

Construct validity in instrument development: A vital link between nursing practice, research, and theory

Construct validity provides a vital linkage between nursing practice, research, and theory. Seventeen articles published in *Advances in Nursing Science* that met the criterion of reporting instrument development or modification were examined for evidence of these linkages. All were based on theoretical constructs; nursing problems were identified in 15, and 14 provided evidence of construct validity. Factor analysis was the primary method of construct validity reported. Implications for nursing practice were limited, suggestions for research focused on further instrument development, and only half reported implications for theory development. The findings indicate the need to strengthen links between practice, research, and theory.

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THE DISCIPLINES OF practice, research, and theory are dear to the hearts of all who claim nursing as their profession. While each of these terms may be clearly defined by nursing, the associations between them are less clear. This article demonstrates that construct validity constitutes a vital link between practice, research, and theory in the construction of nursing science.

HISTORICAL CONTEXT

In discussing stages and milestones in the development of nursing knowledge, Meleis¹ dated the birth of nursing theory from Columbia University Teachers College's response to concern about graduate curricula in nursing in the late 1950s. She stated that the philosophy and experiences of Teachers College strongly influenced theoretical development in nursing, adding that the Yale School of Nursing soon responded to this impetus and was an

important influence on nursing research in the 1960s. Following publication of the American Nurses' Association position paper in 1965 (see *Am J Nurs* 1965;65:106-111), nursing theory was identified as an essential goal in the development of nursing knowledge.

In 1968, Dickoff and James² presented a position paper on the theory of theories, in which they outlined four themes to direct the development of nursing theory. They stated that theory consists of a system or framework invented for a specific purpose. Furthermore, they implied that professional purpose requires a commitment to go beyond the mere description and understanding of phenomena. They suggested the goal of such commitment should be to create situation-producing theory to guide practice.

In an overview of theory construction in nursing, Jacox³ referred to theory as an arrangement of words or concepts that indicate the subject of the theory. She iterated that concepts that are not directly observable are often constructed of concepts that are observed, either directly or indirectly. The former concepts are known as constructs.

In explicating the theory-practice linkage in nursing, Jacobs and Huether,⁴ in the first issue of *Advances in Nursing Science*, stated that theory construction begins with concept definition. They said that, unless concepts have empirical referents in practice, the theories developed from these concepts cannot be applied or tested in clinical practice settings. They further pointed out that conceptual linkages in the form of empirically referenced theoretical propositions must be validated, and thus validation in practice is essential to the

development of viable linkages between practice and theory.

Gortner⁵ questioned whether nursing practice should continue to be the major source of ideas or problems for nursing research. Her position was that concepts or constructs are basic to the formation of research questions and that nursing practice should not be the exclusive source of questions. She stressed that nursing research and theory should contribute to understanding across disciplines.

Since these early writings, various leaders in nursing theory development and research have addressed the relationship between nursing practice, research, and theory. Meleis¹ identified the 1980s as a time when theory was accepted as a useful tool in nursing. She stated that theory results from problems that arise in practice and is a tool that can be used in both practice and research. Theory serves as a conceptual guide for research, while research findings validate and support or modify theory, which then returns to guide practice.

To date, few nurse scientists have provided evidence of objective, recognizable linkages between the professional activities of practice, research, and theory. The adequate conceptualization and operationalization of constructs are critical to the use of the construct in theory development, research, and practice based on theory. One of the vital linkages is the identification of the dimension of constructs. Without knowing what construct is of interest to nursing practice, research, or theory, it is impossible to operationalize or measure the construct. Without knowing that an operation (tool or instrument) measures the construct of interest, it is impossible to

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interpret the findings. Construct validity is one linkage that addresses this dynamic process between practice, research, and theory.

Construct validity is defined by Anastasi as "... the extent to which the test may be said to measure a theoretical construct or trait."^(p151) Some methods for accumulating the evidence of construct validity include correlating scores with test scores, comparing pretest and posttest scores, establishing convergent and discriminant correlations between test scores, and employing factor analysis.

In their *Standards for Educational and Psychological Testing*, the Committee of the American Psychological Association (APA) stated, "Validity is the most important consideration in test evaluation. The concept refers to the appropriateness, meaningfulness, and usefulness of the specific inferences made from test scores."^(p9)

Moreover, the APA Committee responsible for developing the standards stated that, whereas traditional categories of content, criterion, and construct validity are convenient, these categorical labels do not imply that there are different types of validity. Precise distinctions between the types is impossible, and ideal validation includes several types of evidence coming from each of the traditional categories. For this critique, the authors used this inclusive definition of construct validity.

This article examines the reports of instrument development for practice and research published in *Advances in Nursing Science* from 1978 through this writing. The focus of this criticism is the vital link that construct validity provides between the activities of nursing practice, research, and theory.

MATERIALS AND METHODS

To evaluate the development of instruments designed for use in nursing practice and research, a review of all articles in *Advances in Nursing Science*, from its inception in 1978 through October 1987, was completed. This review focuses on the linkages between practice, research, and theory, as evidenced by the identification of a specific construct in the clinical problem situation, the development of the research instrument from a theoretical or conceptual framework, and the inclusion of construct validity in establishing the psychometric properties of the instrument (Fig 1).

Two reviewers did a preliminary screening of all issues of *Advances in Nursing Science* through an inspection of the abstracts or the stated purposes of the articles. Articles were selected for initial review that appeared to meet the criterion of reporting the development or modification of an instrument. Out of this initial screening of 253 articles published from October 1978 to October 1987, 25 articles were selected, which were then divided among the three reviewers for critique. On further review and discussion, six of these articles were eliminated as not fully meeting this criterion for inclusion. They had described data collection methods using a

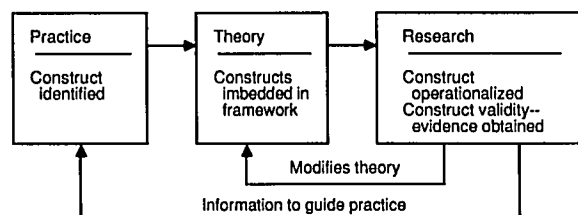


Fig 1. Linkages among nursing practice, research, and theory.

phenomenological or grounded theory paradigm or had used instruments to validate theory, but they did not focus on the development and validation of the instrument per se. One article was excluded because the reliability and validity of the instrument were described elsewhere. The remaining articles⁸⁻²⁴ ($N = 17$) were divided among the three reviewers for analysis with a checklist constructed of the following questions:

1. Is a clinical practice question or problem presented as a basis for development of the instrument?
2. Is a conceptual framework presented as a basis for development of the instrument?
3. Is a theoretical construct presented as a basis for development of the instrument?
4. Is a definition of construct validity provided in discussing psychometric properties of the instrument?
5. What methods, if any, were used to determine construct validity of the instrument?
6. What implications for nursing practice, nursing research, and nursing theory were included in discussion of the instrument?

These critiques were then synthesized into three tables of findings. To check on the consistency of the critiques, three arti-

cles were randomly selected from each reviewer's group and rated by a second reviewer. The comments and conclusions drawn by the reviewers were congruent in all cases.

FINDINGS

Clinical problems were identified in all but 2 of the 17 articles reviewed. These problems were both global (eg, understanding adolescence) and specific (eg, identification of predictors of breast self-examination in elderly women). Conceptual frameworks were identified in 14 of the articles, and all 17 detailed clearly designated theoretical constructs on which the instruments were based. Five of the instruments were based on specific nursing theories, in three cases Orem's Self-Care Theory. The remaining instruments were based on theories of learning, health behavior, health beliefs, personality development, decision making, and dynamics of child maltreatment. These findings are summarized, in the chronological order of the articles analyzed, in Table 1.

While only 2 of the articles included a definition of construct validity, 14 included findings derived from methods of determining construct validity (Table 2). These methods included factor analysis, expert review, principal-component factor

Table 1. Clinical problems related to conceptual frameworks and theoretical constructs in instrument development reported in *Advances in Nursing Science*

Name of instrument	Clinical problem	Conceptual framework	Theoretical construct
Assessment index (Bilitski, 1981) ⁸	Family self-care and coping	Orem's Self-Care	Family self-care
Personal-Family Problem Index (Maloney, 1982) ⁹	Nurses' work in stressful environments. Difference between stress levels, intensive care unit (ICU) v non-ICU	None stated	Personal-family problems (stress)
Questionnaire to Measure Nursing Activities (Brands, 1983) ¹⁰	Elders' reactions to basic needs met by nurses	Aydelotte Nursing Process	Nursing activities
Interview Schedule (no formal name) (Scavnick-Mylant, 1983) ¹¹	Understanding of adolescence	Ausubel's Satellization	Derived v primary status
Semantic Differential of Nursing Conceptual Models (Jacobson, 1983) ¹²	Total impact of nursing models	Several sources of theory development	Implied: Characteristics of nursing conceptual models
Self-Care Behavioral Rating Scale (Harper, 1984) ¹³	Effectiveness of self-care medication program for elderly black hypertensive women	Orem's Self-Care	Self-care behavior (communication, performance)
Instrument to Measure Concepts of Health Belief Model (no formal name) (Champion, 1984) ¹⁴	Concepts of health beliefs and breast self-examination	Health Belief Model	Susceptibility, seriousness, benefits, barriers, health, and motivation
Symptoms of Stress (Kogan and Betrus, 1984) ¹⁵	Self-management to reduce stress symptoms	Social Learning, Psychophysiological and Cognitive Theories	Self-management of stress response
Canfield Learning Style Inventory (Merritt and Marshall, 1984) ¹⁶	None given	Canfield's Model of Learning Style	Learning style
Child Health Self-Concept Scale (Hester, 1984) ¹⁷	None given	None given	Health self-concept
Quality of Life Index (Ferrans and Powers, 1985) ¹⁸	Quality of life as major concern in planning, implementing, and evaluating health care and social policies	Indirectly, definition of Campbell et al quality of life	Quality of life
Quality of Life Index (Padilla and Grant, 1985) ¹⁹	Outcome for evaluating impact of cancer nursing care	None; several operational definitions; authors construct an a posteriori model	Quality of life

Table 1 (continued)

Name of instrument	Clinical problem	Conceptual framework	Theoretical construct
Danger Assessment (Campbell, 1986) ²⁰	Nursing assessment of battered women in all health settings	Orem's Self-Care	Danger of homicide
Seriousness Vignettes Subscale (Misener, 1986) ²¹	Judgment of seriousness of child maltreatment questioned by nurses	McKirnan's Model of Decision-Making; Justice and Justice's model of child maltreatment dynamics	Judgment of seriousness of child maltreatment
Judgments About Nursing Decisions (Ketefian, 1987) ²²	Need for nurses to make authoritative decisions and act on them	Dewey's stages of moral reasoning, Piaget's nature of intellectual growth, and Kohlberg's moral development	Moral development, moral reasoning, moral behavior in Nursing
Health Self Determinism Index (Cox, Miller, and Mull, 1987) ²³	Need to match nursing interventions to client motivation	Health self-determinism related to health status and health behaviors	Intrinsic motivation in health behavior
Breast Self-Examination Checklist (Lashley, 1987) ²⁴	Need to identify predictors of breast self-examination in elderly women	Health Belief Model	Correct technique for breast self-examination

analysis with varimax rotation, correlation with scores from another tool, known groups or multitrait-multimethod analysis, Tucker's Coefficient of Congruence, readability, and correlation with literature review.

Implications for the use of the instruments in practice were discussed in 14 of the articles. Implications for research were presented in 12 articles, but implications for theory were addressed directly in only 10. These findings are summarized in Table 3.

DISCUSSION

In the studies reviewed, the direct implications for practice are limited for several reasons. First, while the majority of articles have a conceptual basis, most do not focus on specific clinical problems or popula-

tions. The implications for application of some of the theories, for example, Orem's Self-Care Theory and the Health Belief Model, to clinical practice would be easily discerned by the practitioner, but other possible applications are less clear. Second, article titles were at times not helpful in identifying the constructs and the concepts included in the instrument. Third, the lack of sample items in some of the scales would make it difficult for the clinical practitioner to determine whether the specific population with whom he or she is involved would be able to use the scale effectively. Fourth, the lack of detail in the technical aspects of the reports would also limit the ability of the practitioner to know whether the scale would be appropriate for a particular investigation.

The major concern regarding application to practice is the lack of specific

Table 2. Definitions and methods to determine construct validity of instrument development reported in *Advances in Nursing Science*

Instrument (theoretical construct)	Definition of construct validity	Method to determine construct validity
Assessment Index ⁸ (family self-care and coping)	None given	Correlated with Family Coping Index
Personal-Family Problem Index ⁹ (personal-family problems [stress])	None given	None reported
Questionnaire to Measure Nursing Activities ¹⁰ (nursing activities)	None given	Readability by elders; activities categorized by author according to conceptual definitions
Interview schedule ¹¹ (derived v primary status)	None given	None given
Semantic Differential of Nursing Conceptual Models ¹² (characteristics of nursing conceptual models)	Author's definition	Factor analysis
Self-Care Behavioral Rating Scale ¹³ (self-care behavior)	None given	None given
Concepts of Health Belief Model ¹⁴ (susceptibility, seriousness, benefits, barriers, Health, and Motivation)	Author's definition	Factor analysis, expert review
Symptoms of Stress ¹⁵ (self-management of stress response)	None given	Factor analysis
Canfield's Learning Style Inventory ¹⁶ (learning style)	None given	Factor analysis
Child Health Self-Concept Scale ¹⁷ (health self-concept)	Goodwin and Driscoll's definition	Multitrait-multimethod, factor analysis
Quality of Life Index ¹⁸ (quality of life)	None given	Further evaluation with factor analysis under way
Quality of Life Index ¹⁹ (quality of life)	None given	Factor analysis, analysis of variance with four known groups, correlated with MD's estimates and prognosis
Danger Assessment ²⁰ (danger of homicide)	None given	Correlated with prevalence of Conflict Tactics Scale and Scale adapted (Berk); expert review
Seriousness Vignettes Subscale ²¹ (judgment of seriousness of child maltreatment)	None given	Known groups
Judgments About Nursing Decisions ²² (moral development, moral reasoning, moral behavior in nursing)	None given	Correlated with defining issues test, known groups, hypothesis test, and factor analysis
Health Self-Determinism Index ²³ (intrinsic motivation in health behavior)	None given	Factor analysis; Tucker's coefficient of congruence
Breast Self-Examination Checklist ²⁴ (correct technique)	None given	Expert review; readability using SMOG; content from ACS* and NCI† literature

*American Cancer Society.

†National Cancer Institute.

Table 3. Implications for nursing practice, research, and theory related to instrument development reported in *Advances in Nursing Science*

Instrument	Practice	Implications for research	Theory
Assessment Index ⁸	Impact of resources on self-care behaviors	Assess change in client systems	None specific to Orem
Personal-Family Problem Index ⁹	For policy and practice match between job and personal characteristics of nurses	Longitudinal study of physical and psychological stress of nurses	None given
Questionnaire to Measure Nursing Activities ¹⁰	Educating public about nurses as primary caregivers	None stated	None stated
Interview Schedule ¹¹	Guidance to parents on working with their children	None stated	Not far enough along
Semantic Differential of Nursing Conceptual Models ¹²	Assist clinical agencies to select model for implementation; Tap views for development of Nursing Science	Tool development; Compare educators and clinicians	Not addressed directly
Self-Care Behavioral Rating Scale ¹³	Teaching self-care behaviors	Refine instrument; Replicate with other ages and populations	Support for Orem's propositions
Concepts of Health Belief Model ¹⁴	Possibility for assessment of health motivation and health behaviors after further development of model	Refinement to fit other conditions	Supports HB Theory; Adds that seriousness is not unidimensional
Symptoms of stress ¹⁵	Supplement current nursing actions	None stated	Supports psychophysiologic theory of stress
Canfield's Learning Inventory ¹⁶	None stated	Implied for assessing learning styles	Supports refinement of Canfield's model
Child Health Self-Concept Scale ¹⁷	None stated	Useful to look at cultural differences; Compare child's and parents' perceptions; Further stability of factor structure and validity analyses	Relates findings to Mead's Theory of Symbolic Interactionism
Quality of Life Index ¹⁸	Evaluate practice, facilitate communication with patients, plan interventions to improve quality of life	Vague	None stated
Quality of Life Index ¹⁹	None given	Prospective test of theoretical model; impact of nursing; confidence in nurse	Model from data; support for multidimensional construct

Table 3 (continued)

Instrument	Practice	Implications for research	Theory
Danger Assessment ²⁰	Warn battered women in shelters and other settings	Relationship between pregnancy and battering. Determine degree of risk. Further tool development	Supports Orem's theory (discussed indirectly)
Seriousness Vignettes Subscale ²¹	Provide continuing education for nurses and care to families; encourage nurses to report cases of child maltreatment	None stated	Findings compared to conceptual framework
Judgments About Nursing Decisions ²²	Indirectly, practice morally according to standards of the profession	None stated	Tentative linkages to theoretical model of ethical decision making
Health Self-Determination Index ²³	Tailor interventions to match clients' motivational orientation and achieve specific outcomes	Further tool development in populations with chronic illness	Supports relationship between intrinsic motivation and health behaviors
Breast Self-Examination Checklist ²⁴	Teach steps of breast self-examination	Further tool development and study of breast self-examination	Need to explore concept of barriers; Health Belief Model

recommendations about how and under what circumstances the instrument might be useful. There were no clinical practice implications listed in three of the articles.^{16,17,19} Others made only global recommendations for implementation in practice. Several authors^{13,14,20,23} suggested that their scales were not sufficiently validated for current use. General recommendations, which would guide practitioners in determining potential usefulness in their particular clinical settings, were included, but few of the instruments would be useful without considerable additional input from the authors.

Validity

The articles reviewed here represent a beginning point in the validation of their

respective tools. Because the accumulation of validity data is an ongoing process, no one study or one series of studies can provide all the necessary information. To facilitate the process of accumulating validity data on a continuing basis, investigators are encouraged to reflect on the results of their preliminary studies and to discuss what further steps might be taken in validating the tool. Thus it is important to go beyond simply reporting the results; investigators should interpret their meaning as well. In some of the articles reviewed here, the empirical evidence suggested that the tool be revised or reconceptualized to make it a more appropriate measure of the intended constructs. Investigators should also acknowledge any limitations in the methodology used to validate the tool. For

example, factor structures can be notoriously unstable, particularly with small samples, so the results of factor analysis need cross-validation.

Factor analysis was often reported inadequately, in the studies analyzed here, sometimes considerably so, and this limited the reviewers' ability to interpret the findings. It is important that the investigator provide the reader with information about the type of factor analysis and about the decisions made as factors were identified, including the type of rotation, the criteria for identifying significant factors (usually eigenvalues), and the factor loading necessary for an item to load significantly (eg, greater than 0.30), as well as the titles of the factors and sample items. Selected articles can be discussed as illustrative of this inconsistency.

Kogan and Betrus,¹⁵ for example, reported a factor analysis of their instrument, but included no specifics about the analysis. The instrument from which their Symptoms of Stress Self-Assessment was adapted was reported to have 9 subscales, but the tables in their report referred to what seem to be ten factors. The reader would not know if the instrument were applicable to his or her own research without having much additional information from the authors.

In a more complete report, Champion¹⁴ described a principal components analysis with an orthogonal rotation. She also reported that seven factors were identified, which explained 100% of the variance in the instrument. The eigenvalues for the factors were not listed, but items, factors, and factor loadings were included. In another more complete report, Cox, Miller, and Mull²³ used a principal components

factor analysis with eigenvalues of significant factors greater than 1.0. They also reported using an oblique rotation because they believed that the factors would be correlated. Their statement that the four-factor solution yielded the most interpretable factors tells the reader that more than one solution was sought and the one given made the most sense. Items with factor loadings greater than 0.40 were retained. The report includes items, factors, and factor loadings in two separate tables. The details reported by Cox, Miller, and Mull enable a reader to make an independent assessment of the findings and to corroborate the interpretation offered by the investigators.

The APA Committee on Standards for Educational and Psychological Testing stressed the importance of considering validity generalization. Consequently, investigators are urged to indicate in what situations their tools might be most appropriately employed. This step is particularly significant in nursing, where tools developed with one group are often applied to an entirely different group. For example, researchers often use tools originally validated on an able-bodied sample with patient groups. Without psychometric information about the tool's performance with the group of interest to the nurse researcher, use of that tool may yield misleading results.

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Factor analysis was the major method used to assess construct validity of the tools reviewed here. While factor analysis is certainly important, it should not be the only method used to establish what the tool measures. Other methods, such as the correlation of scores from the new tool with scores on similar tools to which it should be related or the comparison of the scores of groups known to differ on the construct being measured, require additional data collection. However, they provide information not available from factor analysis and therefore expand understanding of the tool's meaning.

Theory testing and development

The measurement of constructs via instruments provides an essential method for developing and testing theoretical constructs and hypothetical relationships between them to establish theory. While most of the articles reviewed here identified theoretical or conceptual frameworks basic to the construction of the measurement tool, nearly half of the articles contained no discussion of the implications for further theory development, while others reported vague or tentative implications.

Several articles contained explicit discussions of the effect of the instrument on further development of the theoretical base. For example, Merritt and Marshall¹⁶ discussed ways in which the psychometric testing of Canfield's Learning Style Inventory, which they revised, supported the need to refine the conceptual model from which it was derived. This implication came directly from the data analyzed to

provide evidence of construct validity. Factor analysis yielded subscales that might be combined to provide more meaningful constructs.

Similarly, Harper¹³ based the development of the Self-Care Behaviors Rating Scale (SCBRS) on Orem's Self-Care Theory. The use of technologies and deliberate action on the part of an individual were rated to measure or assess communication and performance of medication self-care. Using Orem's theoretical construct of self-care and nursing systems, three propositions were tested with the SCBRS developed for this study. Following data analysis and interpretation of the SCBRS, Harper related the findings to Orem's propositions and discussed how specific behaviors assessed with this instrument differed from previous assessments of behavior consistent with the construct of compliance rather than self-care. Furthermore, Harper recognized and directly declared the need to develop and refine constructs that validate the theoretical construct of self-care.

Other investigators also discussed implications for theory related to development of their research instruments. Misener²¹ derived the construct of Judgment of Seriousness from a conceptual framework and an epidemiological model and related the findings concerning the validity of the instrument to both the framework and the model. Lashley²⁴ based the Breast Self-Examination Checklist (BSEC) on the health belief model and related the evidence of validity to specified constructs within the model. Likewise, Campbell²⁰ created an assessment instrument based on Orem's Self-Care Theory and discussed the

use of the instrument to operationalize the theory.

Several of the instruments were designed to measure constructs familiar to nursing, but the authors did not identify explicit theoretical frameworks. Maloney,⁹ for example, developed the Personal-Family Problem Index (PFPI) to study stress levels of nurses working in critical care and non-critical care settings. However, she did not provide a theory base and related her findings to a general literature review of related concepts, such as anxiety, job satisfaction, and susceptibility to stress. Padilla and Grant¹⁹ provided several operational definitions of quality of life, whereas Ferrans and Powers¹⁸ began directly with that construct, providing no theoretical framework or background. The former researchers constructed a theoretical model a posteriori and discussed their findings relative to this model, but the latter researchers provided no discussion of the relationship between their quality-of-life instrument and theory.

Hester¹⁷ began with a phenomenological view of health as individually and subjectively defined. Thus she developed the Child's Health Self-Concept Scale (CHCS) to measure a child's perceptions of health and behaviors related to this construct. No theoretical framework was provided for the development of the instrument, although Hester identified the construct of "health self-concept"^{17(p46)} and added that only one citation of this construct was found in the literature. In a discussion of the data analyzed for evidence of construct validity, Hester stated that she used Mead's theory of symbolic interactionism as the basic matrix for the multitrait-multi-

method analysis. The evidence of construct validity was slender, which may be related to the lack of a clearly defined theoretical framework for the initial development of the tool. Hester did attempt to discuss her findings as they related to Mead's theoretical constructs.

Ketefian²² began with several theories to explore the construct of moral behavior in nursing, stating later that the construct was moral development, and then adding moral reasoning as another distinct concept germane to her investigation. These constructs were applied to nurses who must make authoritative decisions and act on them. To measure two dimensions of moral behavior—professionally ideal moral behavior and realistically likely moral behavior—Ketefian developed Judgments About Nursing Decisions (JAND). The stated purpose was to develop a model of ethical decision making based on the results of inductive findings of empirical research. In this instance, more attention was paid to the steps of constructing a new, ideal theory than to developing an existing theory more clearly.

Finally, using nursing models, Jacobson¹² developed a semantic differential tool. Based on a variety of conceptual frameworks and using criteria provided by major nursing theorists, this instrument was not based on a construct that is a component of one extant theory. Rather, it is an evaluation tool useful to theory development in a different way, ie, it addresses the link between theory and practice. Jacobson stated that, through use of the instrument, it is possible to assess how conceptual models of nursing are evaluated by clinicians who are expected to

use them. This instrument could prove useful in developing theories to explain and predict the behavior of nurses in clinical practice.

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Findings of this critique support the need to strengthen links between practice,

research, and theory in published reports. The reviewers strongly recommend that, in order for theory to guide practice, constructs and their relationships should be validated through empirical research.

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