

THE DEVELOPMENT OF A FAMILY COMPETENCE INSTRUMENT RELATED TO HEALTH *

Virginia Boardman • Stephen J. Zyzanski

ANALYSIS, REVISION AND RESCALING

Investigators have shown that illnesses cluster in families (Downes, 1945) and that patterns of illness are repeated in successive years (Rogers & Reese, 1965). Cassel (1976) has suggested that "a remarkably similar set of social circumstances characterizes people who develop tuberculosis (Holmes, 1956) and schizophrenia (Dunham, 1961; Mishler & Scotch, 1963), are victims of multiple accidents (Tillman & Hobbs, 1949) and commit suicide (Durkheim, 1951). They are individuals who for a variety of reasons . . . have been deprived of meaningful social contact." One related social psychological variable, interpersonal competence, based on Mead's (1934) social behaviorism theory and defined by Foote and Cottrell (1955, p. 49) as "capabilities to meet and deal with the changing world, to formulate ends and implement them" has been suggested as related to the ability of persons to achieve optimal health.

According to Mead (1934) rational behavior, mind, self, language and communication are developed only through repeated interactions with other human beings. The individual learns the meaning of his own behavior only through reflecting upon the response of other persons to his behavior. As verbal and non-verbal gestures are exchanged over an extended period of time, the same gesture calls out the same response in interacting individuals. They come to share the same meaning for specific verbal and non-verbal gestures. The gestures become significant symbols whose meaning is shared, resulting in

Virginia Boardman, Ph.D., R.N., is Associate Professor, Community Health Nursing, Case Western Reserve University, Cleveland, Ohio.

Stephen J. Zyzanski, Ph.D., is Director of Research and Associate Professor, Family Medicine, Case Western Reserve University.

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language which makes communication possible between the participants. When the behavior of one individual impinges upon that of another, each learns the role of the other. Since the individual has learned the roles of others, he can predict how they will respond to his behavior. As he experiences interaction with more diverse groups of persons he develops a generalized other, a predictable set of responses from his environment. Cottrell, a student of Mead's, has devoted much of his professional career to the application of Mead's social behaviorism theory to the development of interpersonal competence of individuals, families and communities (Cottrell, 1953; Foote & Cottrell, 1955; Cottrell, 1964, 1977).

While Cottrell had not used the term family competence in his previous work, he drew from his work on interpersonal and community competence (Foote & Cottrell, 1955; and Cottrell, 1977) to conceptualize family competence as composed of seven components (1970):

- 1 .*Commitment* of family members to family group objectives such as education, home, protection, and looking out for each other, preference for family companionship.
- 2 .*Communication* — confiding in one another, talking things out, feeling understood and feeling that one understands the other, the ability of the family to arrive at a working consensus on issues and problems, and the ability of the family to communicate with individuals outside the family.
- 3 .*Pride in and respect of the family.*
- 4 .*Self confidence* — confidence in the family's ability to manage its own affairs and to effect necessary changes in the social environment outside the family.
- 5 .*Judgment* — ability to identify and weigh alternatives and courses of action; to consider consequences in making decisions.
- 6 .*Creativity-resourcefulness* — productivity of new ideas and approaches in resolving problems and achieving goals, willingness to try new ways; knowledge of and willingness to use the resources of the community in the interest of the family.
- 7 .*Participation* — in the commitment of family members to a collective process in the community, their contribution to a definition of goals, as well as to ways and means of their implementation and enjoyment.

Based on this conceptualization, Cottrell collaborated with the present investigators to construct a 64 item questionnaire (Appendix) designed to measure these components.

To test the power of these theoretically conceived components, and family competence as a whole to discriminate between families with high and low levels of health, elementary school absences were assumed to be an indirect measure of family health (Basco, Eyres, Glasser, & Roberts, 1972); and illnesses were assumed to cluster in families (Downes, 1945).

In order to study the relationship between family competence and elementary school absences, one pool of elementary school children with ten or more episodes of absence two years in succession and another pool with three or fewer episodes of absence two years in succession were identified. From these two pools 100 randomly selected families of high absence children were matched by race, sex, grade, and school attended by the index child, with 100 randomly selected families of low absence children to yield a study sample of 200 families. Absence data were collected from the school record. Information required for measurement of family competence and the control variables (social position, number of chronic illnesses and number of illnesses causing loss of time from work or school (excluding the index child), absence of father from the home, family size, number of preschool children and number of siblings younger than the index child, mother's age, and belief in education) was obtained via home interviews with the mothering person in each family (Boardman, 1972; Boardman, Zyzanski, & Cottrell, 1975).

The goal of the investigation was to determine whether family competence as conceived was associated with rates of school absence of the index child.

The number of response options for individual items making up the seven components varied from eleven to two. Therefore, to give all items comparable weights, the responses to the items were converted into standard scores. The responses to items within each component were then averaged to yield component scores. The total competence score was the sum of the seven standardized component scores.

After a series of preliminary analyses of the data, two final analyses were performed. To determine both the independent and the joint contribution which the control and matching variables and family competence made in the delineation of families with a high or low absence child and to evaluate the contribution of the total competence score after having partialled out the combined influence of all the

other variables, a stepwise partial correlation analysis was performed. In this analysis all the variables except family competence were considered in the partialling procedure and each entered in the order of its strength of association with the absence level of the index child. Family competence was held out until all the variation that could be attributed to control or matching variables was determined and partialled out. Family competence, considered only after all other variables were partialled, was found to be significantly associated with absence level ($p .05$). The seven variables which demonstrated significant partial correlations with absence level were: belief in education, number of time losing and chronic illnesses (excluding the index child), number of preschool children, father in the home, race, and social position.

To verify the significant relationship between family competence together with its seven components, and absence level, a two-way multivariate analysis of covariance was performed, cross-classifying the sample by social position and absence level. This analysis treated separately as covariates each of the six variables indicated by the partial correlation analysis as being significant and independent contributors of absence behavior. With the effects of the six covariates and social position eliminated, statistical tests for absence status in relation to the total competence score and three components: participation, self-confidence, and judgement were significant ($p .05$).

Since chronic and time losing illnesses (excluding the index child) were measured as control variables, the opportunity existed to study the relationship between family competence and its components, and absence, as well as illness levels in other family members. The two illness variables, chronic illness and time-losing illness, were each dichotomized as "no illness reported in family members" or "one or more illnesses reported in family members." These results were then combined to form a variable with four possibilities: 1) both time-losing and chronic illness reported in the family members, 2) only chronic illness reported in family members, 3) only time-losing illness reported in family members, and 4) no illness reported in family members. One way analysis of variance was used to test the relationship between illness of family members (excluding the index child) and family competence and its components. The level of significance was set at .05. Families reporting illness scored lower on family competence ($F=3.4$, $p .05$) and the components of self confidence ($F=3.5$, $p .05$) and judgement ($F=3.2$, $p .05$) than did families reporting no illness.

A cross tabulation of families by absence level of the index child and illness level as categorized above yielded a chi square value of 10.02 ($p .05$). Absence level in the child was significantly related to illness level in other family members.

The instrument showed promise of being highly useful in predicting specific areas of family functioning related to health and illness. However it was cumbersome to use in its original form, both in the large number of items and the complex scoring system. Therefore with the collaboration of a psychometrician (S.J.Z.) the investigator proceeded to revise the instrument and its scoring.

METHOD

Factor analysis. The original 64 items measuring the seven components of family competence were derived from social behaviorism theory. The first step in exploring the empirical structure underlying the family competence construct was to submit the responses of the random sample of 200 mothers to principal axes factor analysis. The major use of factor analysis is to extract a smaller number of valid factors contained in a larger set of independent items. In this application there is an exploration and detection of patterning of variables with a view to discovering new concepts and a possible reduction of data. The solution which seemed to provide the simplest explanation of the construct contained four factors. Of the 64 original items, 18 loaded more than .25 on "family interaction", 6 items loaded similarly on "community participation", 22 items on "family problems," and 20 items loaded on the factor "non-family resources." The names of the factors were assigned tentatively after examining the content of the items having the largest loadings on each factor.

Stepwise regressions. Since some of the items which loaded more than .25 on individual factors may be redundant, the subjects' scores for items loading more than .25 on each factor were regressed in a stepwise fashion against the subjects' respective factor scores.*

Items explaining at least 1% of the variation in the factor score were noted. A second set of regressions was computed with chronic and time losing illness as dependent variables and the 64 original family competence items as the independent variables. The purpose of these

* The factor scores for an individual are computed from the data (test scores) and factor analytic information. A person who scores high on several variables that have heavy loadings for a factor will obtain a high factor score on it. Guertin, W. H. & Bailey, J. P., Jr. Introduction to Modern Factor Analysis. Ann Arbor, Michigan: Edwards Bros., Inc. 1970, 192-197.

regressions was to identify items explaining the variation in the families' illness experience. Eight items which explained a significant amount of the families' illness experience were noted. The eight items that loaded at least .25 on one of the four factors and were significantly related to illness experience were then forced into the stepwise regressions on the respective factor scores before the items previously noted to have explanatory power. When the eight illness related items were considered first, some of the originally significant items were redundant and were dropped from their respective factors.

Reliability. The four scales formed above were then tested for internal consistency reliability using Cronbach's coefficient (Guilford, 1954). Those items that were strongly correlated with all other items in their respective scales and the total scores were retained in the scales. Through the three procedures 28 of the original 64 items were dropped from the instrument, leaving 36 items in the revised instrument. The final Cronbach's Alpha reliability coefficients were .82 for the total competence instrument, .83 for family interaction, .70 for family problems, .67 for non-family resources, and .91 for community participation.

The empirically derived components. The four empirically derived components evolved essentially from five of the theoretically conceived components. Communications became family interaction, participation became community participation, creativity-resourcefulness became non-family resources, and judgment and self confidence became family problems. The responses to the items measuring the original components of commitment and pride in family contributed little to the final family competence instrument.

The factor loadings for the final nine items making up the component family interaction ranged from .31 to .73. Seven of the nine items making up the component were in the original theoretically conceived communication component. The original judgment and self-confidence components contributed one item each.

The second empirically derived component, community participation, is composed of four of the original participation items and one item from the commitment component. The factor loadings of these items ranged from .73 to .84.

The third empirically derived component, non-family resources, is composed of six items from the original creativity-resourcefulness component, and two items each from self confidence and participation. These ten items had factor loadings which ranged from .26 to .66.

The last empirically defined component, named family problems by a group of faculty consultants, was composed of 12 items representing all seven of the original components, with factor loadings ranging from .27 through .51. Self confidence contributed five items, judgment two items; while the other five components each provided one item.

The factor analysis, regression procedure, and reliability testing confirmed the contribution of five of the original components of the theoretically conceived construct of family competence as measured in this study.

Optimal scaling. In the original instrument scores were assigned to item response possibilities according to the investigators' best judgment. However, from the data generated from the 200 subject random sample, the response possibilities of each item could be weighted optimally, with the weighting determined by the subjects' responses to each item in relation to other items in the same scale. Using the original 200 subjects (mothers of high and low absence children), responses to each of the 36 items retained from the original competence instrument were optimally scaled by a method developed by Fisher (1948). The computational techniques used were programmed by Bock (1960) and developed further by Nishisato and Leong (1975). A very similar method of scaling of alternative responses to a given stimulus was independently developed by Guttman (1941). The scaling depended on the cross-tabulation of subjects by their choice of an item response possibility and the level of their component score divided into high, medium, and low categories. An example of the difference between the original scoring and optimal scaling is illustrated below.

A. Original intuitive scoring scheme:

Every family has its own way of doing things. There is no right or wrong way. We are interested in what is happening to families now. Place an "x" on the line according to where you think your family lies.

1. I can't take care of my own problems.

1 2 3 4 5 6 7 8 9 10 11
Really true Not true at all

2. We vote in most of the local elections.

1 2 3 4 5 6 7 8 9 10 11
Never Always

B. Optimal item scaling:

Every family has its own way of doing things. There is no right or wrong way. We are interested in what is happening to families now. Place an "x" on the line according to where you think your family lies.

I can't take care of my own problems.

1 1 1 1 1 1 5 5 5 5 7
Really true Not true at all

We vote in most of the local elections.

1 1 1 1 1 2 2 2 2 2 6
Never Always

Test of the optimally scaled items. The reliability coefficients for the four scales were recalculated using optimal item weights. There were no changes in the reliability coefficients. Originally the component scores were constructed by averaging the standard scores of the items making up the component. When statistical analyses were carried out comparing both the averaged component score and a simple addition of the optimally scaled scores of the items, little difference in the reliability or discriminating strength was observed. The component scores are now constructed simply by adding the optimally weighted items within each scale. The weights are "integer" numbers as indicated in the sample above,

Several of the statistical analyses carried out with the original 64 item instrument were repeated using the revised and rescaled 36 item instrument. With absence level as the dependent variable, stepwise discriminant analyses were performed holding family competence out until all the control variables from the original study explained as much of the variation between families of high and low absence children as possible. Family competence was then considered and was found to be negatively related to absence level (p .05).

After testing family competence in relation to absence level, time losing and chronic illness variables were placed in four categories, as described earlier. One-way analysis of variance between level of illness as categorized and family competence and its components yielded the following results: family competence, $F=3.7$, $p .05$, family interaction, $F=3.6$, $p .05$; non-family resources $F=1.2$, n.s.; family problems $F=4.2$, $p .05$; and for community participation, $F= .59$, n.s.

The means of the scores for family competence, family interaction, and family problems were significantly higher for families reporting no illness as compared to the means of scores of families reporting illness.

Summary and discussion

The original 64 item, theoretically conceived, family competence instrument was designed for use with families with children in elementary school. In a study of 200 randomly selected families, the total family competence score and three of the components, self confidence, judgment, and participation were negatively related to school absence level, an indirect measure of health. In addition the total competence score and the components, self confidence, and judgment, were negatively related to the reported amount of family illness.

The original theoretically conceived family competence instrument was revised and rescaled by means of factor analysis, multiple regression techniques, testing of internal consistency reliability, and optimal scaling procedures. Four empirically derived components emerged from the original seven components: family interaction from communication; community participation from participation; non-family resources from creativity-resourcefulness; and family problems from self-confidence and judgment. Responses to items measuring commitment and pride in family contributed little to the new instrument. The five contributing components have direct theoretical links to the interaction, communication, and the environmental predictability concepts of Mead.

The final empirically derived 36 item instrument was tested by extracting the responses to the 36 items and the absence and illness data from the original study. The revised family competence score retained its negative relationship with the absence level of the index child. In addition the revised family competence score and two factors, family interaction and family problems, were negatively related to reported illness levels of the families.

The revised family competence instrument appears to be useful for both clinical and research investigation of factors related to school absences and family illness level. Of particular interest is the identification of factors contributing to family competence. Identical total scores can be achieved by different combinations of factor scores. Thus, utilizing both total and factor scores, profile differences in families can be examined. Interactive relationships among the factors and global competence in relation to health outcomes can be identified.

Further development. The instrument at this time is based on one 200 subject random sample. Validation of the revised instrument with larger more representative samples from other populations is necessary. In addition the opportunity existed to make further revisions of the instrument so that it could be used to study families in later stages of the life cycle. Five items which are pertinent only for families with school children have been deleted. Other items which loaded on the respective factors and are relevant for families at all stages have been studied in relation to their power to explain the factor score and their contribution to the internal consistency reliability of the scale. Therefore two versions of the revised instrument now exist, one for the study of family competence in families having school children and one in families at all stages. The instruments and further information concerning instrument development are available from the first author.

APPENDIX (Sample items)

Family Competence Questionnaire
(For families with school children)

Proceed slowly and thoughtfully through the questions. Think about every question carefully. Put an "x" on the line according to your judgment as to where the answer lies from "most" to "least."

Component 1 — Family interaction

Generally, how much does each family member listen to what others say about the problem.

Not at all Listen carefully

Generally, how much does each family member feel he or she is understood concerning the problem?

Not at all Very much

Component 2 — Family problems

If I had more education, I could help my family more.

Not true at all Really true

I would expect our in-laws to take care of their own problems.

Not true at all Really true

Component 3 — Non-Family Resources

Can you think of a time when then the family had a real emergency in the *past few years* such as when one of the adults in the family has been very ill, or was in the hospital for more than a week, or had to be away from home for more than a week? During that time how much help did you get from:

Your neighbours?
No help.....Great deal of help
Your church?
No help.....Great deal of help

Component 4 — Community participation

Community activities of parents. Circle YES or NO for *each* parent.

	Mother		Father	
Member of school parent association	Yes	No	Yes	No
Helps teacher or other parent with school activities one or two days a year.	Yes	No	Yes	No

REFERENCES

Basco, D., Eyres, S., Glasser, J. H., & Roberts, D. E. Epidemiologic analysis in school populations as a basis for change in school nursing practice — report of the second phase of a longitudinal study. *American Journal of Public Health*, 1972, 62, 491-497.

Boardman, V. School absence, illness, and family competence. (Doctoral Dissertation, Department of Epidemiology, University of North Carolina, Chapel Hill, 1972). Dissertation Abstracts International, 1973, 33, 3748B. (University Microfilms No. 73-4802).

Boardman, V., Zyzanski, S. J., & Cottrell, L. S., Jr. School absences, illness, and family competence. In B. H. Kaplan and J. C. Cassel (Eds.), *Family and health: An epidemiological approach*. Chapel Hill, North Carolina: Institute for Research in Social Science, University of North Carolina, 1975

Bock, R. D. Methods and applications of optimal scaling. University of North Carolina at Chapel Hill. Psychometric Laboratory Research Report No. 25, 1960.

Cassel, J. The contribution of the social environment to host resistance. *American Journal of Epidemiology*, 1976, 104, 107-123.

- Cottrell, L. S., Jr. New directions for research on the American family. *Social Casework*, 1953, 34, 54-60.
- Cottrell, L. S., Jr. Social planning, the competent community and mental health. In *Urban American and the planning of mental health services*, Symposium No. 10, pp. 391-402. New York: Group for the Advancement of Psychiatry, 1964.
- Cottrell, L. S., Jr. Personal communication. Chapel Hill, North Carolina, 1970.
- Cottrell, L. S., Jr. The competent community. In R. L. Warren (Ed., 2nd ed.) *New perspectives on the American community*. Chicago, Rand McNally College Publishing Company, 1977, pp. 546-560.
- Downes, J. Sickness as an index of the need for health supervision of the school child. *American Journal of Public Health*, 1945, 35, 593-601.
- Dunham, H. W. Social structure and mental disorders: competing hypotheses of explanation. *Milbank Memorial Fund Quarterly*, 1961, 39, 259-311.
- Durkheim, E. *Suicide: A study in sociology*. Glencoe, Illinois: The Free Press, 1951, pp. 210-216.
- Fisher, R. A. *Statistical methods for research workers*. New York: Hafner, 1948, Section 49.2.
- Foote, N., & Cottrell, L. S., Jr. *Identity and interpersonal competence*. Chicago: The University of Chicago Press. 1955.
- Guilford, J. P. *Psychometric methods*. New York: McGraw-Hill, 1954, p. 385.
- Guttman, L. The quantification of a class of attributes: a theory and method of scale construction. In P. Horst, P. Wallin, L. Guttman (Eds.), *The prediction of personal adjustment*. New York: Social Science Research Council, 1941, 318-348.
- Holmes, T. Multidiscipline studies of tuberculosis. In P. J. Sparer (Ed.) *Personality stress and tuberculosis*. New York: International Universities Press, 1956, Chapter 6.
- Mead, G. H. *Mind, self and society*. Chicago: University of Chicago Press, 1934.
- Mishler, E. G., & Scotch, N. A. Sociocultural factors in the epidemiology of schizophrenia: a review. *Psychiatry*, 1963, 26, 315-351.
- Nishisato, Z., & Leong, K-S. Opscal: A fortran program for analysis of qualitative data by optimal scaling. Measurement and evaluation of categorical data. Technical Report #3. University of Toronto, Toronto: 1975.
- Rogers, K. D., & Reese, G. Health studies — presumably normal high school students. II Absence from school. *American Journal of Diseases of Children*, 1965, 109, 9-27.
- Tillman, W. A., & Hobbs, G. E. The accident-prone automobile driver: a study of the psychiatric and social background. *American Journal of Psychiatry*, 1949, 106, 321.

RÉSUMÉ

Les aptitudes de la famille et la santé

Un instrument de mesure a été conçu à partir de la conceptualization de Cottrell des aptitudes de la famille, qui avait sa source dans la théorie du comportement de Mead. Les 64 points de l'instrument ont été conçus afin de mesurer sept composantes proposées par Cottrell: l'engagement, la communication, la fierté familiale, la confiance en soi, le jugement, la créativité-ingéniosité, et la participation. L'instrument a été testé sur un échantillon de deux cents familles choisies au hasard et ayant toutes des enfants à l'école primaire.

Les aptitudes de la famille et trois éléments: la participation, la confiance en soi et le jugement avaient une corrélation négative avec le taux d'absentéisme des enfants sujets et le taux de maladies chroniques et de maladies qui entravent les activités dans les familles (à l'exception des enfants sujets). L'examen de l'instrument dérivé de la théorie à l'aide de l'analyse factorielle des principaux axes, de la régression multiple et de l'évaluation de consistance interne de la fiabilité a permis de réduire l'instrument de mesure des aptitudes à 36 points et quatre composantes: 1) participation communautaire, 2) ressources extérieures à la famille, 3) interaction familiale, et 4) problèmes familiaux. Deux des composantes de la théorie originale: l'engagement et la fierté familiale n'ont que très peu contribué à l'application de l'instrument de mesure empirique. Les quatre nouvelles composantes obtenues empiriquement sont étroitement reliées aux concepts d'interaction sociale et de l'élaboration de prévisions relatives au milieu de Mead. Les techniques d'échelle optimale ont simplifié l'évaluation des items, d'une combinaison de trois décimales à des chiffres simples. L'instrument révisé d'évaluation empirique est maintenant prêt à être testé par les chercheurs sur d'autres populations; il permettra d'obtenir une meilleure compréhension de sa valeur en identifiant les familles chez lesquelles la probabilité de maladie est très élevée.