

Quality of life index: development and psychometric properties

The purpose of the study on which this article is based was to assess the validity and reliability of an instrument designed to measure quality of life. Sixty-four items applicable to both healthy subjects and dialysis patients were tested with graduate students ($n = 88$); six items relative to dialysis were added, and the instrument was administered to dialysis patients ($n = 37$). Items were based on literature review, which supported content validity. Correlations between the instrument and an overall satisfaction with life question of 0.75 (graduate students) and 0.65 (dialysis patients) supported criterion-related validity. Support for reliability was provided by test-retest correlations of 0.87 (graduate students) and 0.81 (dialysis patients) and Cronbach's alphas of 0.93 (graduate students) and 0.90 (dialysis patients).

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ACCORDING TO Campbell,¹ the term "quality of life" entered the American vocabulary between World War II and Lyndon Johnson's Great Society Program. It was used to emphasize that "the good life" required more than simple material affluence. Since then quality of life has become an important concern in health care and social policy. However, the issue of quality of life is complicated by the problems encountered in defining and measuring it.

George and Bearon² have contended that because different people value different things, defining quality of life is difficult. Although many determinants or indicators have been suggested as standards for life quality, an agreed on definition to guide research is lacking. This deficiency leads to inconsistencies in the interpretation of what actually constitutes quality of life. For instance, Dalkey and Rourke offered a comprehensive definition of quality of life: "a person's sense of well

being, his satisfaction or dissatisfaction with life, or his happiness or unhappiness."^{3(p11-210)} However, Campbell et al argued that happiness and satisfaction are conceptually different, stating that "satisfaction implies a judgmental or cognitive experience, while happiness suggests an experience of feeling or affect."^{4(p8)}

Therefore, inasmuch as quality of life is a major concern in planning, implementing, and evaluating health care and social policies, the purpose of the study described in this article was to assess the validity and reliability of an instrument designed to overcome some of the problems of measuring this phenomenon.

MEASUREMENT ISSUES

To measure quality of life, researchers have used either one tool that taps many dimensions, or several tools that taken together measure life quality but give no overall evaluation. However, there is no agreement regarding which of the potentially infinite number of aspects of life should be included in quality of life measurement. The following dimensions were included in two or more of the studies reviewed: subject's opinion of own quality of life or life satisfaction, socioeconomic status, physical health, affect, perceived stress, friendship, family, marriage, life goals, housing and neighborhood, city and nation, self-esteem, depression, psychological defense mechanisms, and coping. (Appendix A presents a complete list of the dimensions measured in representative studies.) However, there is a growing consensus that life satisfaction is the most important dimension to include. Campbell et al⁴ reported that individuals in a nation-

wide study responded in terms of life satisfaction when asked specifically about their quality of life. This supports the notion that people generally think of life satisfaction when conceptualizing life quality. In addition, life satisfaction has been used extensively in quality of life research. Laborde and Powers⁵ have called it a barometer of quality of life. Hundreds of studies have examined life satisfaction in the elderly, and the major theories of successful aging use it as the outcome criteria.² *Psychological Abstracts* alone lists over 400 studies performed since 1965 assessing aspects of life satisfaction for all age groups.⁶ Therefore, if one dimension must be chosen, life satisfaction is the one that seems to be the most important indicator of quality of life.

Another issue in measurement of quality of life is whether to use subjective or objective measures of dimensions. Subjective measures depend on the subject's description of the quality of his or her own life experience, whereas objective indicators do not.⁷ For example, asking subjects to indicate how satisfied they are with various aspects of their lives, such as family or marriage, typifies an approach using subjective indicators. Examples of objective indicators are income, education, and type of occupation. George and Bearon² maintained that both types of indicators should be used to assess quality of life to measure resources and status as well as subjective experience. However, Campbell⁷ has argued that subjective indicators assess the experience of life directly, whereas objective ones merely measure things that *influence* that experience. To support this position, he reported that although almost all objective socioeconomic indicators

increased from 1957 to 1972, the number of people who reported themselves to be very happy steadily declined. This trend was especially pronounced among the affluent. Therefore, he concluded that objective indicators are merely surrogate measures of quality of life.

Although overall quality of life has been measured by assessing satisfaction, the issue of differences in the importance of specific dimensions contributing to quality of life has been neglected. Just as satisfaction with each dimension varies from person to person, the importance of each

dimension, ranging from the perception of fulfillment to that of deprivation;^{4(p8)} need was defined as the amount of a particular reward that a person may require.^{4(p12)}

The Quality of Life Index (QLI) was designed to measure quality of life, taking into account the life domains noted by experts, the subjective evaluation of satisfaction with domains, and the unique importance of each domain to the individual. The purpose of the study described in this article was to assess the validity and reliability of the QLI.

INSTRUMENT DESCRIPTION

The QLI was developed to measure the quality of life of healthy individuals, as well as those who are experiencing an illness. The instrument consists of two sections: one measures satisfaction with various domains of life, and the other measures the importance of the domain to the subject.

Both the satisfaction and importance sections have 32 items that assess the following areas: health care, physical health and functioning, marriage, family, friends, stress, standard of living, occupation, education, leisure, future retirement, peace of mind, personal faith, life goals, personal appearance, self-acceptance, general happiness, and general satisfaction. For use with dialysis patients three additional items relative to dialysis treatment were added to each section. Subjects respond to each item on a six-point Likert-type scale ranging either from "very satisfied" to "very dissatisfied" for the satisfaction items, and from "very important" to "very unimportant" for the importance items. Six response categories were chosen to maximize discrimination and reliability while

Just as satisfaction with each dimension varies from person to person, the importance of each dimension also varies and does not impact equally on quality of life.

dimension also varies and does not impact equally on quality of life.¹ Because people differ with regard to which dimensions predominate in importance, simple addition of satisfaction scores produces an inaccurate representation of quality of life. Although the importance of selected dimensions to individuals has been acknowledged and preliminarily explored,^{1,4,7-11} the individual variance in the importance of dimensions has not been systematically accounted for in measurement of quality of life. Therefore, following the suggestion of Campbell et al,⁴ quality of life for this study was defined as the satisfaction of needs. Accordingly, Campbell et al stated that "satisfaction can be precisely defined as the perceived discrepancy between aspiration and achieve-

maintaining meaningful categories.¹² Guilford¹³ states that reliability of a rating scale increases with the number of response categories but levels off at seven.

Sellitz et al¹⁴ stated that clarity in wording of items and response categories reduces the possibility of distortion in ratings. The clarity of wording of the QLI was examined by 88 graduate students in nursing who were involved in research and measurement courses, and 37 dialysis patients. Several items that patients and/or graduate students found confusing were reworded.

Determination of scores

Quality of life scores are determined by adjusting satisfaction responses for the importance responses. Thus, the adjusted quality of life score reflects not only satisfaction, but also how much an individual values each domain. Therefore, the adjustment of satisfaction responses based on importance corrects for the varying influence of individual values and thus produces a more accurate reflection of the subject's quality of life.

To adjust satisfaction scores to take importance into account, the satisfaction responses for each item are recoded and multiplied with importance responses to produce an adjusted score. This adjustment produces the highest score for items that have high satisfaction/high importance responses, and the lowest score for high dissatisfaction/high importance responses. Those items of low importance produce middle-range scores. The rationale behind this adjustment is that persons who are highly satisfied with important areas of life enjoy a better quality of life than those who are very dissatisfied with

important areas of life. Raw satisfaction responses are recoded to make zero the midpoint to produce this adjustment. If scores were not recoded, a person who was very dissatisfied with an area of high importance would receive the same item score as a person who was very satisfied with an area of low importance. It is a reasonable assumption that great dissatisfaction with an important area has a more negative impact on quality of life than great satisfaction with a very unimportant area. Thus, the recoding of satisfaction responses makes it possible to properly take importance into account. Recoded satisfaction responses are multiplied with importance responses to produce adjusted item scores. Adjusted item scores are summed to produce domain subscale scores and overall quality of life scores. The procedure used to calculate scores is summarized in Appendix B.

Content validity

Carmines and Zeller^{15(p20)} stated that "content validity depends on the extent to which an empirical measurement reflects specific domain of content." Support for content validity is derived from subjective judgment that the items are representative of the content area.¹⁶ Content validity for the QLI is supported by the fact that items were based both on literature review of issues related to quality of life and on the reports of patients regarding the effects of hemodialysis on their quality of life. Appendix A summarizes these sources.

A two-stage process was used to assess the validity and reliability of the QLI, starting with a general sample of graduate students ($n = 88$), and then moving to a more clinically relevant sample of 37 dialy-

sis patients. First, all graduate students in nursing at a large midwestern university were invited to participate, and 53% volunteered. Ages ranged from 23 to 52 years ($M = 33.1$, $SD = 6.73$). The majority of subjects were female (97%) and white (95%). The QLI was used as a written questionnaire with this group.

Second, a convenience sample of 39 dialysis patients was selected. Two refused to participate, which resulted in a final sample of 37 patients. Ages ranged from 24 years to 75 years ($M = 50$, $SD = 14.18$). The majority of subjects were male (72%). Seventy-two percent were white, 22% were black, and 5% were Latino. With this sample the QLI was used in an interview format.

Criterion-related validity

Criterion-related validity is evaluated by comparing the scores of one instrument with those of another instrument believed to measure the attribute of interest.¹⁶ The criterion measure's reliability and validity must be known to allow faith to be placed in the results.¹⁶ To assess the criterion-related validity of the QLI, an overall satisfaction with life question was used as a criterion measure of quality of life. The question was based on the measurement by Campbell et al of overall satisfaction with life.⁴ Campbell et al conceptualized satisfaction with life as a cognitive judgment regarding the fit between a person's standards or aspirations and actual life experiences. Subjects were asked to rate their overall satisfaction with life on a six-point rating scale, which ranged from "very satisfied" to "very dissatisfied."

The validity of the satisfaction with life question has been demonstrated.¹⁷ How-

ever, because test-retest reliability with less than an eight-month interval was unknown, the satisfaction with life question was administered with a two-week interval to graduate students ($n = 69$) in the present study. Although the resulting correlation of 0.61 was acceptable, it indicated that there was some instability in the instrument.

The correlation between scores from the QLI and the life satisfaction question for the graduate students was 0.75; for the dialysis patients, it was 0.65. This demonstrated a high amount of overlap and thus supported the validity of the QLI.

Stability reliability

Test-retest reliability assessment gives information regarding the stability and dependability of an instrument.¹³ Test-retest assessment was appropriate for the QLI, because quality of life has been demonstrated to be relatively stable over several weeks.¹⁷ Subjects were retested with the QLI after a minimum of two weeks to allow day-to-day variations to occur.¹² In both groups stability reliability of the QLI was supported by test-retest correlations of 0.87 with a two-week interval (graduate students, $n = 69$) and 0.81 with a one-month interval (dialysis patients, $n = 20$).

Internal consistency reliability

According to Nunnally,¹² sampling of items is the major source of error in an instrument, and therefore internal consistency reliability should be evaluated on all new instruments. Cronbach's alpha estimates internal consistency based on the average inter-item correlation among items within a test and the number of items.¹²

Internal consistency reliability of the index was supported by Cronbach's alphas of 0.93 (graduate students) and 0.90 (dialysis patients).

DISCUSSION

Common problems encountered in measurement of quality of life are the absence of consensus regarding which domains to measure, lack of subjective assessment, and failure to take individual differences in importance of domains into account. These problems were addressed in the QLI by including the domains noted by experts in quality of life measurement, by subjectively measuring satisfaction with domains, and by adjusting the satisfaction responses with the importance of each domain to the subject. To evaluate some of the psychometric properties of the QLI, the criterion-related validity, stability reliability, and internal consistency reliability were assessed.

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The general rule of thumb for criterion-related validity is the higher the correlation, the more valid the instrument.¹² However, correlations are attenuated by unreliability of the measures, because the unreliable portions are measurement errors by definition. The upper bound for the correlations is not 1.0, but the square root of the product of the reliabilities of the

instrument and criterion.¹⁸ Thus, the highest possible value for the validity correlation between the QLI and the overall life satisfaction question was 0.75 for the graduate students and 0.74 for the dialysis patients. With these upper bounds in mind, it can be seen that there was a great deal of overlap between the QLI and the life satisfaction question, which supports the validity of the QLI. Further evaluation of the validity of the QLI using factor analysis to assess construct validity is currently under way.

Findings supported the test-retest reliability of the QLI. Before accepting these findings, however, the possible influence of memory had to be considered. Because the measurement waves were only two weeks apart for the graduate students, memory could have caused an overestimation of reliability.¹⁹ However, Nunnally¹² stated that a large number of ratings, being difficult to remember, can make testings virtually independent of each other. Because the QLI requires from 64 to 70 ratings, it is unlikely that memory significantly influenced the second rating.

Although the test-retest reliability of the QLI was supported, it could not be considered evidence of reliability unless there was a high Cronbach's alpha also.¹² Fortunately, high alphas ranging from 0.93 to 0.95 were calculated for the QLI. These alphas not only support the internal consistency of the QLI, but also give assurance that the inter-item correlations had very little attenuation due to random measurement error.¹⁵

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In summary, the QLI is a comprehensive measure of quality of life that overcomes

some of the problems encountered when measuring this phenomenon. The results supported the criterion-related validity, stability reliability, and internal consistency of the QLI when used with a healthy sample. In addition, the QLI was demonstrated to be reliable and valid when modified for use with dialysis patients. The positive results obtained from these assessments, and the

ease with which the QLI can be adapted for use with other illness groups, encourage the use of the QLI with other samples and populations. The QLI shows promise as an instrument to be used in nursing research and clinical practice for evaluation of practice, facilitation of communication with patients, and planning of interventions to improve quality of life.

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Appendix A

Dimensions used in studies to assess quality of life

Dimension	Representative studies
Subject's opinion of quality of life or life satisfaction	Andrews and Withey, ¹ Bortner and Hultsch, ² Cantril, ³ Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Crandall and Putnam, ⁸ Fry and Ghosh, ⁹ Johnson et al., ¹⁰ Kazak and Linney, ¹¹ Kilpatrick and Cantril, ¹² Hatz and Powers, ¹³ Jackle, ¹⁴ Laborde and Powers, ¹⁵ Levy and Wynbrandt, ¹⁶ Neugarten et al., ¹⁷ Padilla et al., ¹⁸ Palmore and Kivett, ¹⁹ Palmore and Luikart, ²⁰ Penckhofer and Holm, ²¹ Soper, ²² Sophie and Powers, ²³ Watts, ²⁴ Webb and Powers. ²⁵
Socioeconomic status (including occupation, education, income, and/or financial status)	Bonney et al., ²⁶ Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Johnson et al., ¹⁰ Kaplan De-Nour and Shanahan, ²⁷ Levy and Wynbrandt, ¹⁶ Padilla et al. ¹⁸
Physical health (including activity level and/or physical symptoms)	Bonney et al., ²⁶ Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Johnson et al., ¹⁰ Kaplan De-Nour and Shanahan, ²⁷ Levy and Wynbrandt, ¹⁶ Padilla et al. ¹⁸
Affect	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Conte and Salamon, ²⁸ Crandall and Putnam, ⁸ Glenn and McLanahan, ²⁹ Johnson et al., ¹⁰ Keon and McDonald, ³⁰ Levy and Wynbrandt, ¹⁶ Neugarten et al. ¹⁷
Perceived stress	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al. ⁷
Friendships (including social support)	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Johnson et al., ¹⁰ Levy and Wynbrandt. ¹⁶
Family (including children)	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Johnson et al., ¹⁰ Kaplan De-Nour and Shanahan, ²⁷ Levy and Wynbrandt. ¹⁶
Marriage (including sex)	Bonney et al., ²⁶ Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Johnson et al., ¹⁰ Kaplan De-Nour and Shanahan, ²⁷ Levy and Wynbrandt, ¹⁶ Padilla et al. ¹⁸
Achievement of life goals	Levy and Wynbrandt, ¹⁶ Neugarten et al. ¹⁷
Satisfaction with housing and neighborhood	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al. ⁷
Satisfaction with city and nation	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Cantril, ³ Kilpatrick and Cantril. ¹²
Satisfaction with self (including self-esteem)	Campbell, ^{4,5} Campbell and Converse, ⁶ Campbell et al., ⁷ Conte and Salamon, ²⁸ Kaplan De-Nour and Shanahan, ²⁷ Neugarten et al. ¹⁷
Depression, psychological defense mechanisms, and coping	Bonney et al., ²⁶ Kaplan De-Nour and Shanahan, ²⁷ Levy and Wynbrandt. ¹⁶

Appendix B

Summary of the scoring procedure for the quality of life index*

Steps	Calculations
1. Recode satisfaction scores	To center the scale on zero, subtract 3.5 from the satisfaction response for each item
2. Adjust item scores	To obtain adjusted item scores, multiply the recoded satisfaction score by the importance score, item by item
3. Obtain overall adjusted score	Obtain the sum of all adjusted item scores. To prevent bias due to missing scores, divide the sum of the items by the number of items answered. To eliminate negative values, add 15 to every score to get the final score. (Range possible for final overall quality of life score is 0 to 30.)

*A computer program that performs the above calculations has been written by the author and has been tested. This program is available from the author on request.

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