunteer reviewer participation.

GENIE from federal and nonprofit granting agencies or directly from the proposal authors by personally contacting these organizations and individuals. Individual proposal authors were identified by performing a PubMed search to locate recently published nutrition education programs. Corresponding authors were asked to provide their program proposal for the published research or another program for use in this study. Program proposals are written plans for nutrition education activities that are submitted to grantors to solicit funding support. Most proposals describe why a particular approach was planned and provide evidence about its effectiveness in the past or in other situations. A total of 50 requests yielded 32 proposals, 16 of which were chosen for the validation process. These proposals were purposefully selected to represent a range of ages from preschoolers to elderly, a variety of races, and settings that included schools, clinics, food banks, farmers' markets, and others. Selected proposals also included diverse educational strategies aimed at achieving educational, behavioral, and physiological outcomes. The proposals were made anonymous to remove any identifying information such as names, institutions, locations, and financial reports. Proposals were kept in their original format to reflect the diversity of styles found in practice.

Potential expert panelists were selected from the investigators' contacts. Panelists were not restricted to RDNs, although 9 of 10 experts who agreed to participate were RDNs. Panelists were chosen to represent a balance of expertise in areas of nutrition education including research/theory, program administration, and application/implementation. Before the meeting, the selected experts were provided with proposals and were asked to assess all 16 using an online data collection instrument without actual knowledge of GENIE or its criteria. The instrument required the experts to assess proposals across 3 general domains using a 10-point Likert scale (1 = extremely poor; 10 = excellent): (1) overall program quality; (2) the program's likelihood of achieving the proposed outcomes; and (3) the quality of the program's evaluation plan. They were also asked to identify whether 7 characteristics were present or absent in each of the proposals: (1) evidence-based; (2) appropriate environment for program delivery; (3) appropriate instructional techniques; (4) focus on behavior change and distal outcomes; (5) appropriate program materials; (6) appropriate evaluation plan; and (7) realistic program and plan. These characteristics were drawn from the program elements identified from published research used to create the first draft of GENIE; however, they were worded less explicitly than the first draft and did not have accompanying definitions. Experts independently entered their assessments across these domains and characteristics using the online data collection instrument. Project staff aggregated the data and kept them anonymous for presentation to the expert panel at the meeting.

Phase 1 of expert panel. To establish the criteria on which GENIE would be judged, the expert panel discussed their assessment of each of their 16 proposals, with the goal of reaching a consensus score on the 3 domains evaluated using the same Likert scores employed in the individual assessments. Consensus was defined as having all experts agree on a rating range that included 3 consecutive scores (ie, 3, 4, 5 or 6, 7, 8). This method was selected to allow the proposal scores to be differentiated, but also acknowledged differences in perception and grading stringency among experts. Project staff remained present during these discussions to record the expert's consensus ratings and note strengths and weaknesses of each proposal identified by the group, but did not offer opinions or attempt to influence the group's ratings. The first draft of GENIE was introduced to the experts at the end of phase 1.

Phase 2 of expert panel. Experts were asked to consider whether all crucial elements for evaluating the quality of nutrition education programs were reflected in GENIE and whether any parts of GENIE reflected elements that were not important to a nutrition education program. Group discussion was facilitated by project staff, which also answered questions and recorded comments. Detailed content editing of GENIE was completed in pairs and as a group. The experts worked collectively to accept, modify, or dismiss these edits, which included reordering and combining of some previously established categories. The revised version of GENIE included 9 categories with a total of 35 quality criteria (Supplementary Material). Expert panelists received an honorarium of $1000 as compensation for their time.

Follow-up from expert panel. At the suggestion of the expert panel, the revised version of GENIE was modified by project staff to provide additional definitions and reduce the reading level of the document to a US high school grade level to make it understandable to a wider variety of users. After revisions, the expert panelists were asked to review once more. Nine of 10 experts responded; 1 expert requested minor revision for approval.

Project staff made revisions and a finalized version of GENIE was sent out to the experts again for approval. Experts were also sent 1 of 3 selected calibration proposals (from the original 16) to evaluate using the newest version of GENIE. Nine of 10 experts provided their proposal assessments. For each of the 3 proposals, project staff created calibration scores by averaging the individual assessment objective and subjective scores provided by the experts. These same 3 calibration proposals and their associated scores were used to train the reviewers in part 2 of the reliability and validity testing process.

Part 2: Criterion Validity and Inter-Rater Reliability

Registered Dietitian Nutritionists representing a diverse group of experience and expertise in nutrition education were solicited to establish criterion and inter-rater reliability of GENIE. Based on the power estimations provided by Walter et al,[25] 10 reviewers were required to assess 13 proposals to be appropriately powered at $\alpha = .05$, $1–\beta = 0.8$ to detect 60% agreement among reviewers. Members of the Academy's DPBRN were recruited to participate in a 1-day in-person training and serve as reviewers for nutrition education proposals. Of 740 total members, 111 expressed interest in participating by completing a short online survey that asked about their credentials, education, and experience in dietetics, nutrition education, and evaluation. To account for the possibility of attrition in the reviewers, 15 RDN members were randomly selected to generally represent the entire applicant pool in experience and credentials. Of the 15 reviewers, 13 attended the training and participated in the review of 12 proposals (Table 1). Before the training, reviewers were asked to read the 3 calibration proposals selected in part 1.

During training, reviewers were introduced to GENIE. Project staff explained the components of the GENIE scoring systems to illustrate the proposal review process. Questions about GENIE were discussed as a group and addressed by project staff, who noted areas of GENIE the reviewers found unclear. Reviewers then evaluated 2 calibration proposals using GENIE. Reviewers entered their scores using an online survey tool (SurveyMonkey, Inc, Palo Alto, CA) for easy data aggregation. After the reviewers completed their assessments, they were provided with a copy of the calibration score for each proposal. Reviewers were asked to compare their scores to the calibration scores determined by the experts and discuss any similarities or differences as a group.

Reviewers were given instructions to assess the final calibration proposal using the online data collection tool at home. After completing the final assessment, project staff provided each reviewer with individual feedback and the calibration scores for comparison via e-mail.

Project staff made minor revisions to GENIE based on group feedback and selected 12 proposals from part 1 for evaluation and provided these to the reviewers. Each reviewer was assigned to begin assessments with a different proposal, to account for reviewer fatigue and increasing assessment proficiency over time. Project staff members were available for questions during the assessment process. Within 8 weeks of training, all 13 reviewers completed the 12 proposal assessments using the online assessment form. They also provided more detailed information about their experience (Table 1) for analysis of the relationship between reviewer characteristics and scores. Reviewers received a stipend of $500 as compensation for their time.

Data Analysis

Data analysis was divided into 5 questions. Table 2 lists the questions and statistical analyses to answer those questions in establishing the reliability and validity of GENIE.[26] The 5 research questions were further divided into 3 primary goals: (1) develop an optimized scoring mechanism by comparing reviewer objective and subjective scores (question 1); (2) establish inter-rater reliability among reviewers (questions 2–4); and (3) establish criterion validity by comparing reviewers with experts (question 5). Several statistical analyses were employed to answer these questions, including Spearman correlation (questions 1 and 4), intra-class correlation (question 2), Cronbach alpha (question 3), ANOVA (question 4), independent *t* test (question 5), and a point biserial correlation (question 5).

Because the revised version of GENIE included 35 criteria across 9 categories, the maximum total score using the objective system was 35 (1 point per criterion marked as present) and the maximum total score using the subjective system was 27 (up to 3 points per category across 9 categories). For analyses within individuals, but across proposals for each category (to determine whether individual reviewers were consistent in the way they assessed each category across proposals), the objective score within each category was computed as a percentage of total criteria within the category. To determine consistency among reviewers across different proposals, subjective scores within categories were summed across all 13 proposals to create a composite subjective score. Both reviewers' subjective scores and objective scores were included in the analysis.

Before analysis, expert consensus quality score ranges for each proposal were divided into 3 groups based on the middle score within the range: low (middle consensus score of 1–4; n = 6), medium (middle consensus score of 5–7; n = 7), and high (middle consensus score of 8–10; n = 0). These groups were used in an independent *t* test to compare expert consensus scores for overall quality with mean reviewer objective scores for each proposal. All analyses were conducted in SPSS, Version 20 (SPSS IBM, Armonk, NY, 2011) and significance was defined as $P < .05$.

Table 1. Self-Reported Characteristics of Reviewers Who Participated in Inter-Rater Reliability Testing of GENIE

Characteristic	Reviewers (total of 13)
Registered Dietitian Nutritionist, n	13
Current graduate student, n	2
Master's degree, n	8
Doctoral degree, n	3
Area of expertise (average experience), y (range [median])	
Experience in education program evaluation	12 (0–35 [10])
Experience in outcomes assessment	13 (0–35 [10])
Experience in research methods	9 (1–35 [4])
Average research experience, n (range [median])	
Total formal research projects	8.4 (0–34 [2])
Research projects as principle investigator	2.9 (0–16 [1])
Published research articles	5.9 (0–32 [1])

RESULTS

Face and Content Validity

Detailed content editing of GENIE resulted in various changes to the tool, including reorganization of the checklist's original 10 categories into 9. Three original categories, Program Outcome, Instructional Dose, and

Table 2. Individual Questions Posed and Statistical Analyses to Answer Questions in Establishing Reliability and Validity of Guide for Effective Nutrition Interventions and Education

Goal	Question	Test
Develop optimized scoring mechanism by comparing reviewer objective and subjective scores: measure consistency between reviewer objective and subjective scores	1. Are reviewer objective scores related to subjective scores within proposals?	Spearman correlation to compare objective scores with subjective scores across all categories within each proposal[a]
Establish inter-rater reliability among reviewers: measure consistency among reviewers	2. How well do reviewers agree with each other across all proposals?	Intra-class correlation to compare the variation between reviewers' total subjective and objective scores. Random effects assumed for both reviewers and proposals
	3. How well do reviewers agree with each other within each category?	Cronbach alpha to compare reviewers' ratings within each category: subjective and objective scores analyzed
	4. Are there certain reviewer characteristics that influence scoring behavior?	ANOVA to compare education level and Spearman correlation coefficient to compare years of previous experience with reviewer overall objective scores across all proposals
Establish criterion validity by comparing reviewers with experts: measure consistency between reviewers and experts	5. How well do reviewers agree with experts?	Expert overall ratings and average reviewer total objective score for each proposal compared using independent *t* test and a point bi-serial correlation

[a]Effect sizes were categorized as $r = .1$ (small/weak), .3 (medium/moderate), and .5 (large/strong).[26]

Self-Assessment, were converted into criteria within the categories of Program Goal and Instructional Methods. A new category, Program Description and Importance, and its associated criteria were added based on expert panel feedback that the context of a program needed to be adequately described and justified. The expert panel also divided the criteria from Program Environment and added them to Program Framework and a new category titled Program Setting, Recruitment, and Retention Plan. Criteria regarding program partnerships and collective impact were added to the categories of Program Framework and Sustainability. Criteria addressing evidence-based methodology were added to Program Framework, Instructional Methods, Program Content, and Program Evaluation. Program Evaluation was also expanded to include criteria addressing the analysis plan and evaluation tools. The experts thought that it was important to specify that physical activity goals should be included in all nutrition education programs in which weight is specified as a primary outcome, but they did not think it should be its own criterion because it may not be appropriate for all populations. After the meeting, instructions on how to use GENIE and a complete list of definitions were added. All experts approved the revised version of GENIE, which was considered a measure of face validity.

Goal 1: Develop an Optimized Scoring Mechanism by Comparing Reviewer Objective and Subjective Scores: Measure Consistency Between Reviewers' Objective and Subjective Scores

For most proposals, correlations ranged from 0.592 to 0.839 (*P* between .001 and .063) between the objective score (number of checkmarks achieved) and the total subjective score (Table 3), with significant *P* for Spearman's rho for all but 1 proposal. This indicates a high level of agreement between reviewer objective and subjective scores. Proposal D with a correlation of 0.148 ($P = .63$) was an exception. This proposal included an instructional method that reviewers subjectively rated poorly, yet objective ratings indicated that the program scored higher than might have been predicted. These results indicate consistency between objective and subjective scores on multiple levels within proposals, within categories, and within reviewers.

Goal 2: Establish Inter-Rater Reliability Among Reviewers: Measure Consistency Among Reviewers

Variation in quality assessment across proposals can vary as a function of the differences in the actual quality of the proposals as well as the differences among reviewers (eg, differences in training, experience). For GENIE to be useful across reviewers and setting types, one would expect the proportion of variance explained by individual reviewer differences to be relatively low. Thus, a higher interclass correlation coefficient (ICC) indicates that differences in proposal quality are a result of true quality differences, and not individual reviewer differences. There

Table 3. Scoring Consistency to Determine Equivalence Between GENIE Reviewers' Objective and Subjective Scores (Column 1) and Comparison of Average Reviewer Scores and Expert Consensus Rating Ranges (Column 2 vs Column 3) Used to Determine GENIE's Validity Across Each Proposal

	Consistency Between Reviewer Objective and Subjective Scores			
Proposal Letter	**ρ[a]**	***P***	**Reviewer Mean Objective Score[b]**	**Expert Overall Quality Consensus Rating Range[c]**
A	.691	.009	29	4–6
B	.777	.002	24	2–4
C	.605	.03	28	4–6
D	.148	.63	30	5–7
E	.643	.02	23	5–7
H	.690	.009	23	3–5
J	.674	.01	30	4–6
K	.839	.001	23	1–3
L	.592	.03	31	4–6
M	.830	.001	22	2–4
O	.739	.004	31	2–4
P	.641	.02	27	6–8

GENIE indicates Guide for Effective Nutrition Interventions and Education.
[a]Spearman's rho (nonparametric correlation). Effect sizes were categorized as $r = .1$ (small/weak), .3 (medium/ moderate), and .5 (large/strong)[26]; [b]Reviewer ratings using GENIE on a scale of 0–35; [c]Experts rated proposals on a scale of 1–10 and came to a consensus on a 3-point range.

was agreement between reviewers across proposals and across categories on both subjective scores ($F = 7.21$, $P < .001$; ICC = 0.76 [confidence interval, 0.53–0.92]) and objective scores ($F = 7.88$, $P < .001$; ICC = 0.82 [confidence interval, 0.63–0.94]), where ICC = 1 indicates that differences among reviewers had no effect (thus perfect agreement among reviewers). Results indicated that quality differences among proposals, rather than individual reviewer differences, explained subjective and objective differences in quality scores.

Measures of reviewer agreement were examined within categories (using Cronbach alpha). Table 4 shows that for most categories, there was acceptable (>.6) or good (>.7) agreement among reviewers.[27] Category 4 subjective score agreement is an exception.

Based on the higher ICC of the objective scores, the researchers decided that the final tool would only use the objective scoring system.

The ICC results (not shown) indicated that differences among reviewers accounted for a relatively low proportion of differences in subjective and objective quality assessments, but the effect of reviewer characteristics could not be completely ruled out. Reviewer characteristics including highest academic degree achieved, total years of nutrition education experience, years of program evaluation experience, years of outcome assessment experience, years of research methodology experience, number of research projects as a principal investigator, total number of research projects, and number of published research articles were examined for possible influence on rating trends (Table 1). Reviewers with more experience with nutrition education program content tended to score proposals higher. Conversely, reviewers with more experience with program evaluation tended to score the proposals lower. Although this was a strong trend, these and all other relationships were not statistically significant.

Goal 3: Establish Criterion Validity by Comparing Reviewers With Experts: Measure Consistency Between Reviewers and Experts

If individual reviewer quality assessments are consistent with expert quality assessments, one would expect proposals that received a low rating from experts to have a lower mean reviewer objective score (averaged across all reviewers) than proposals that received a medium rating from experts (none of the proposals received a high consensus quality score from experts). Table 3 shows the reviewer mean objective ratings and expert overall quality consensus rating range for each proposal compared using Spearman's rho and its associated *P*. A point bi-serial correlation indicated that there was a relationship ($r = .564$) between expert and reviewer medium and low scoring proposal groups. A small sample may have contributed to a lack of statistical significance. *Post hoc* power analysis revealed that if the same relationship had been observed with 2 additional reviewers (n = 15), the relationship would have reached statistical significance. This suggests a strong possibility of type II error, and thus should be interpreted in terms of the effect size rather than the statistical significance.

DISCUSSION

Past research has attempted to define best practices in nutrition education. Many review articles have chosen to

Table 4. Within-Category Agreement Between GENIE Reviewers' Subjective and Objective Scores Measured to Select a Single Reliable Scoring System

Category	Criteria, n	Subjective Score (α)	Objective Score (α)
1. Program Description and Importance	4	.67	.44
2. Program Goal	4	.82	.82
3. Program Framework	4	.74	.82
4. Program Setting, Recruitment, and Retention Plan	2	−.017	.58
5. Instructional Methods	4	.56	.71
6. Program Content	3	.72	.64
7. Program Materials	1	.86	.81
8. Evaluation	8	.92	.95
9. Sustainability	5	.79	.81

GENIE indicates Guide for Effective Nutrition Interventions and Education.

focus on a single element of nutrition education,[24] a specific population or disease state,[2,5,7,9] or a specific setting or intervention type.[6,8] The Guide for Effective Nutrition Interventions and Education is the first known tool of its kind designed to assist in developing quality programs for all populations, settings, and situations. Other resources available to help nutrition education practitioners make evidence-based programming choices include those offered by the Centers for Disease Control and Prevention,[28] the Center for Training and Research Translation,[29] and the Guide to Community Preventative Services[30]; however, these are broader in scope and less specific.

Previous research attempted to create tools to streamline the evaluation of various nutrition paradigms: for example, the GroPromo audit tool developed by Kerr and colleagues[31] and a predictive breakfast consumption questionnaire developed by Dehdari and colleagues.[32] GroPromo was designed to evaluate grocery store marketing and promotional environments.[31] The questionnaire developed by Dehdari and colleagues measures Health Promotion Model constructs as a predictor of breakfast consumption. The researchers were able to identify variables that could serve as predictors of breakfast consumption.[32] Like GENIE, these tools attempt to simplify the assessment of a complex concept with similar evaluative and predictive intentions; however, their scope is far more limited.

Based on the perceived value of GENIE, the Academy created and validated the Developing and Assessing Nutrition Education Handouts tool,[33] an instrument for evaluating the quality of written nutrition education materials. Like GENIE, this tool is intended to be used by practitioners of all skill levels, including those without formal nutrition training, and can be applied to all kinds of nutrition education handouts. It may be valuable to use this model to develop tools for evaluating curricula or other specific elements of nutrition education programs as well.

The results demonstrate good agreement among individual reviewers' assessments of various proposals and that GENIE performs well across reviewers. Greater consistency was found when comparing objective scores among the 13 reviewers than was found with subjective scores. This implies that the reviewers tended to agree more on the presence or absence of GENIE criteria (objective) than on their ratings for each category (subjective). Because of GENIE's use as a tool for self-evaluation, relying on the objective presence or absence of quality criteria rather than subjective scores seemed most appropriate.

There are some possible explanations for the non-significant differences observed in reviewers' scoring behavior. Reviewers with more program development experience may be willing to score proposals more generously because they are not only more familiar with the challenges faced in implementing nutrition education programs, but also the personal impact such programs can have. Reviewers with more evaluation methodology experience may have higher standards for effective program design and outcome assessment. This more scientific approach to proposal assessment may explain their slightly lower scores. This pattern may also be explained by the different number of quality criteria within each of the 9 categories. Categories that contain more quality criteria carry more weight because they have a greater influence on the total objective score. Because the evaluation category contained more criteria than any other category (8 criteria), reviewers who tended to score this section lower would also tend to have lower overall scores, and vice versa.

There was a strong relationship between expert overall quality scores and reviewers' average total objective scores, which showed that reviewers generally agreed with the expert panelists' consensus score. Although one cannot confidently generalize beyond this sample, similar results would be expected with a similarly trained group of reviewers. Expert assessments were considered to be the reference standard scores for each proposal, so reviewer agreement with these scores indicates a high level of criterion validity. Because a single expert consensus score for general quality was compared with total objective scores for each proposal, the results reaffirm that the quality criteria built into GENIE reflect the measures used less formally by the experts to develop their general quality ratings. In addition, approval by the experts of the final tool makes the case for its face and content validity. This establishes GENIE as a valuable tool for nutrition education program planners as well as those assessing nutrition education proposals. Because effectiveness must be measured longitudinally, and proposals do not allow these results to be captured, an attempt was made to determine the relationship between GENIE score and intervention outcomes by scoring close to 100 published nutrition education programs.[34]

The project to develop GENIE began without the intention of publishing the tool or conducting research. Therefore, GENIE was developed without a systematic literature search plan. Although the tool was thoroughly reviewed by the expert panel, the lack of a systemic literature review is a shortcoming. A limitation of this study is also that the proposals and expert panelists used in the validity and reliability testing of GENIE were selected by project staff. Although efforts were taken to select a variety of nutrition education proposals and a range of experienced nutrition education program administrators, planners, and practitioners, GENIE's final content may have been influenced by the people and proposals selected to evaluate the tool. Another limitation of this study is that all reviewers were RDNs. In addition to RDNs, GENIE may be used by program developers and funders who do not have nutrition training, but the researchers did not test inter-rater reliability in this group. Registered Dietitian Nutritionists may possess a collection of characteristics that make them different from other GENIE users, although no single reviewer characteristic was found to have a significant impact on scoring. In addition, all reviewers underwent a daylong in-person training and completed calibration exercises. The authors have attempted to replicate the training elements on the Web site by including explanations of each category as well as calibration proposals.

Although efforts were made to evaluate a variety of nutrition education program proposals, it was not possible to evaluate every possible program type using GENIE, owing to the level of diversity in nutrition education.

IMPLICATIONS FOR RESEARCH AND PRACTICE

To the authors' knowledge, GENIE is the first instrument of its kind designed to translate current research recommendations into a tool for developing and guiding funding for quality nutrition education programs. The Guide includes criteria and categories that experts and the literature agree are most likely to lead to positive outcomes. It was a reliable and valid tool for assessing a wide variety of nutrition education proposals within this study. Proposals chosen for assessment by the reviewers and experts included a variety of program types, target audiences, and formats. These proposals could all be evaluated using GENIE without compromising inter-rater reliability or validity. This demonstrates that GENIE is a robust instrument applicable across an assortment of nutrition education programs. Future studies may seek to replicate these results with non-RDN reviewers and a larger sample of nutrition education proposals to confirm these findings.

Overall results support GENIE's ability to assist nutrition education program planners within all nutrition education practice areas in developing quality programs with the potential for effectiveness. For grant writers without direct experience with nutrition education, GENIE can serve as a guide for program development. Similarly, funders looking to compare and evaluate nutrition education programs can rely on GENIE to assess the quality of various proposals with ease and efficiency.

ACKNOWLEDGMENTS

Funding was provided by the ConAgra Foods Foundation through an educational grant to the Academy of Nutrition and Dietetics Foundation, which included salary support for the investigators. The ConAgra Foods Foundation was not involved in the collection, analysis or interpretation of data. The authors acknowledge the contribution of the individuals and organizations who shared their proposals for the purposes of this study. They would also recognize the expert panelists: Maria Ali, Amanda Birnbaum, Karen Chapman-Novakofski, Sarah Colby, Phyllis Crowley, Amy Knoblock-Hahn, Donna McDuffie, Megan Nechanicky, Sandy Procter, and Margie Tate; and DPBRN reviewers: Sara Beckwith, Elsa Ramirez Brisson, Frances Catinella, Mary Ellen DiPaolo, Sari Edelstein, Beth Gillham, Heather Heefner, Kate Hoy, Jill Kennedy, Kate Machado, Robin Nwankwo, Susan Parks, and Kathy Tigue, who contributed their time and knowledge to the project.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jneb.2015.03.003.

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.