1988

Sociometric Categorization of Children: An Empirically Based Method

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Sociometric Categorization of Children: An Empirically Based Method

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University

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On those remote pages it is written that animals are divided into (a) those that belong to the Emperor, (b) embalmed ones, (c) those that are trained, (d) suckling pigs, (e) mermaids, (f) fabulous ones, (g) stray dogs, (h) those that are included in this classification, (i) those that tremble as if they were mad, (j) innumerable ones, (k) those drawn with a very fine camel´s hair brush, (l) others, (m) those that have just broken a flower vase, (n) those that resemble flies from a distance.

(Borges, 1966, p. 108)

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Abstract

SOCIOMETRIC CATEGORIZATION OF CHILDREN: AN EMPIRICALLY BASED METHOD

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The use of sociometric assessment as a method for investigating the social competence of children and the prediction of future adjustment difficulties was reviewed. Recent methods used to form up to five sociometric groups (Popular, Average, Rejected, Neglected, and Controversial) were surveyed.

Various combinations of raw scores, standard deviation units, standardized scores, and binomial probability scores have been used in classification procedures. Inclusion/exclusion criteria, or cutoff scores, have been based on arbitrary statistical decisions regarding the "extremeness" of children's statements (positive and negative nominations) regarding their peers. These aspects of sociometric categorization result in limitations on the validity and generalizability of research in the area. The

current study attempted to develop an empirically based categorization system to remedy limitations to sociometric research.

Four components made up the study. The relationship between a set of teacher-reported behavioral descriptors and continuous sociometric data was determined. Second, contingent-frequency tables for the behavioral descriptors most strongly associated with the sociometric data were developed. Third, cutting scores to maximize the behavioral homogeneity of sociometric groups were determined from this information. Finally, the efficiency of binomial scores in classifying children sociometrically was compared to that achieved by arbitrary classification schemes.

An empirically based method for sociometric categorization was developed which differed significantly from previously devised methods. Discriminant function analyses for the new method and two arbitrary methods were performed to assess the prediction of Average, Popular, and Rejected groups from parent ratings. No significant difference was

found between the three methods' ability to correctly classify cases into one of the three groups with parent ratings as predictor variables. However, two important groups (Neglected and Controversial children) were deleted from the comparison because of inadequate size. This placed an unintended limit on the validational comparison. Advantages of an empirical approach to sociometric classification and implications of the study are discussed in terms of the cognitive psychological concept of prototypes. Limitations of the current study together with possible directions for future research are presented.

Sociometric Categorization of Children: An Empirically Based Method

Introduction

Sociometric assessment, a group of techniques for measuring the attraction between individual members of a specified group, has been a popular method for investigating the social competence of children and the prediction of future adjustment difficulties (Asher & Hymel, 1981; Cowen, Pederson, Babigian, Izzo, & Trost, 1973). One of the earliest sociometric techniques, the peer-nomination measure (Moreno, 1934), has undergone considerable research and development. Nomination sociometrics have been commonly used to identify up to five groups of children: Popular, Average, Rejected, Neglected, and Controversial (Coie, Dodge, & Coppotelli, 1982). Significant differences exist between these sociometric categories on behavioral, social, and cognitive indices (Asher & Wheeler, 1985; Dodge, Schlundt, schocken & Delugach, 1983). The methodology used to determine membership in sociometric groups is the focus of this study.

Typically, researchers using nomination sociometry obtain positive and negative nomination data from a specified group through the use of individual interviews or group procedures. Children might, for example, be asked to nominate three peers whom they enjoy playing with (positive

nomination), and three peers whom they do not enjoy playing with (negative nomination). By considering positive and negative scores, or some combination thereof, children are classified into Popular (high positive, low negative), Neglected (low positive, low negative), Rejected (low positive, high negative), Controversial (high positive, high negative), or Average (extreme on neither positive nor negative scores) groups (See Figure 1). (Although the terms "Popular", "Neglected", etc. may be somewhat misleading and inaccurate[1], they will be used throughout this study because of their consistency with the majority of the literature on sociometric categories.)

Two aspects of this general procedure result in significant limitations to sociometric applications. The first involves the type of scores used in assigning children to sociometric groups. Various combinations of raw scores, standard deviation units, standardized scores, and binomial probability scores have all been used in classification procedures. Secondly, inclusion/exclusion criteria, or cutoff scores, are based on an arbitrary statistical decision regarding the "extremeness" of children's statements (positive and negative nominations) regarding their peers. Whether a child has obtained a necessary number of nominations for inclusion in a particular

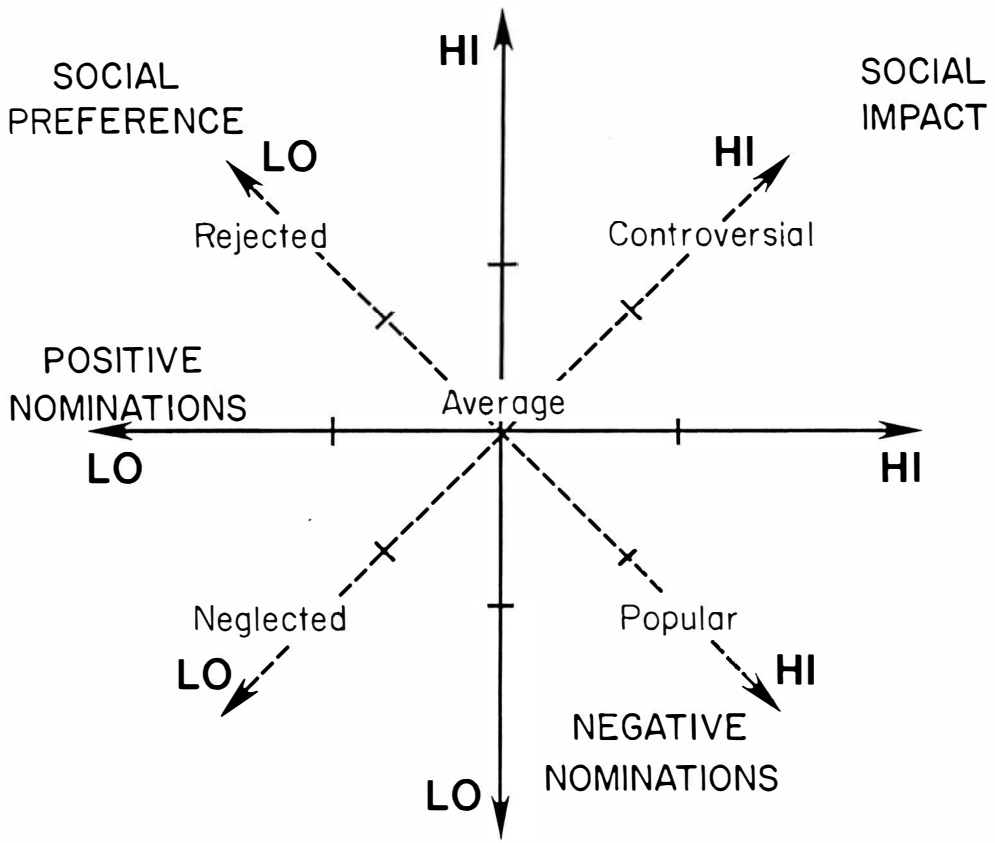

Figure 1. Relationships between positive and negative nominations, social preference and social impact dimensions, and sociometric classifications.

sociometric category is very much dependent on published precedents and researchers' personal preferences. These aspects of sociometric classifications will be further discussed here, together with their resultant limitations.

Type of Scores Used In Classification Procedures

A review of the literature suggests that three general classification procedures are most commonly used. Classification may be based on (a) the frequency of nominations, in which case raw positive and negative nomination scores are used; (b) on a normal distribution model, using either standard deviation scores or a standard normal distribution, often involving the combination of positive and negative scores to form "social impact" scores and "social preference scores"; or (c) on a binomial model, where scores are based on the binomial probability distribution rather than population parameters or sample statistics. Each of these methods will be briefly described.

Formation of sociometric groups on the basis of frequency of nominations is the least statistically sophisticated method used. Arbitrary frequency criteria for inclusion and exclusion of individuals are set by the researcher without concern for the observed distribution of scores in the sample. For example, Dodge (1983) set out to investigate the development of sociometric status in

children's peer groups over time. He formed six groups with eight boys in each, and conducted a sociometric interview with each child after a number of play sessions. Children were asked to nominate the two boys in the group they liked most (LM) and two that they liked least (LL). Assignment to sociometric categories was based on the frequency of raw scores each child received. Popular boys were defined as those whose social preference scores (calculated as LM - LL) were at least 3. Rejected boys were those whose preference scores were -3 or less. Neglected boys had social impact scores (calculated as LM + LL) as 2 or less. Controversial children were those whose social impact scores were at least 6 and whose LM and LL scores were at least 3. Boys not included in any of these categories were classified as Average.

The use of simple frequencies does not convey any information regarding the central tendency or dispersion of sociometric scores. An improvement over the use of simple frequency data is found in the normal distribution model of classification. In this model, group means and distributions are calculated based on the number of positive and negative nominations each child receives. Individual children are then assigned to sociometric groups or categories based on their location (in standard deviation units) on the group distributions. French and Waas (1985b) used a normal distribution model in their investigation of

the effectiveness of teachers' ability to identify Rejected children. French and Waas converted the number of nominations received by each child to a proportion based on the number of children in their respective classrooms, and these scores were used in deriving normal distributions for positive and negative nominations. In this study, Popular children were defined as those who scored at least 0.5 SD above the mean for positive nominations and 0.5 SD below the mean for negative nominations. Rejected children scored at least 0.5 SD above the mean for negative and 0.5 SD below the mean for positive nominations. Neglected children scored 0.5 SD below the mean on both scales while Controversial children scored at least 0.5 SD above the mean on both scales. Average children were defined as those who did not meet the inclusion criteria for any other group.

A refinement of the normal distribution model involves transforming the sociometric scores to standard scores and the addition and subtraction of positive and negative nomination scores. Using this procedure, additional scores are computed to differentiate likeability and social visibility. Coie and Dodge (1983) used this method in their longitudinal investigation of children's social status. In this study liked most (LM) and liked least (LL) nomination scores were transformed into standardized scores, and these standard scores were used to generate social preference ($Z_{LM} - Z_{LL}$) and social impact ($Z_{LM} + Z_{LL}$) scores. Children were

then assigned to groups using this data (the relationship of sociometric groups to social preference and social impact scores is graphically presented in Figure 1). The Popular group consisted of those with social preference scores greater than 1.0, a LM standardized score of greater than 0, and a LL standardized score of less than 0. Similarly, Rejected children were defined as those who received a social preference score of less than -1.0, a LL standardized score of greater than 0, and a LM standardized score of less than 0. Neglected children received a social impact score of less than -1.0, and LM and LL standardized scores of less than 0. Controversial children received a social impact score of greater than 1.0 and LM and LL standardized scores that were each greater than 0. The remaining children were considered to be in the Average group.

Reliance on normal distributions and standardized scores creates the appearance of similarity that may not exist across diverse social networks. For example, social networks may differ in size, setting, and variation in acceptance and rejection, while the use of standard deviations, standardized scores, and equivalent criterion scores results in approximately equal percentages of children falling in sociometric groups regardless of the specific characteristics of the social network being considered (Newcomb & Bukowski, 1983). Thus, although the use of normal and standard normal distributions in

sociometric classification is a clear advance over simple frequency criteria, methodological problems in the formation of the groups continues to compromise research using these methods.

Newcomb and Bukowski´s (1983) binomial probability method obviates the difficulty with social network variation. Their proposal of a third classification method was designed to provide a standard frame of reference in sociometric research. In Newcomb and Bukowski´s scheme, all children are classified using a standard probability method (binomial distribution) rather than standardized distribution scores derived from each separate social network. In their 1983 article evaluating three sociometric procedures, they derived binomial distributions for groups on the basis of three positive nominations, three negative nominations, and six total nominations (impact score) for each child. A criterion probability level of .05 was chosen to determine rare scores. Popular children obtained a rare positive nomination score and a negative nomination score below the mean. Rejected children obtained a rare disliked score and a liked score below the mean. Neglected children obtained a lower than chance impact score, while Controversial children obtained a rare positive nomination score and/or negative nomination score and, if only one score was rare, a score above the mean on the other nomination dimension. Average children were defined as

those obtaining a chance impact score and a less than rare number of positive and negative nominations.

These three general procedures do not exhaust the sociometric classification schemes reported in the literature. For example, White and Blackham (1985) used an unusual combination of peer nominations and peer ratings along with ordinal cutoffs and frequency distributions, in their formation of sociometric groups. "Populars", in this study, were defined as children who obtained "one of the five highest peer ratings in their classroom but not more than three negative nominations, and placed in the upper third of the class for positive nominations" (White & Blackham, 1985, p. 256). One rather obvious limitation to the use of such a variety of procedures is that similar groups of children are not being identified across studies, limiting the generalizability of research findings (Kazdin, 1980; Gresham, 1986).

Choice of Cutting Scores in Sociometric Classification

Arbitrary cutoff points are chosen to allow sociometric classification no matter which of the previously described methods is used. The illusion that boundaries between categories are distinct, created by the use of similar sociometric labels (Popular, Rejected, etc.) across research reports, is misleading. In truth, they are only artificially distinct. For example, in the Coie and Dodge

(1983) method, *z*-scores of 0.5, 1.5 or 2.0, or any other level of deviation from the mean, may have been chosen for the classification criteria. In Newcomb and Bukowski's (1983) approach, a criterion probability level of .05 was chosen for determination of rare scores, while in a later article (Newcomb & Bukowski, 1984) a criterion probability level of $p<.10$ was used.

The objective of category formation includes the grouping of elements into clusters such that the elements within a cluster have a high degree of "natural association" among themselves while the clusters are "relatively distinct" from each other (Anderberg, 1973). Because membership in a sociometric category is based on arbitrary decisions rather than observable, naturally occurring, properties of individuals, heterogeneous groups may result, reducing the external validity of research involving sociometric groups (Kazdin, 1980). The use of different criterion levels for classification purposes in different studies reduces the generalizability of results, while the use of quasi-diagnostic labels suggests just the opposite to the casual reader of the sociometric literature. When using arbitrary cutoffs, one runs the risk of classifying individuals with essentially similar scores into two different groups, and of classifying individuals whose scores are quite dissimilar into the same group. A child who receives, for example, two positive nominations and

seven negative nominations from a group of 28 children may be very different from a child who receives no positive nominations and 15 negative nominations from the same group. However, they would most likely both be classified as "Rejected". The formation of sociometric categories based on arbitrary criteria, while helpful from a conceptual standpoint, is deceptive. This approach may be expected to reduce the association between research variables and sociometric variables, resulting in a loss of information.

In summary, research based on sociometric classification schemes is limited by the use of many different classification procedures and cutting scores. The variety of procedures used in nomination sociometric research is reflected in the survey of recent methodologies reported in Table 1.

Recent and Potential Uses of Sociometric Classification

Sociometric methods have been used to explore two related lines of research. In the first, the concern has been with determining the characteristics and social skills associated with sociometric status and social competence (Gresham, 1986). For example, while the social approaches of both Rejected and Neglected children are likely to be rebuffed by peers, Neglected children are more likely to use a tactic of waiting and hovering around the peer group to

Table 1

Recent Methodologies Used in Formation of Sociometric Groups from Peer Nominations

Study	Methodology
Asher & Dodge (1984)	Distribution = standard normal. Number of sociometric groups = 6. Popular = preference score > 1.0, liked score > 0, disliked score < 0; Rejected = preference score < -1.0, disliked score > 0, liked score < 0; Neglected = impact score < -1.0, liked & disliked scores < 0; Controversial = liked & disliked scores > 0, impact score > 1.0; Average = preference score > -.5 & < .5, impact score > -.5 & < .5; Other = all remaining children.
Bierman & McCauley (1987)	Distribution = standard normal & frequency. Number of sociometric groups = 3. Combination of peer nomination and peer rating ("friendship") scores used. Peer accepted = positive nomination, preference, & friendship scores > 0, negative nominations <0; Rejected = positive nomination, social preference < 0, negative nomination > 0; Neglected = social impact < -1.0, raw score positive nominations = 0.

(table continues)

Study	Methodology
Coie et al. (1982) Li (1985)	Distribution = standard normal. Number of sociometric groups = 5. Popular = preference score > 1.0, liked score > 0, disliked score < 0; Rejected = preference score < -1.0, disliked score > 0, liked score < 0; Neglected = impact score < -1.0, absolute liked score = 0; Controversial = liked & disliked scores > 0, impact score > 1.0; Average = preference score > -.5 & < .5.
Coie & Dodge (1983) Newcomb & Bukowski (1984) Bukowski & Newcomb (1985)	Distribution = standard normal. Number of sociometric groups = 5. Popular = preference score > 1.0, liked score > 0, disliked score < 0; Rejected = preference score < -1.0, disliked score > 0, liked score < 0; Neglected = impact score < -1.0, liked & disliked scores < 0; Controversial = liked & disliked scores > 0, impact score > 1.0; Average = all remaining children.
Coie & Kupersmidt (1983)	Distribution = standard normal. Number of sociometric groups = 4. Popular = preference score > 1.0; Rejected = preference scores < -1.0; Neglected = impact score < -1.0; Average = preference & impact scores > -1.0 & < 1.0.

(table continues)

Study	Methodology
Dodge (1983)	Distribution = frequency. Six play groups with eight children in each. Number of sociometric groups = 5. Popular = social preference score > 3; Rejected = social preference < -3; Neglected = social impact < 2; Controversial = social impact > 6, liked most and liked least > 3; Average = all remaining children.
Dodge, Coie, & Brakke (1982)	Distribution = frequency. Subjects chosen from a population of 101 children. Number of sociometric groups = 3. Popular = eight children who received the highest preference scores; Rejected = eight children who received the lowest preference scores; Average = eight children with preference scores close to the population median.
Dodge et al. (1982)	Distribution = frequency. Subjects chosen from a population of 101 children and a second population of 118 children. Number of sociometric groups = 4. Popular = eight children who received the highest preference scores; Rejected = eight children who received the lowest preference scores; Neglected = eight children who received the lowest social impact scores; Average = eight children who received liked-most and liked-least scores that were close to modal scores for the population.

(table continues)

Study	Methodology
Foster & Ritchey (1985)	Distribution = frequency. Number of sociometric groups = 3. Children in five classrooms listed in order those they would most like to and least like to play with. Score of +2 assigned for first choice on positive nomination, +1 for second choice. Score of -2 assigned for first choice on negative nomination, -1 for second choice. Two children in each class with highest scores = Accepted; two children in class with lowest scores = Rejected; two children in each class with fewest nominations = Ignored.
French & Waas (1985a) French & Waas (1985b) Virtue & French (1984)	Distribution = normal distribution of proportions of nominations. Number of sociometric groups = 5. Popular = positive nominations > 0.5 SD, negative nominations < -0.5 SD; Rejected = negative nominations > 0.5 SD, positive nominations < -0.5 SD; Neglected = positive & negative nomination < -0.5 SD; Controversial = positive & negative nominations > 0.5 SD; Average = all remaining children.

(table continues)

Study	Methodology
Newcomb & Bukowski (1983)	Distribution = binomial. Criterion probability level = .05. Number of sociometric groups = 5. Populars = rare liked score, disliked score above mean; Rejects = rare disliked score, liked score below mean; Neglects = lower than chance impact score; Controversials = rare liked score and/or disliked raw score and, if only one score rare, score above the mean on the other dimensions; Average = chance impact score, less than rare number of liked and disliked nominations.
Newcomb & Bukowski (1983)	Distribution = standard normal and frequency. Number of sociometric groups = 5. Popular = preference score > 1.0, liked score > 0, disliked score < 0; Reject = preference score < -1.0, disliked score > 0, liked score < 0; Neglected = impact score < -1.0, raw liked score = 0; Controversial liked & disliked scores > 1.0; Average = preference & impact scores <.5 & > -.5.

(table continues)

Study	Methodology
Newcomb & Bukowski (1984) Falk & Stolberg (1987)	Distribution = binomial. Criterion probability level = .10 Number of sociometric groups = 5. Populars = rare liked score, disliked score above mean; Rejects = rare disliked score, liked score below mean; Neglects = lower than chance impact score; Controversials = rare liked score and/or disliked raw score and, if only one score rare, score above the mean on the other dimensions; Average = chance impact score, less than rare number of liked and disliked nominations.
Strauss, Lahey, Frick Frame, & Hand (1988)	Distribution = frequency. Sociometric scores were adjusted for class size. Number of sociometric groups = 3. Popular = positive nominations >4.5, negative nominations <1.5; Rejected = positive nominations <1.5, negative nominations >4.5; Neglected = positive nominations <1.5, negative nominations <1.5.
White & Blackham (1985)	Distribution = frequency. A combination of peer nomination and peer rating was used. Number of sociometric groups = 4. Populars = one of the five highest ratings in classroom but not more than three negative nominations, placed in upper third of class for positive nominations; Rejecteds = one of the five lowest peer ratings, three or fewer positive nominations, upper third of class for negative nominations; Neglecteds = peer rating less than "theoretical mean", not more than one positive nomination, not more than four negative nominations; Controversials = upper 40% of class on positive nominations, bottom 40% on negative nominations.

gain entry than Rejected children. Rejected children are more aggressive than their Neglected, Average, or Popular peers and are likely to use a disruptive tactic to gain entry to a social activity (Dodge, 1983; Dodge et al., 1983). They frequently initiate pro-social interactions during work periods, but initiate such interactions at a lower rate than their peers while on the playground. Through the description of the "profiles" of children's status groups, researchers have sought to develop theories explaining the acquisition of social status in children's peer groups and the development of social skills (Dodge, 1986; Renshaw & Asher, 1982; Schlundt & McFall, 1985), and to link findings regarding sociometric status to social skills training (Ladd & Asher, 1985).

The second line of research has been concerned with the identification of children at risk for future adjustment problems and the prevention of these problems. Knowledge of children's sociometric status may help target those most in need of help. Coie and Dodge (1983) have noted that many intervention programs have been directed at both Rejected and Neglected children, but longitudinal study suggests that, without intervention, Neglected children move toward positive social status simply with the passage of time. On the other hand, the Rejected child's social difficulties are persistent, continuing across time and across social settings (Coie & Dodge, 1983; Coie & Kupersmidt, 1983). The

children in this group appear to be at most risk for future social rejection and maladjustment. Problematic peer relations in childhood have been associated with delinquency, arrest, and dropping out of school (Janes, Hesselbrock, Myers, & Penniman, 1979; Roff, Sells, & Golden, 1972), confinement and/or dishonorable discharge from the Armed Forces, and adult psychosis (Roff, 1961, 1963). Sociometric ratings by third grade peers have been reported to be better predictors of adolescent and adult psychiatric disturbance than school records, measures of academic achievement, psychological measures, and teacher ratings (Cowen et al., 1973).

Few reports to date present information on the strength of the relationship (correlational measures) between sociometric data and concurrent or future adjustment, leaving aside peer-assessment studies. For example, the frequently cited Cowen et al. (1973) study presents results often interpreted as indicating that childhood early problems in peer relations are strongly related to problems in later life. However, this inference is based on differences in significance levels of multiple t-tests. Correlation coefficients are not reported by Cowen et al.

Unfortunately, research using sociometric classification schemes has also not often investigated the efficiency of sociometric data in predicting concurrent or future adjustment. Such an investigation would require the

use of actuarial prediction procedures (Sines, 1964). Actuarial prediction procedures are those that derive probability estimates of criterion status from contingent-frequency tables of predictor attributes, the most familiar example of which is the use of actuarial prediction in the insurance industry (Wiggins, 1973). By combining demographic information such as age, sex, marital status, place of residence, etc., the insurance actuary determines the probability of accidents in setting insurance rates. Actuarial prediction procedures have also been used in psychological assessment, particularly with the Minnesota Multiphasic Personality Inventory (MMPI) and the Personality Inventory for Children (PIC) (Gilberstadt & Duker, 1965; Lachar & Gdowski, 1979; Marks & Seeman, 1963). When information on the strength of the relationship between sociometric data and criterion data is made available, information which would relate sociometric score ranges to criterion presence or absence (contingent-frequency tables) is usually not presented (e.g., Ullmann, 1957). Only one study was found which provided contingent-frequency tables: Roff et al. (1972) demonstrated the relationship between ranges of a peer-choice measure, socioeconomic status, and the criterion of "early delinquency".

Sociometric actuarial prediction holds promise for the more efficient provision of preventive mental health services. Questions such as "given a particular pattern of

sociometric data, what is the probability that this student will exhibit severely disruptive behavior in the classroom, will drop out of school, or will be incarcerated some time in the future?" might properly be answered were actuarial data to be gathered, and could guide the planning and delivery of scarce mental health resources. These important questions are unanswerable given the use of discrete sociometric groups rather than the more continuous data provided by positive and negative sociometric nominations.

Additionally, actuarial information could help guide research concerning the characteristics associated with sociometric status. By using cutoff points based on observable and naturally occurring properties of the groups and on a standard frame of reference, more homogeneous sociometric groups could be formed and researchers would be in a better position to evaluate the comparability of sociometric groups across studies. Findings regarding the characteristics of particular sociometric groups would not be limited by the peculiarities of the researcher's methodology. In these ways, an actuarial approach to sociometric categorization could increase the external validity of research involving sociometric groups.

Different cutoff points may often be necessary for different decisions (Meehl & Rosen, 1955). As noted above, research on sociometric status and behavioral characteristics may require cutoff points which lead to

relatively homogeneous sociometric groups. Cutoff points that are used in longitudinal prediction, such as determining children at risk for future delinquency for assignment to a prevention program, may differ. For the second situation, limits on the number of children that may be enrolled in the prevention program may exist due to budgetary and personnel limitations. The outcomes of false positives and false negatives both hold costs for the prevention program, and perhaps society at large. In the research example, there are may be no such constraints. Decision theory (Cronbach & Gleser, 1965), a method for maximizing the expected utility (through assigning values and costs to predictive outcomes such as valid positives, false positives, etc.) of a particular decision making strategy, might be used in determining cutoff points for the prevention program, while the choice of cutoff points for the research project might involve a consideration of the base rates of particular behaviors in the general population.

Purpose of the Study

Efforts to make use of sociometric data have suffered thus far from the previously described methodological limitations. The present study sought to remedy these limitations through the determination of empirically based cutting scores. It was proposed that binomial sociometric

cutting scores based on observations of children's behavior would serve to increase the homogeneity of sociometric groups, increasing the association between research variables and the conceptually appealing sociometric categories. In turn, this would allow for greater generalization of findings across studies. Further, empirical determinations of the relationships between continuous sociometric data (rather than discrete sociometric groups) and concurrent and/or longitudinal behavioral data would allow for actuarial prediction.

Four components made up the study. First, the relationship between a set of behavioral observations and continuous sociometric data was determined. To accomplish this, positive, negative, and impact binomial scores were correlated with 104 teacher reported behavioral descriptors. Second, contingent-frequency tables for the behavioral descriptors most strongly associated with the sociometric data were developed. Third, cutting scores to maximize the behavioral homogeneity of sociometric groups were determined from this information. Finally, the efficiency of binomial scores in classifying children sociometrically was compared to that achieved by arbitrary classification schemes. The results and implications of the study are discussed in terms of the cognitive psychological concept of prototypes.

Method

Subjects and sociometric procedures

All children in the third, fourth, and fifth grades of two suburban elementary schools (N = 489) who had given their permission and had returned properly signed parental permission forms participated in a sociometric nomination procedure as part of a different research project (Falk & Stolberg, 1987) (N = 396, 81%). Children participated in peer nominations conducted in 38 groups. Students were asked to nominate three grademates they "especially like to do things with" (positive nomination) and three grademates they "don't like to do things with" (negative nomination) on typed grade level rosters. Students participating in the peer nominations were assigned numbers and 120 children were randomly selected using a table of random numbers. Parents were contacted by a letter sent home with their child and asked for their permission to gather ratings from the child's teacher (described later under Criterion Data). Parents were also asked to complete the Personality Inventory for Children (PIC; Wirt, Lachar, Klinedinst, & Seat, 1984). Follow-up phone calls were made to non-respondents to maximize the return rate. Eighty-five of the original random sample returned signed permission forms, for a 71 percent return rate (Male N = 44, Female N = 41).

Parent and teacher ratings had also been gathered on an

additional, non-random, sample of 53 children to meet the requirements of a previous study (Falk & Stolberg, 1987). This study had involved a sociometric classification scheme along the lines of Newcomb and Bukowski's (1983) procedure with a binomial criterion probability level of .10. For this additional sample, random assignment had been continued past the original 120 children until each of five sociometric groups had 39 members or the sample from a particular group was exhausted. Data on these children were combined with the 85 randomly sampled children for use in validational discriminant function analysis (see the Data Analysis section of this chapter). A total of 138 cases were available for discriminant function analysis (Male N = 70, Female N = 68).

Measures

Sociometric scores

Total same-sex positive and negative scores were calculated for each child. Nominations for the positive criteria and the negative criteria were summed to obtain an impact score. Means and standard deviations for the binomial distributions of the three sociometric indices (positive nomination, negative nomination, and impact) were determined (Howell, 1982). Scores on the three sociometric indices were transformed into scores with a mean of 100 and

a standard deviation of 15 because of the familiarity of this metric. For example, the probability of a child obtaining six nominations, with each child asked to make three nominations, from a group of 28 grade-mates by chance is .05. The mean score expected based on the binomial distribution is 2.996, with a standard deviation of 1.64. The binomial score for a child obtaining six nominations from 28 grade-mates is 127. Similarly, the binomial score for a child obtaining four nominations from 28 children is 109 (p = .18).

Criterion Data

Criterion data were collected from the children's teachers. These primary informants responded to 104 items contained in two inventories: the Walker Problem Behavior Identification Checklist (WPBIC) (Walker, 1983) and the Health Resources Inventory (HRI) (Gesten, 1976). These instruments were chosen because they assess indicators of pathology and competence related to sociometric status (Falk & Stolberg, 1987).

Walker Problem Behavior Identification Checklist. The WPBIC (Walker, 1983) consists of 50 descriptions of observable, maladaptive behaviors which were generated through interviews with elementary school teachers. The WPBIC items describe child behaviors that are thought to interfere or compete with successful academic performance

and/or school adjustment. Items are circled by a child's teacher if they have been observed during the previous two months. Split-half reliability of the total checklist has been reported as .98 and satisfactory test-retest reliability has been demonstrated (Walker, 1983). Factor-analytically derived clusters make up five subscales of the WPBIC: Acting-out, Withdrawal, Distractibility, Disturbed Peer Relations, and Immaturity. Studies of the WPBIC's item variance indices, item validity indices, and item intercorrelations have been reported by Walker (1983).

Health Resources Inventory. The HRI (Gesten, 1976) is a 54 item inventory designed to assess competence behaviors. Teachers rate children on HRI items using 54 five point scales. Items were drawn from prior health scales, literature statements concerning healthy functioning, and suggestions from teachers, mental health professionals, and parents. The initial pool of 79 items was reduced to 54 based on teacher ratings of ease of ratability and estimated variability across children. The HRI discriminates between clinically disturbed and normal children, and distinguishes levels of competence within a normative sample (Gesten, 1976). Factor analysis of the HRI has yielded five factors: Good Student, Adaptive Assertiveness, Peer Sociability, Follows Rules, and Frustration Tolerance.

Validation Measure

Personality Inventory for Children (PIC). The PIC (Wirt et al., 1984) was used as an independent source of data in validating the classification groups formed by empirically determined cutoff scores and two arbitrary methods of sociometric categorization. It is an empirically and rationally constructed instrument designed to be completed by the child's mother or other source close to the subject since early childhood. It has been shown to be able to predict observations of teachers and clinicians, child performance on ability and achievement measures, and future child status (Lachar, Gdowski, & Snyder, 1985). The Revised Format, Parts I & II (Lachar, 1982) was used in this study. This 280 true-false item inventory yields normed scores on three validity scales, one screening scale (Adjustment, ADJ), 12 clinical scales, and four broad-band factor scales. Acceptable internal consistency and test-retest reliability has been reported for the Revised Format scales (Lachar, 1982). The clinical scales were used in the validation analysis.

Data Analysis

Data analysis occurred in four stages (see Results for more detailed descriptions). First, potential sociometric scale descriptors, or those items which describe the

relationship between sociometric indices (the positive, negative, and impact nomination scores) and external criteria (Health Resources Inventory and Walker Problem Behavior Identification Checklist items) were identified by correlational analyses. Second, actuarial guidelines for sociometric indices were developed by determining the relationship between the frequencies of external criteria and ranges of binomial scores. In the third stage, cutoffs for sociometric classification were determined.

Classification groups formed by empirically determined cutoffs were compared to arbitrary cutoff schemes through the use of discriminant function analysis. The empirical method of classification is described in Results. Two sets of arbitrary classification schemes used in the sociometric literature were also used: the standard normal distribution method of Coie and Dodge (1983) and the binomial probability method of Newcomb and Bukowski (1983).

Coie and Dodge's procedure involved the transformation of positive and negative nomination scores into standardized positive (z_+) and negative (z_-) scores, and these standard scores were used to generate social preference ($z_+ - z_-$) and social impact ($z_+ + z_-$) scores which were again transformed into standard scores. Children were then assigned to groups using this data. The Popular group consisted of those with social preference scores greater than 1.0, a positive nomination standardized score of greater than 0, and a

negative nomination standardized score of less than 0. Rejected children were those who received a social preference score of less than -1.0, a negative nomination standardized score of greater than 0, and a positive nomination standardized score of less than 0. Neglected children received a social impact score of less than -1.0, and positive nomination and negative nomination standardized scores of less than 0. Controversial children received a social impact score of greater than 1.0 and positive and negative standardized scores that were each greater than 0. The remaining children were considered to be in the Average group.

In Newcomb and Bukowski's (1983) scheme, children were classified using the binomial distribution. Binomial distributions were determined for groups on the basis of three positive nominations, three negative nominations, and six total nominations (impact score) for each child. A criterion probability level of .05 was used to determine rare scores. Popular children were defined as those who obtained a rare positive nomination score and a negative nomination score at or below the mean. Rejected children obtained a rare disliked score and a liked score at or below the mean. Neglected children obtained a lower than chance impact score, while Controversial children obtained a rare positive nomination score and/or negative nomination score and, if only one score was rare, a score above the mean on

the other nomination dimension. Average children were defined as those obtaining a chance impact score and a less than rare number of positive and negative nominations.

Following classification, three discriminant function analyses were performed in a validational comparison of the empirical method of sociometric categorization to the Coie and Dodge (1983) and Newcomb and Bukowski (1983) methods. Three of the sociometric groups determined by each method ("Popular", "Average", and "Rejected") were used for validational discriminant function analysis. The "Controversial" and "Neglected" groups were dropped from analysis due to insufficient numbers of cases in these groups (Tabachnick and Fidell, 1983). McNemar's chi square test for change was applied to classification results to determine if classification improved as a result of categorization method (McNemar, 1969; Tabachnick & Fidell, 1983).

Results

Results of data analyses are presented in four stages. In Stage I, sociometric scale descriptors were identified by correlational analyses. Stage II analyses involved determining the relationships between the frequencies of external criteria and ranges of binomial scores to provide actuarial guidelines for sociometric indices. In the third stage, cutoffs for sociometric classification were determined. In Stage IV, classification groups formed by these empirically determined cutoffs were compared to arbitrary cutoff schemes through discriminant function analysis of parents' diagnostic ratings.

Stage I: Identification of sociometric scale correlates

The initial statistical treatment involved calculations of point biserial correlations between the 50 dichotomous criteria (WPBIC) and each of the three sociometric indices (positive nomination, negative nomination, and impact) and Pearson correlations between the 54 ordinal criteria (HRI) and the three sociometric indices. Results of these correlations and nominal significance levels are listed in Appendix A.

The five external criteria (HRI and WPBIC items) which correlated most highly with each of the three sociometric indices were identified. Because of overlap, a total of eleven scale correlates were identified, with ad hoc

significance levels ranging from <.0001 to .0062. These correlates are presented in Table 2, along with the strength of their correlation coefficients for all three sociometric indices.

Stage II: Selection and placement of descriptors

The second stage of data analysis involved the construction of pragmatic descriptive guidelines for sociometric indices. The correlates identified in Stage I were first inspected to determine those that had uniquely high correlations with a given indice. Descriptors that correlated highly with the negative sociometric scale were also found to correlate highly with the impact scale. The eleven scale correlates identified in Stage I were plotted in three dimensional space (axes = positive, negative, and impact indices) to identify possible groupings of correlates. Two groupings were apparent (see Figure 2) and were used for assignment of descriptors to either the positive or negative indices. Because impact scores were highly correlated with negative scores (r = .68, p<.0001, Appendix B) and only one of the eleven descriptors correlated higher with the impact scores than with the negative scores (Table 2), the impact index was eliminated from further consideration. No more information was to be gained from using the redundent impact scores.

Table 2

Correlation of External Criteria with Sociometric Indices

Criteria	Positive Index	Negative Index	Impact Index
WPBIC 1: Complains about others' unfairness and/or discrimination towards him/her.....	-.21	.46	.27
WPBIC 3: Does not conform to limits on his/her own without control from others.....	-.05	.51	.44
WPBIC 4: Becomes hysterical, upset, or angry when things do not go his/her way.....	.06	.31	.33
WPBIC 8: Other children act as if he/she were taboo or tainted.....	-.08	.40	.32
WPBIC 27: Has temper tantrums.....	.00	.30	.29

(table continues)

Criteria	Positive Index	Negative Index	Impact Index
WPBIC 31: Has rapid mood shifts: depressed one moment, manic the next..	-.10	.46	.36
HRI 4: Has a good sense of humor.....	.35	-.13	.15
HRI 25: Plays enthusiastically.....	.32	-.18	.07
HRI 34: Well liked by classmates.....	.44	-.45	-.09
HRI 39: Has many friends.....	.46	-.38	.00
HRI 44: Adjusts well to changes in the class-room routine.....	.33	-.23	.04

Note. Underlined correlation coefficients indicate sociometric index descriptor assignment.

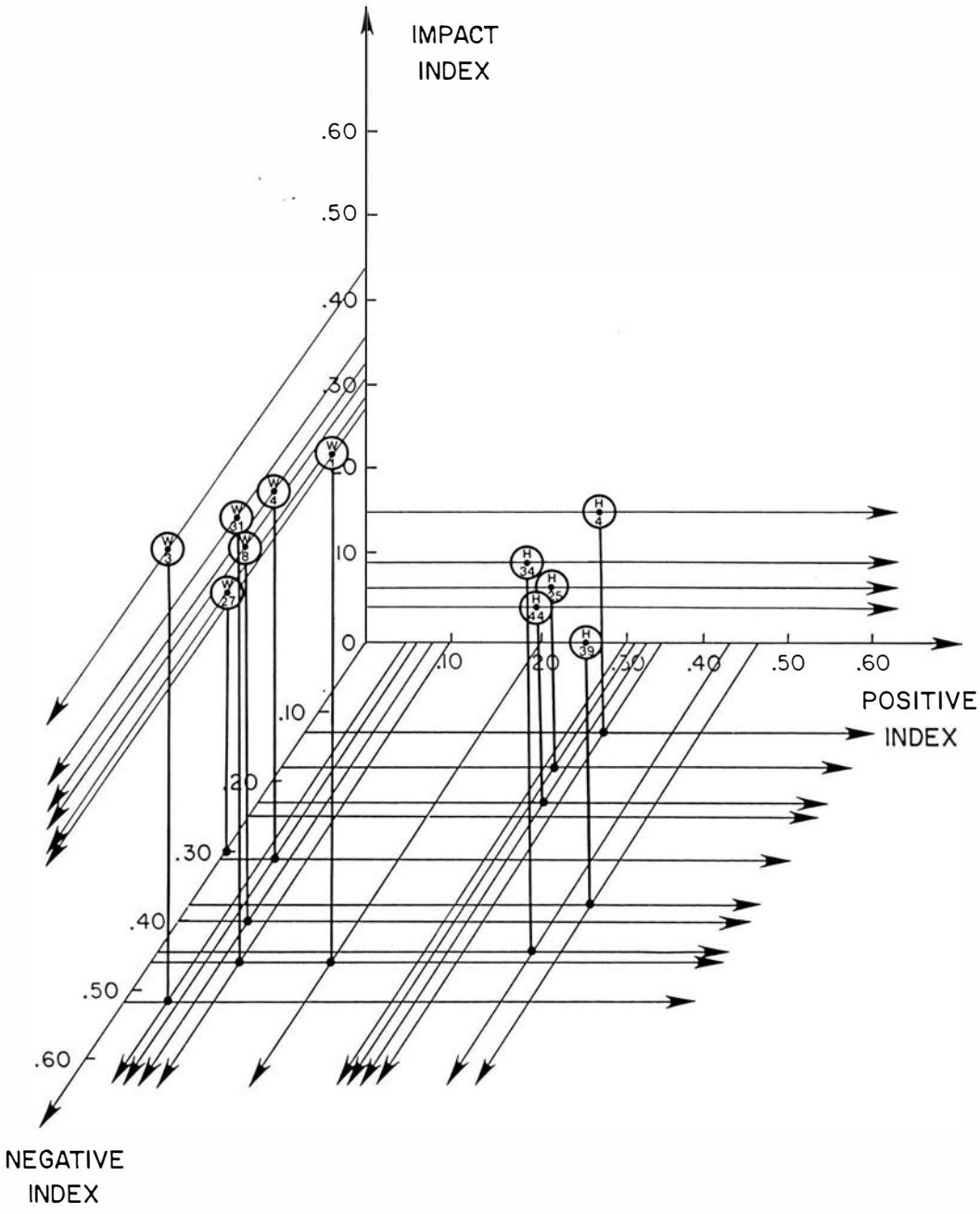

Figure 2. Three dimensional plot of scale correlates. (W = WPBIC, H = HRI)

Correlates assigned to either the positive or negative sociometric indices were evaluated to determine the sociometric scale elevation range that was most descriptive for each correlate (correlate placement). The relationship between correlate presence and sociometric scale elevation was determined by tabulating criterion frequencies for sociometric binomial score ranges. The frequency (expressed as a percentage) with which a behavioral correlate was endorsed was determined for sociometric score ranges of $\leq$75, 76 to 85, 86 to 95, 96 to 105, 106 to 115, 116 to 135, and $\geq$136. The percentage of children receiving endorsement on particular items was determined for the range of 116 to 135 instead of the usual 10 point range to include an adequate number of subjects within the range. Correlate frequencies for negative binomial scores are presented in Table 3, and correlate frequencies for positive binomial scores are presented in Table 4.

Binomial score ranges were inspected to determine cutoff points. Placements were made based on a point where the presence or absence of a particular correlate clearly exceeded the base rate of the sample. Additionally, an attempt was made to minimize the ratio of false positives to valid positives above the cutoff point. However, since the goal of the procedure was to provide accurate descriptive placements, the primary consideration in correlate selection was the location of scale score

Table 3

Correlate Frequencies for Negative Binomial Scores

Correlate	Base Rate	Score Ranges ≤75	76-85	86-95	96-105	106-115	116-135	≥136	Cutoff Scores
WBPIC 1	24	7	14	13	11	57	33	75	>135(18/75) <76(7/27)
WPBIC 3	15	0	0	13	11	29	44	50	>115(7/47) <86(0/27)
WPBIC 4	11	0	5	13	0	43	11	25	>105(5/25) <76(0/25)
WPBIC 8	4	0	5	0	0	0	0	25	>135(1/25)
WPBIC 27	6	0	10	0	0	14	0	25	>135(4/25)
WPBIC 31	1	0	0	0	0	0	0	13	>135(0/13)

Note. WPBIC 1: Complains about unfairness. WPBIC 3: Does not conform to limits. WPBIC 4: Becomes hysterical, upset, or angry. WPBIC 8: Taboo or tainted. WPBIC 27: Temper tantrums. WPBIC 31: Rapid mood shifts.

Table 4

Correlate Frequencies for Positive Binomial Scores

Correlate	Base Rate	Score Ranges ≤75	76-85	86-95	96-105	106-115	116-135	≥136	Cutoff Scores
HRI 4	73	67	47	60	89	89	82	86	>95(56/87)
HRI 25	75	67	53	67	89	87	82	86	>95(62/87)
HRI 34	65	44	40	67	74	78	73	86	>135(63/86) <86(42/74)
HRI 39	56	33	27	53	63	86	73	86	>105(47/77) <86(29/67)
HRI 44	62	44	47	53	74	78	64	86	>135(60/86) <96(49/74)

Note. HRI 4: Sense of humor. HRI 25: Plays enthusiastically. HRI 34: Well liked. HRI 39: Many friends. HRI 44: Adjusts well to changes.

ranges most descriptive of each criterion (Lachar & Gdowski, 1979). Correlate placements were formulated from crosstabulation of score ranges and either the endorsement of a dichotomous WPBIC item or a score of 4 or 5 (item describes child "well" or "very well") on the Likert-type HRI items. Crosstabulation tables are presented in Appendix C. The likelihood of a particular external criterion for each cutoff point is expressed in Tables 3 and 4 in the form of two percentages separated by a slash mark: obtained criterion frequency below the correlate placement (sociometric score)/obtained criterion frequency above the correlate placement.

Table 3, WPBIC item 1 (Complains about unfairness) indicates that this correlate occurs in 24% of the total sample (base rate). The frequency of occurrence for this correlate increases dramatically at or above the binomial score of 136. Therefore, the correlate placement for this item was set at or above the negative peer nomination standard score of 136, and the likelihood of this particular external criteria expressed as >135(18/75). In other words, 18% of the children below the correlate placement of 136 were described by their teachers as exhibiting this correlate while 75% of the children at or above this correlate placement were described as exhibiting the same correlate. When one considers that the base rate for the

total population is 24%, the descriptive utility of this correlate placement is easily grasped.

Correlate placements were determined in a like manner for those items where the lower end of the binomial score distribution was meaningful in predicting criterion absence. A second correlate placement was set at <76 for WPBIC item 1 (Table 3). In this instance, children obtaining negative peer nominations at or below a standard score of 75 received endorsement of the item "Complains about others' unfairness" at a frequency clearly below the base rate (seven percent as opposed to 24 percent), while 27% of the children above the placement received endorsement of the item, a level consistent with the base rate. Two placements were determined whenever both ends of the binomial score ranges allowed for meaningful descriptive statements regarding the criterion. In some cases only one placement was determined, where lower or higher scale elevations reflected relatively equal criterion frequencies.

Two correlate placements were determined for WPBIC item 3. Forty-seven percent of the children scoring above 115 received endorsement of the statement "Does not conform to limits...", while only 7% of those scoring below 116 had the statement endorsed by their teachers, compared to a total sample base rate of 15%. No children scoring below 86 received endorsement of item 3, while 27% of the children at

or above 86 received endorsement of this item by their teachers.

The distribution of correlate frequencies across the binomial score ranges was somewhat less clear-cut for item 4, "Becomes hysterical, upset, or angry..." because a dramatic increase from base rate was obtained in the 106 to 115 range (43% compared to 11%), while the binomial score ranges of 116 to 135 and ≥136 first returned to base rate (11%) and then increased (25%). The presence of the correlate clearly exceeded the base rate of the sample at and above the binomial scores of 106 and 136 (25% compared to 11% for both points) and the ratios of false positives to valid positives were equal for the two potential cutoff points. The likelihood of endorsement of WPBIC item 4 for those children obtaining binomial scores >105 and >136 was constant at 25%. However, the likelihood of endorsement was 9% below 136 and 5% below 106. Because the goal of the procedure was to provide descriptive placements, the cutoff of >105 was chosen. Thus, 25% of the children falling at or above the binomial score 106 received item endorsement, while only 5% scoring below 106 received item endorsement. A lower cutoff of <76 was also determined for WPBIC item 4, with 0% of the children below the cutoff and 25% of the children above the cutoff receiving item endorsement.

Correlate placements for WPBIC items 8, 27, and 31 were relatively straightforward, with all three cutoffs set at

>135. Likelihoods of endorsement for these three items are presented in Table 3. Correlate placements for the positive binomial scores were determined in a like manner for HRI items 4 and 25, (one placement each) and items 34; 39; and 44 (two placements each). Likelihoods of endorsement for positive binomial scores and their cutoff scores are presented in Table 4.

Stage III: Selection of sociometric classification cutoffs

Cutting scores optimally reflect the purpose for which they are intended (Meehl & Rosen, 1955). The goal of this study was to determine if empirically derived sociometric criterion scores provide greater homogeneity of groups than arbitrarily determined criterion scores. Therefore, the process of selecting sociometric classification cutoffs was included to locate scale score ranges where most, if not all, correlates exceeded the base rate for the correlates in the total sample. Other correlate frequencies examined by binomial score range could form the basis for selection strategies that are tailored to meet specific goals (e.g.: selection for inclusion in a prevention program. See pp. 21-22 of the Introduction).

Correlate placements for the two sociometric indices (positive and negative) were arranged in frequency distributions. The most common correlate placement (mode) for each end of the sociometric indices provided a cutting

point to hopefully maximize the behavioral homogeneity of children scoring above or below the cutting point. For example, six external correlates were determined for the upper end of the negative nomination sociometric index. A correlate placement of >105 was determined for one correlate, >115 for another, and >135 for four correlates. The modal correlate placement was >135. Therefore, the binomial score of 135 was chosen as the upper cutting point for the negative nomination index. Two correlate placements of <76 were determined for the lower end of the negative sociometric index, with one placement of <86. The binomial score of 76 was chosen as the lower cutting point for the negative sociometric index. Correlate placements for the upper end of the positive sociometric index were bimodal (two at >95, two at >135). Therefore, because of the absence of a single modal cutpoint, the median correlate placement (>105) was chosen in an attempt to maximize behavioral homogeneity of children scoring highly on the positive sociometric index. Finally, two correlate placements of <86 were determined for the lower end of the positive sociometric index, with one placement of <96. The binomial score of 86 was chosen as the lower cutting point for the positive sociometric index.

Stage IV: Validity of empirically derived sociometric classification cutoffs

Validity of sociometric classification based on empirical cutoffs was evaluated by calculating discriminant functions derived from independent data (PIC scales completed by parents) for the empirically determined cutoffs and for two sets of classification schemes used in the sociometric literature: the standard normal distribution method of Coie and Dodge (1983) and the binomial probability method of Newcomb and Bukowski (1983). It was thought that the empirically derived cutoffs would result in greater classification accuracy than either of the two schemes which use arbitrary cutoffs because the groups formed by the empirical cutoffs would be more homogeneous.

Sociometric Classification

Sociometric groups were formed by using the empirically derived cutoffs as described in the previous section : (a) so-called "Popular" children were those who obtained a positive score above the upper cutoff (>105 and a negative score less than or equal to the upper cutoff ($\leq$135; (b) "Rejected" children were those who received a negative score above the upper cutoff and a positive score less than or equal to the upper cutoff; (c) "Neglected" children were those who obtained a negative and a positive score below the

lower cutoffs (<76 and <86, respectively); (d) "Controversial" children were those who received negative and positive scores above the upper cutoffs; (e) "Average" children were identified as all remaining individuals, with negative and positive binomial scores falling below the upper cutoffs and either negative or positive binomial score falling above the respective lower cutoffs.

Additionally, sociometric groups were formed using the Coie and Dodge (1983) classification procedure and the Newcomb and Bukowski (1983) procedure (described in the Method section). Group membership according to the three classification methods is presented in Table 5 for the original random sample (N = 85), and for the expanded, non-random sample (N = 138). Crosstabulation of group membership according to categorization method is presented in Appendix D. The small Controversial and Neglected groups (n for empirical classification method = 1 and 4, respectively) were eliminated from subsequent analyses to avoid overfitting the data (Tabachnick & Fidell, 1983).

Discriminant Function Analyses

Sociometric group membership for each of the three classification schemes were predicted from parent PIC ratings by the calculation of three stepwise discriminant

Table 5

Group Membership By Classification Method - Random Sample

	Sociometric Group				
Method	Popular	Average	Neglected	Rejected	Controversial
Empirical.....	27 (32%)	48 (57%)	2 (2%)	8 (9%)	0 (0%)
Coie & Dodge (1983).....	14 (17%)	42 (49%)	12 (14%)	11 (13%)	6 (7%)
Newcomb & Bukowski (1983)..	11 (13%)	52 (61%)	10 (12%)	9 (11%)	3 (4%)

(table continues)

Group Membership By Classification Method - Extended Sample

	Sociometric Group				
Method	Popular	Average	Neglected	Rejected	Controversial
Empirical.....	51 (37%)	61 (44%)	4 (3%)	21 (15%)	1 (1%)
Coie & Dodge (1983).....	32 (23%)	51 (37%)	16 (12%)	27 (20%)	12 (9%)
Newcomb & Bukowski (1983)..	30 (22%)	56 (41%)	14 (10%)	29 (21%)	9 (7%)

function analyses (mean PIC clinical scale scores for all groups and each sociometric categorization method are contained in Appendix E). Groups were Average, Popular, and Rejected children from the expanded sample. Predictor variables were the PIC clinical scales (see "Measures" in the Method section). Because no strong a priori reason existed for ordering the entry of variables, stepwise analyses were used. Variables were entered one variable at a time according to their minimization of the overall Wilk's lambda. Minimum F to enter and maximum F to remove was 1. Minimum tolerance level was .001.

The sociometric groups were found to reliably differ along one dimension for all three categorization methods. The significant discriminant function for the empirical classification method accounted for 86% of the between group variability ($p<.0001$), while the Coie and Dodge (1983) and Newcomb and Bukowski (1983) methods accounted for 80% ($p=.0001$) and 79% ($p<.0001$) of the between group variability, respectively. All three significant discriminant functions were found to maximally separate Rejected from Popular children, and secondarily, Rejected from Average children. A summary of the discriminant function analyses is contained in Table 6. Loading matrices between predictor variables and the significant discriminant functions are presented in Appendix F.

Table 6

Summary of Discriminant Function Analyses

Empirical Method

Number of Cases.....133

Number of Functions Calculated.....2

Number of Significant Functions.....1

Significance Level.....<.0001

Percent of Variance Accounted For.....86%

Variables in Analysis at Last Step.....8

Coie & Dodge (1983) Method

Number of Cases.....110

Number of Functions Calculated.....2

Number of Significant Functions.....1

Significance Level.....0001

Percent of Variance Accounted For.....80%

Variables in Analysis at Last Step.....7

Newcomb & Bukowski (1983) Method

Number of Cases.....115

Number of Functions Calculated.....2

Number of Significant Functions.....1

Significance Level.....<.0001

Percent of Variance Accounted For.....79%

Variables in Analysis at Last Step.....5

Children in the expanded sample were classified into groups based on the models generated by the three step-wise discriminant function analyses. Classification results are presented in Table 7. Cases in common (classified as either Average, Popular, or Rejected) between methods were identified and McNemar's (1969) chi square for change (without Yates correction; Howell, 1982) was used to test for differences in classification accuracy. No significant difference was found between the empirical method and either the Coie and Dodge (1983) or Newcomb and Bukowski (1983) methods (χ^2[1, N = 110] = 1.13, p>.05; χ^2[1, N = 115] = .03, p>.05, respectively). Further, no significant difference was found between the Coie and Dodge (1983) and Newcomb and Bukowski (1983) methods, χ^2(1, N = 110) = 2.00, p>.05. Because overall chi-square analyses for sociometric categorization methods were non-significant, data analysis did not include post hoc tests of specific group differences (i.e.: Rejected) by categorization method.

Table 7

Classification Results

Empirical Method

	Predicted Group Membership		
Actual Group	Popular	Average	Rejected
Popular	63%	26%	12%
Average	46%	44%	10%
Rejected	10%	14%	76%

Percent of total cases correctly classified: 56%

Coie & Dodge (1983) Method

	Predicted Group Membership		
Actual Group	Popular	Average	Rejected
Popular	59%	19%	22%
Average	31%	49%	20%
Rejected	19%	19%	63%

Percent of total cases correctly classified: 55%

Newcomb & Bukowski (1983) Method

	Predicted Group Membership		
Actual Group	Popular	Average	Rejected
Popular	70%	17%	13%
Average	25%	54%	21%
Rejected	21%	14%	66%

Percent of total cases correctly classified: 61%

Discussion

Sociometric Categorization

The empirical method of sociometric classification is not limited by the arbitrary cutoffs found in other sociometric categorization schemes. Unfortunately, two groups (Neglected and Controversial) had to be deleted from further analysis in this study because of inadequate size, resulting in an unintended limit on the validational comparison of the empirical method to two arbitrary categorization methods.

The largest percentage of variance between the groups identified as Popular, Average, and Rejected by the three methods was accounted for by the empirically based method developed in this study. However, no significant difference in classification accuracy was found between the methods. While the categorization system developed in this study was clearly no less efficient than the comparison methods (Coie & Dodge, 1983; Newcomb & Bukowski, 1983), and therefore represents a potentially useful alternative approach to sociometric classification, results at this point must be considered equivocal.

A consideration of sociometric classification from cognitive psychological principles of categorization helps to understand the results of this study, provide support for

an empirically based method, and yield direction for future research. Specifically, the conception of sociometric groups as examples of prototypes (Rosch), 1978) is helpful in these areas.

Sociometric Categories as Prototypes. A prototype is a useful way of defining a concept or category. Many classification schemes in psychology and psychiatry assume that categories are logical, bounded entities, and that membership is defined by an individual's possession of a simple set of critical features. Further, it is frequently assumed that all individuals possessing the critical features have a full and equal degree of category membership (Rosch, 1978). In contrast, a prototype is a theoretical notion consisting of the organized collection of features or criterial attributes of members in a given category. All of these features characterize some members, but no one property is either necessary or sufficient for membership in the category. Members in a particular category may be better or poorer examples of the prototype.

The most common features or properties of members of a particular sociometric category are suggested by the literature. For example, Rejected children are seen as aggressive, disruptive, and inattentive by their peers (Carlson, Lahey, & Neeper, 1984; Coie & Kupersmidt, 1984; Landau & Milich, 1985), by objective behavioral observation

(Dodge, 1983; Dodge et al., 1982; Green, Vosk, Forehand, & Beck, 1981; Ladd & Asher, 1985) and by teacher ratings (Falk & Stolberg, 1987; Li, 1985). Their bids for interaction, even when positive, are more often rejected by peers (Dodge, et al., 1983). Rejected children report experiencing more loneliness than other children (Asher & Dodge, 1984; Asher & Wheeler, 1985). Attributes previously reported in the literature appear consistent with the content of the six items identified as correlates of the negative nomination index (see Table 2). These attributes may characterize some, or even most "Rejected" children. However, they need not characterize all children considered "Rejected".

If we were to investigate the category "birds" we would likely turn up a number of attributes associated with the category: birds fly, sing in a pleasant manner, are small, have feathers, lay eggs, and so on. The composite of attributes would represent a theoretical "ideal bird", or a prototype. However, consider the chicken, the ostrich, or the penguin. It becomes obvious that some members of a category are more typical of that category, and that common attributes of a category are usually neither necessary nor sufficient for membership in a category. Individuals actually rate superordinate semantic categories as having few, if any, attributes common to all members (Rosch, 1975).

While it may be argued that the criterial attributes of "extremeness" on sociometric indices are critical to

membership in sociometric categories, researchers apparently find little that is critical about the level of extremeness in defining sociometric group membership, or even the type of sociometric indices the individuals are "extreme" on (see Table 1). Strauss, Lahey, Frick, Frame & Hynd (1988) have noted that "although many different definitions of... sociometric groups have been used in previous studies... they have generally identified similar groups of children" (p. 139). The "similarity" of the children identified is more important for researchers than a particular definition of group membership. Therefore, in general, a particular level of extremeness on a particular sociometric index may be neither necessary nor sufficient for a child to be categorized as belonging to a certain category, such as "Neglected".

The formal criteria for inclusion of a particular child in a particular group in a particular sociometric study is neither a logical nor psychological necessity (Rosch & Mervis, 1975). Rather, children who come to be viewed as prototypical of the category of "Rejected" are seen as such in proportion to the extent to which they bear a "family resemblance" to other members of the category. A "family resemblance" relationship consists of a set of items of the form AB, BC, CD, DE, etc. In other words, each item has attributes which overlap those of other members of the category. At least one, and probably several, elements are

in common with one or more other items, but no, or few, elements are common to all items. The prototypes of the "Rejected", "Neglected", or "Popular" child did not precede the formation of the category. Rather, our understanding of the prototypical "Rejected" child has followed from research involving individuals assigned to that category.

Sociometric categorization is a a process of forming groups of children who have a family resemblance. Cutoffs for group membership should seek to maximize the overlap of attributes of group members, or come closest to the prototype of that category. Rosch (1978) refers to the probabilistic concept of cue validity in arguing that there is generally one level of abstraction at which the most basic category cuts can be made. The validity of a given cue x, or attribute, as a predictor of a given category y, increases as the frequency with which cue x is associated with category y increases and decreases as the frequency with which cue x is associated with categories other than y increases. Summation of all cue validities for a category results in the cue validity of an entire category. A category with high cue validity is, by definition, more differentiated from other categories than one of lower cue validity. Further, Rosch believes "information rich bundles of perceptual and functional attributes" that occur in the natural world form natural discontinuities, and that basic cuts in categorization are made at these discontinuities

(Rosch, 1978). The parallel between these principles of categorization and the current effort to form empirically defined sociometric groups is obvious.

Rejected, Average and Popular Children. The results of the discriminant function analysis indicate that the Rejected group contains more individuals who are closer to the category prototype ("group centroid") than those in the Average and Popular groups. Two explanations stemming from the conceptualization of sociometric categories as prototypes help explain this. It may be recalled that only one modal upper cutoff was identified for the negative nomination binomial scores, as opposed to two modal cutoffs for the positive nomination binomial scores (Tables 3 and 4). With the choice of a median cutoff it is assured that attributes, in the form of teacher-endorsed observations, are frequently associated with both the Average and Popular groups. The Average and Popular categories represent "fuzzy sets", to use McCloskey and Glucksberg's (1978) terminology. Attributes of the Rejected group, however, are less frequently associated with the other categories (with the exception of the Controversial category, not included in the discriminant function analyses). By this line of reasoning, it would be expected that Rejected would be more differentiated from the other groups than Average and Popular would be from each other, and that the Rejected

group formed from an empirical effort to identify natural discontinuities in important attributes would result in greater differentiation than arbitrary methods of categorization. In fact, this is precisely the outcome of the validational discriminant function analyses.

Secondly, the predictor variables (PIC clinical scales) in the validational portion of the study are all measures designed to assess pathological attributes of children. Attributes reported in the literature and identified in this study which differentiate the prototypical Popular child from other categories involve pro-social behaviors. For example, Popular children are viewed by their peers as leaders and ready to share. Teachers view them as performing exceedingly well academically and as being well adjusted socially. They are not thought to differ from Average peers on rates of aggression (Dodge, 1983; Dodge et al, 1982). The content of items identified as correlates of the positive nomination sociometric in this study are consistent with previous findings. It is likely that discriminant function models based on the three different sociometric classification methods were most effective in discriminating the Rejected group from the Average and Popular groups not only because of the greater cue validity of the Rejected category, but also because the predictor variables were related more directly to the attributes which differentiate the prototypical Rejected child from the other

two categories. The second discriminant function, although non-significant, appeared to maximally discriminate the Popular from the Average groups in all three categorization schemes. A second measure, designed to more directly assess attributes related to the concepts of "prosocial behavior" and competence, would be more useful in the discrimination of the Popular group.

Neglected Children. The greatest limitations to the current study stem from the limited sample size and the attendant elimination of the Neglected and Controversial groups. This prevents validational comparison of the empirically determined Neglected and Controversial groups to the arbitrarily defined groups. However, there is reason to believe that the members of the empirically determined Neglected category share more family resemblance than those of the Coie and Dodge (1983) or Newcomb and Bukowski (1983) methods.

Some researchers (e.g., Gresham, 1981) have suggested that the classification of Neglected children may be an artifact of the sociometric nomination method. A child may be generally liked by, or included in, the activities of the peer group but, because of the constraints of being allowed to name only a small number of peers, appear to be excluded. Additionally, researchers occasionally find that Neglected children do not differ in peer and teacher ratings from

Average or Popular children (e.g.: Virtue & French, 1984). However, with the empirical categorization method used in this study, relatively clear changes were demonstrated for certain correlates (lower endorsement of "has many friends", "well liked by classmates", "complains about other's unfairness", "becomes hysterical, upset or angry" compared to the base rate) at the lower ends of the positive and negative sociometric scales, suggesting relatively high cue validity and probable distinctiveness of this group. In contrast to arbitrary classification methods, different levels of sociometric scores are required in the empirical classification scheme binomial scores, (<86 on positive index, <76 on negative index).

The distinctiveness of the empirical Neglected group is suggested by inspection of mean PIC scores for this group versus those identified as Neglected using the arbitrary schemes. Four of the twelve PIC scale means are in the "clinical range" ($\underline{T}$>59) for this group (Achievement, Intellectual Screening, Development, and Hyperactivity scales), compared to one scale for the Newcomb and Bukowski (1983) group (Intellectual Screening) and no scales for the Coie and Dodge (1983) group (Appendix E, Table E-3). Central features of the prototypical Neglected child, as reflected by PIC interpretive guidelines (Lachar & Gdowski, 1979) are likely to include limited academic achievement; deficits in motor coordination, language skills, or

cognitive functions; and poor social and academic adjustment associated with over-activity, distractibility, or provocation of peers. Similar attributes have been suggested directly (Dygdon, Conger, & Keane, 1987) and indirectly in the work of other researchers (Carlson, et al., 1984; Ollendick, Francis, & Hart, 1985).

Low temporal stability of arbitrarily defined Neglected group children (Coie & Dodge, 1983; Newcomb & Bukowski, 1984) may be explained by the finding that these children are often classified as Average by the empirical method. Coie and Dodge found only 25% of their Neglected children being so classified after one year's time. During subsequent years, the Neglected children in Coie and Dodge's study spread across Neglected, Popular, and Average categories. They were more likely than chance to become Average and less likely than chance to become Rejected or Controversial. Appendix D, Table D-2 shows that, of the 12 children identified as Neglected by the Coie and Dodge method, 10 (83%) were identified as belonging to the Average group by the empirical method developed in the current study. Coie and Dodge and others have suggested that Neglected children are not in need of intervention because they will likely move toward more positive social status simply with the passage of time (Cairns, 1983; Coie & Dodge, 1983; Conger & Keane, 1981). Another possibility is that many children who have been categorized as "Neglected" share few of the

attributes associated with the prototypical Neglected child. Rather, the arbitrary sociometric cutoff scores for group membership result in many children categorized as "Neglected" while sharing more attributes in common with the "Average" prototype.

This line of reasoning is also applicable to studies in which no differences are found between Neglected and Average children (Carlson, et al., 1984; Virtue & French, 1984). For example, French and Waas (1985a) reported that Neglected children did not exhibit more behavior problems than Average children on teacher and parent checklists. They view this finding as support for the concentration of efforts by clinicians and researchers on the Rejected child, given little evidence of concurrent adjustment difficulties for Neglected children. French and Waas used a normal distribution model for sociometric classification of their second- and fifth-grade subjects, with Neglected children defined as those scoring only $\leq .5$ SD below the mean on both positive and negative nominations. Therefore, it is highly likely that a considerable number of the children they identified as Neglected would be considered as Average with the empirical classification procedure developed in this study. The lack of significant differences found in French and Waas´s study may be reinterpreted to suggest that there was no clear differentiation between the groups. That is, "fuzzy boundaries" resulted from classification criteria

that did not reflect basic discontinuities between the groups.

Controversial Children. The Controversial group, so named because children in this group appear to share characteristics with both the Popular and Rejected groups (Coie et al., 1982), may in fact consist of a great many children who are close to either the prototypical Popular child or the prototypical Rejected child, but not both. Criteria for inclusion in the Controversial group according to Newcomb and Bukowski's (1983) classification procedure are (a) children who receive a rare positive nomination and/or negative nomination score, and (b) if only one score is rare, a score above the mean on the other dimension. According to the correlate frequency information developed in the current study (Tables 3 and 4), many children classified with the Newcomb and Bukowski definition may be expected to have attributes more in common with either the Rejected or Popular prototypes, and with the Average group, but not with both Rejected and Popular. Newcomb and Bukowski (1984) found that Controversial children were likely to shift to any other sociometric category over time, except for the Neglected group. Interestingly, 33% of the random sample identified as Controversial by the Newcomb and Bukowski method in the current study were classified as Popular under the empirical method, with another 33% being

classified as Rejected and another 33% classified as Average. According to Coie and Dodge's (1983) data, only 31% of their Controversial children remained in this category after one year. Over five years' time, they have a 14% likelihood of moving into the Average group, a 29% likelihood of moving to the Popular group, and a 36% likelihood of being classified as Rejected. Sixty-seven percent of the random sample identified as Controversial by the Coie and Dodge method in this study was classified as Popular under the empirical method, with 17% classified as Average and another 17% as Rejected. Again, it appears likely that many children who have been categorized as "Controversial" share few of the attributes associated with the prototypical Controversial child. Rather, the arbitrary sociometric cutoff scores for "Controversial" group membership result in many children who share more attributes in common with the "Rejected", "Popular", and "Average" prototypes than they do with each other.

Discussion of the temporal stability of category membership suggests an alternate means of demonstrating classification validity. An investigation of the performance of the empirical categorization procedure developed in this study over multiple time periods would demonstrate the extent to which group classifications remain stable. Temporal stability, in part, is related to a

classification procedure's ability to identify relatively homogeneous subsets of children (Newcomb & Bukowski, 1984).

Finally, while it is tempting to speculate on the attributes associated with a child who obtains PIC clinical elevations on Intellectual Screening, Somatic Concern, Depression, Family Relations, and Anxiety (as did the one child identified as Controversial under the empirical categorization method [Appendix E, Table E-5]), the n of this "group" makes such speculation inappropriate. Bukowski and Newcomb (1985) found that a measure based on the variability of peer ratings rather than cumulative or mean ratings was useful in discriminating the Controversial group from other sociometric groups. It is suggested that a similar measure be used in future studies that attempt to determine the criterial attributes of these children. Unfortunately, research on this group will probably remain limited by the small proportion of children classified as Controversial, whatever the classification method (Bukowski & Newcomb, 1985).

Demographic Variables

Because of the relatively small sample size in this study, no effort was made to investigate or control the effects of race or socioeconomic status on sociometric status. No attempt was made to investigate whether or not external correlates of sociometric status were sex specific.

sociometric scores were calculated based on nominations from same-sex peers because elementary school children exhibit strong bias against opposite-sex peers and their primary membership group typically consists of same sex peers (Asher & Hymel, 1981).

Adaptive social behaviors may vary as a function of demographic variables, including age, sex, socioeconomic status, and race. Unfortunately, most of the work on sociometric status has been done with white, middle class, elementary school-aged males. There are indications that what is socially competent behavior at one age may not be at another (Coie & Dodge, 1983; Kurdek & Krile, 1982; Rehnshaw and Asher, 1983). Sex differences have been found in the proportion of children identified as Rejected (Boys more likely; Coie & Dodge, 1983). Sex differences have also been found in behavioral correlates of social status (Kurdek & Krile, 1982; Carlson, et al, 1984; Coie, et al, 1982), although this finding is not always supported (French & Waas, 1985a). Bukowski and Newcomb (1984) found no sex differences in stability of classification. With regard to race effects, or more properly, the effects of minority status in the population being surveyed, fewer blacks were found to be selected as Popular than whites, and proportionately more blacks were selected as Controversial than whites in at least one study (Coie et al., 1982). Roff et al., (1972) found that the relationship between peer

status and future delinquency was not the same at different socioeconomic levels. At the upper and middle socioeconomic levels, delinquency tended to occur in boys who had been rejected by their peers. At the lowest socioeconomic level, delinquency occurred with about equal frequency among popular and rejected children.

Asher and Hymel (1981) have suggested that an examination of the correlates of same-sex versus cross-sex sociometric nominations may be useful. Further, the investigation of sex-bias in reports gathered from significant others (teachers, parents, and peers) would be of interest. Most importantly, future research should attempt to determine sociometric status correlates that may be specific, or limited in application, to particular socioeconomic status groups, racial groups, and gender groups. That is, do the criterial attributes of the prototypical Rejected female differ from the Rejected male? What are the developmental implications of behavioral and peer assessment correlates of social competence? Do the attributes of the Controversial minority student differ from Controversial students whose racial background is in the majority? Do different ethnic or socioeconomic groups value different behavioral attributes in making social judgments? Clearly there is a great need for research which addresses these types of issues. Studies that clarify the function of cultural, racial, socioeconomic, and gender

variables will help to inform child psychological theory and practice (Scarr, 1988).

Conclusions

An empirically based method for sociometric categorization was developed which differed significantly from previously devised methods. The empirical method sought to link classification cutoffs to important external criteria and maximize the overlap of characteristic of children within a particular group. Classification based on arbitrary criteria results in "fuzzy" or diffuse group boundaries, threatening the internal validity of research involving sociometric groups. Generalizability of research on sociometric groups is reduced by the use of a variety of arbitrary classification schemes. The effects of these weaknesses are seen in the lack of temporal stability of arbitrarily formed groups and inconsistent findings between studies.

Future research on empirical sociometric classification methods may help researchers apply the concept of social status in a more standardized way and in a way that reflects the natural discontinuities in children's social behavior. Future attempts to refine sociometric categories should maximize the overlap of attributes discernible from a variety of data sources: peer assessment, behavioral observation, self-report, and reports of significant adults.

An investigation of the organization of the attributes associated with the various sociometric groups might further theory development in the social competence and social skills fields. Cluster analysis, a set of techniques for discovering structure within complex bodies of data (Anderberg, 1973), may be a useful approach to investigating the organization of the criterial attributes of sociometric groups (see Dygdon et al., 1987 for an interesting study of the structure of peer-generated correlates of sociometric status).

The categorization method determined in this study must be viewed as a preliminary approach to refining sociometric classification. Its major weakness stems from the relatively small N of the study. No clear advantage was demonstrated for the empirical method developed in this study, although validational comparison to arbitrary methods was compromised by the elimination of the Neglected and Controversial groups from the analysis. Further, the addition of a measure of prosocial behavior as a predictor variable may have aided in the discrimination of the Popular Group from the Average group. Future attempts to develop predictive models of sociometric group classification should insure that variables related to the criterial attributes of each sociometric group are included.

Results of the current study are further limited by the failure to include a consideration of the effects of

demographic variables on sociometric classification. The use of a larger sample would allow explicit attention to this limitation. In addition, finer discrimination in sociometric score ranges could be accomplished, while retaining adequate numbers of subjects, with a larger sample size. This, in turn, would allow for more confidence and precision in locating cutoff points where the natural discontinuities in category attributes occur.

Note

[1]The use of the terms "Popular", "Average", "Rejected", "Neglected", and "Controversial" may be misleading, even though retained in the body of this dissertation. Bukowski and Newcomb (1985) have noted that the "controversy" that is associated with "Controversial" children is actually a description of the peer group's perception of them and not a description of the children themselves. In light of this, and the negative connotation associated with the term "controversial", Bukowski and Newcomb suggest the term Mixed Popularity (which also appears to be a description of the peer group's perception of them) as a more adequate name for this group. Parallel arguments may be made for the names of the other sociometric categories. Refinement in terminology will probably become necessary as the criteria for membership in sociometric groups become more refined.

For example, in the current study two of the five correlate placements for the positive sociometric index occurred at a binomial score of >95 and one at the score of >105, with a cutoff point of 105 chosen for the formation of the Popular group (see Results section). The group formed by the empirical method was characterized by teacher observations that have previously been associated in the literature with "Popular" children formed by arbitrary methods (i.e.: good sense of humor, plays enthusiastically, has many friends). While these may be desirable social attributes, they are not the exclusive province of children who are "extreme" on positive sociometric nomination measures. Given the fact that three of the items found to correlate most highly with positive nomination scores do not show a relatively distinct clustering at the upper extreme of the distribution, it is suggested that the term "Popular" and the criteria for inclusion in this group are in need of rethinking. The term Prosocial may be a better descriptor of this group and carry less excess meaning.

Similarly, simply calling the distinctive Rejected group "Rejected" is thought to miss important core characteristics of this group: aggressive, impulsive, and punishing social behavior. Although the term "antisocial" comes closer to a succinct description of these children, this too carries excess meaning. Antisocial suggests a diagnostic category, and most "antisocial" children do not become antisocial adults (Robins, 1978). The term Dyssocial, no longer a part of the official psychiatric nomenclature, is available as an alternative for the Rejected group. Hyposocial and Nomosocial are offered as possible alternatives for the "Neglected" and "Average" groups, respectively. To increase consistency in terminology, Parasocial might replace either "Controversial" or "Mixed Popularity".

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Appendixes

Appendix A

Table A-1

Correlation of Positive Nomination Binomial Scores with Individual Items

HRI Item No.	WPBIC Item No.	Correlation	2-tailed p
39		.46	<.0001
34		.44	<.0001
4		.35	.0010
44		.33	.0022
25		.32	.0032
23		.31	.0042
36		.30	.0046
2		.30	.0060
6		.29	.0070
14		.29	.0070
26		.29	.0077
32		.28	.0100
48		.28	.0101
52		.28	.0107
	9	-.26	.0145
10		.26	.0161
43		.26	.0168
1		.25	.0216
53		.24	.0267
37		.24	.0276
13		.23	.0310
45		.23	.0311
38		.24	.0319
	14	-.23	.0333
31		.23	.0359
	13	-.23	.0368
22		.22	.0445
	37	-.22	.0455

(table continues)

HRI Item No.	WPBIC Item No.	Correlation	2-tailed p
51		.22	.0458
	50	-.21	.0500
42		.21	.0507
	1	-.21	.0527
8		.21	.0551
16		.20	.0658
5		.20	.0661
	35	-.20	.0715
19		.19	.0791
24		.19	.0865
3		.19	.0885
27		.19	.0894
	48	-.19	.0899
15		.18	.0926
	29	-.17	.1143
50		.17	.1195
9		.17	.1289
49		.16	.1408
40		.16	.1471
	28	-.16	.1486
46		.15	.1593
	23	-.15	.1679
30		.14	.1865
	49	-.14	.1904
29		.14	.1979
21		.14	.2088
28		.13	.2216
	16	-.13	.2216
33		.13	.2275
11		.13	.2515
	21	.12	.2653
41		.12	.2667
7		.12	.2725
	46	.11	.3087
	18	-.11	.3146
	17	-.11	.3367
	47	-.10	.3403

(table continues)

HRI Item No.	WPBIC Item No.	Correlation	2-tailed p
	34	.10	.3451
	26	-.10	.3786
	31	-.10	.3786
18		.09	.3947
35		.09	.4076
	41	-.09	.4315
17		.08	.4530
	8	-.08	.4867
47		.08	.4871
	24	-.07	.5240
	19	-.07	.5255
	12	-.06	.5576
12		.06	.5640
20		.06	.5768
54		.06	.5788
	15	.06	.5796
	4	.06	.5824
	30	-.06	.6142
	40	-.06	.6142
	32	.05	.6394
	39	.05	.6394
	3	-.05	.6473
	25	-.05	.6803
	38	-.03	.7729
	45	-.03	.8145
	42	.02	.8587
	2	-.01	.8921
	6	.01	.9528
	27	.00	.9679
	22	-.00	.9693
	10	.00	.9721
	5	-.00	.9944

Table A-2

Correlation of Negative Nomination Binomial Scores with Individual Items

WPBIC Item No.	HRI Item No.	Correlation	2-tailed p
3		.51	<.0001
1		.46	<.0001
31		.46	<.0001
	34	-.45	<.0001
8		.40	.0002
	42	-.39	.0002
35		.38	.0003
	6	-.38	.0003
37		.38	.0004
	36	-.37	.0004
	53	-.37	.0004
	39	-.38	.0004
	7	-.37	.0005
18		.36	.0008
14		.33	.0018
16		.33	.0019
	30	-.32	.0031
	15	-.31	.0035
24		.31	.0040
	22	-.31	.0040
4		.31	.0045
	18	-.30	.0046
27		.30	.0050
	28	-.28	.0096
	29	-.28	.0104
	54	-.28	.0104
	32	-.27	.0125
	51	-.26	.0144
	8	-.26	.0169
	12	-.25	.0221
	52	-.25	.0224

(table continues)

WPBIC Item No.	HRI Item No.	Correlation	2-tailed p
38		.24	.0256
	16	-.24	.0271
	23	-.25	.0306
	44	-.23	.0358
	46	-.22	.0413
23		.22	.0450
	43	-.21	.0504
	41	-.21	.0535
	47	-.21	.0540
	1	-.21	.0572
	45	-.20	.0663
30		.19	.0769
5		.19	.0775
	37	-.19	.0802
	26	-.19	.0807
	25	-.18	.0934
45		.18	.0986
	2	-.18	.1008
39		.18	.1036
	38	-.18	.1100
	33	-.17	.1125
	10	-.17	.1257
	13	-.17	.1262
	49	-.17	.1290
	40	-.16	.1393
	5	-.15	.1587
15		-.15	.1626
41		.15	.1675
19		.15	.1787
	11	-.15	.1840
	17	-.15	.1853
17		.14	.1867
	3	-.13	.2209
	24	-.13	.2235
	4	-.13	.2348
	27	-.13	.2370
28		.11	.3006

(table continues)

WPBIC Item No.	HRI Item No.	Correlation	2-tailed p
	20	.11	.3088
	48	-.11	.3089
49		.10	.3405
9		.10	.3745
	21	-.10	.3831
25		.09	.4161
2		.09	.4335
50		.07	.5002
40		-.07	.5045
34		-.06	.5609
13		.06	.6141
6		-.06	.6150
29		.05	.6648
	14	.04	.6850
47		-.04	.6904
	19	.04	.6933
10		.03	.8109
	9	-.02	.8296
42		.02	.8484
21		-.02	.8519
32		.02	.8592
46		.02	.8592
	31	-.02	.8769
	35	-.02	.8812
48		-.01	.8963
12		-.01	.9175
26		.01	.9231
22		.01	.9530
	50	.00	.9802

Table A-3

Correlation of Impact Binomial Scores with Individual Items

WPBIC Item No.	HRI Item No.	Correlation	2-tailed p
3		.44	<.0001
31		.36	.0007
4		.33	.0018
8		.32	.0028
27		.29	.0062
	14	.28	.0107
1		.27	.0117
18		.26	.0158
	7	-.26	.0169
24		.24	.0267
	18	-.22	.0455
16		.21	.0487
	54	-.21	.0494
39		.21	.0501
35		.21	.0506
	42	-.21	.0536
38		.21	.0596
	12	-.19	.0820
5		.19	.0831
	19	.19	.0841
	30	-.19	.0841
37		.19	.0860
	53	-.17	.1206
48		-.17	.1242
	28	-.16	.1418
	31	.16	.1435
	15	-.16	.1460
	20	.16	.1548
	29	-.15	.1682
45		.15	.1704
	4	.15	.1794
30		.14	.1879

(table continues)

WPBIC Item No.	HRI Item No.	Correlation	2-tailed p
	47	-.14	.1895
14		.14	.1960
	50	.14	.2119
	6	-.14	.2144
47		-.13	.2475
13		-.13	.2542
	22	-.12	.2691
	36	-.12	.2870
40		-.11	.3094
	48	.11	.3250
9		-.11	.3320
46		.11	.3352
	41	-.10	.3514
	9	.10	.3527
15		-.10	.3680
	46	-.09	.3888
19		.09	.3951
50		-.09	.3985
23		.09	.4032
	34	-.09	.4208
29		-.08	.4456
	51	-.08	.4516
	8	-.08	.4580
21		.08	.4726
	17	-.08	.4933
	16	-.07	.4970
41		.07	.4973
2		.07	.5198
	25	.07	.5239
	33	-.07	.5491
32		.07	.5513
26		-.07	.5521
12		-.06	.5900
	2	.06	.6007
17		.06	.6102
25		.06	.6113
	35	.05	.6230

(table continues)

WPBIC Item No.	HRI Item No.	Correlation	2-tailed p
6		-.05	.6410
	26	.05	.6507
	10	.05	.6615
	44	.04	.7099
	11	-.04	.7113
42		.04	.7200
	32	-.04	.7358
10		.03	.7864
	40	-.03	.7946
	49	-.03	.8066
34		.02	.8256
	27	.02	.8354
28		-.02	.8434
	52	-.02	.8512
	13	.02	.8594
	38	.02	.8629
	24	.02	.8743
	23	.01	.8956
	3	.01	.8974
49		-.01	.9054
	21	.01	.9242
	5	.01	.9290
	45	-.01	.9408
	37	.01	.9447
	43	-.01	.9556
	39	.00	.9708
22		.00	.9771
	1	.00	.9917

Appendix B

Table B-1

Intercorrelations Between Sociometric Indices

Index	Standard Normal Method			Binomial Method		
	Negative	Impact	Preference	Positive	Negative	Impact
Standard Normal Method						
Positive	-.33*	.65**	.84**	.99**	-.34*	.45**
Negative	--	.50**	-.77**	-.32*	.97**	.66**
Impact		--	.15	.63**	.47**	.94**
Peference			--	.84**	-.76**	-.07
Binomial Method						
Positive				--	-.34*	.45**
Negative					--	.68**

*$p<.01$. **$p<.0001$.

Appendix C

Table C-1

Crosstabulation of WPBIC Item 1 by Negative Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	14	1	15
	%	93.4	6.7	17.6
76 to 85	n	18	3	21
	%	85.7	14.3	24.7
86 to 95	n	14	2	16
	%	87.5	12.5	18.8
96 to 105	n	8	1	9
	%	88.9	11.1	10.6
106 to 115	n	3	4	7
	%	42.9	57.1	8.2
116 to 135	n	6	3	9
	%	66.7	33.3	10.5
>135	n	2	6	8
	%	25.0	75.0	9.4
Column Total	n	65	20	85
	%	77.5	23.5	100.0

Note. WPBIC Item 1: Complains about others' unfairness and/or discrimination towards him/her.

Table C-2

Crosstabulation of WPBIC Item 3 by Negative Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	15	0	15
	%	100.0	0.0	17.6
76 to 85	n	21	0	21
	%	100.0	0.0	24.7
86 to 95	n	14	2	16
	%	87.5	12.5	18.8
96 to 105	n	8	1	9
	%	88.9	11.1	10.6
106 to 115	n	5	2	7
	%	71.4	28.6	8.2
116 to 135	n	5	4	9
	%	55.6	44.4	10.5
>135	n	4	4	8
	%	50.0	50.0	9.4
Column Total	n	72	13	85
	%	84.7	15.3	100.0

Note. WPBIC Item 3: Does not conform to limits on his/her own without control from others.

Table C-3

Crosstabulation of WPBIC Item 4 by Negative Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	15	0	15
	%	100.0	0.0	17.6
76 to 85	n	20	1	21
	%	95.2	4.8	24.7
86 to 95	n	14	2	16
	%	87.5	12.5	18.8
96 to 105	n	9	0	9
	%	100.0	0.0	10.6
106 to 115	n	4	3	7
	%	57.1	42.9	8.2
116 to 135	n	8	1	9
	%	88.9	11.1	10.5
>135	n	6	2	8
	%	75.0	25.0	9.4
Column Total	n	76	9	85
	%	89.4	10.6	100.0

Note. WPBIC Item 4: Becomes hysterical, upset, or angry when things do not go his/her way.

Table C-4

Crosstabulation of WPBIC Item 8 by Negative Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	15	0	15
	%	100.0	0.0	17.6
76 to 85	n	20	1	21
	%	95.2	4.8	24.7
86 to 95	n	16	0	16
	%	100.0	0.0	18.8
96 to 105	n	9	0	9
	%	100.0	0.0	10.6
106 to 115	n	7	0	7
	%	100.0	0.0	8.2
116 to 135	n	9	0	9
	%	100.0	0.0	10.5
>135	n	6	2	8
	%	75.0	25.0	9.4
Column Total	n	82	02	85
	%	96.5	3.5	100.0

Note. WPBIC Item 8: Other children act as if he/she were taboo or tainted.

Table C-5

Crosstabulation of WPBIC Item 27 by Negative Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	15	0	15
	%	100.0	0.0	17.6
76 to 85	n	19	2	21
	%	90.5	9.5	24.7
86 to 95	n	16	0	16
	%	100.0	0.0	18.8
96 to 105	n	9	0	9
	%	100.0	0.0	10.6
106 to 115	n	6	1	7
	%	85.7	14.3	8.2
116 to 135	n	9	0	9
	%	100.0	0.0	10.5
>135	n	6	2	8
	%	75.0	25.0	9.4
Column Total	n	80	5	85
	%	94.1	5.9	100.0

Note. WPBIC Item 27: Has temper tantrums.

Table C-6

Crosstabulation of WPBIC Item 31 by Negative Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	15	0	15
	%	100.0	0.0	17.6
76 to 85	n	21	0	21
	%	100.0	0.0	24.7
86 to 95	n	16	0	16
	%	100.0	0.0	18.8
96 to 105	n	9	0	9
	%	100.0	0.0	10.6
106 to 115	n	7	0	7
	%	100.0	0.0	8.2
116 to 135	n	9	0	9
	%	100.0	0.0	10.5
>135	n	7	1	8
	%	87.5	12.5	9.4
Column Total	n	84	1	85
	%	98.8	1.2	100.0

Note. WPBIC Item 31: Has rapid mood shifts: depressed one moment, manic the next.

Table C-7

Crosstabulation of HRI Item 4 by Positive Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	3	6	9
	%	33.3	66.7	10.6
76 to 85	n	8	7	15
	%	53.3	46.7	17.6
86 to 95	n	6	9	15
	%	40.0	60.0	17.6
96 to 105	n	2	17	19
	%	10.5	89.5	22.4
106 to 115	n	1	8	9
	%	11.1	88.9	10.6
116 to 135	n	2	9	11
	%	18.2	81.8	12.9
>135	n	1	6	7
	%	14.3	85.7	8.2
Column Total	n	23	62	85
	%	27.1	72.9	100.0

Note. HRI Item 4: Has a good sense of humor.

Table C-8

Crosstabulation of HRI Item 25 by Positive Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	3	6	9
	%	33.3	66.7	10.7
76 to 85	n	7	8	15
	%	46.7	53.3	17.9
86 to 95	n	5	10	15
	%	33.3	66.7	17.9
96 to 105	n	2	17	19
	%	10.5	89.5	22.6
106 to 115	n	1	7	8
	%	12.5	87.5	9.6
116 to 135	n	2	9	11
	%	18.2	81.8	13.1
>135	n	1	6	7
	%	14.3	85.7	8.3
Column Total	n	21	63	84[a]
	%	25.0	75.0	100.0

Note. HRI Item 25: Plays enthusiastically.
[a]Missing data for one subject in 106 to 115 range caused reduction in N for this table.

Table C-9

Crosstabulation of HRI Item 34 by Positive Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	5	4	9
	%	55.6	44.4	10.6
76 to 85	n	9	6	15
	%	60.0	40.0	17.6
86 to 95	n	5	10	15
	%	33.3	66.7	17.6
96 to 105	n	5	14	19
	%	26.3	73.7	22.4
106 to 115	n	2	7	9
	%	22.2	77.8	10.6
116 to 135	n	3	8	11
	%	27.3	72.7	12.9
>135	n	1	6	7
	%	14.3	85.7	8.2
Column Total	n	30	55	85
	%	35.3	64.7	100.0

Note. HRI Item 34: Well liked by classmates.

Table C-10

Crosstabulation of HRI Item 39 by Positive Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	6	3	9
	%	66.7	33.3	10.6
76 to 85	n	11	4	15
	%	73.3	26.7	17.6
86 to 95	n	7	8	15
	%	46.7	53.3	17.6
96 to 105	n	7	12	19
	%	36.8	63.2	22.4
106 to 115	n	2	7	9
	%	22.2	77.8	10.6
116 to 135	n	3	8	11
	%	27.3	72.7	12.9
>135	n	1	6	7
	%	14.3	85.7	8.2
Column Total	n	37	48	85
	%	43.5	56.5	100.0

Note. HRI Item 39: Has many friends.

Table C-11

Crosstabulation of HRI Item 44 by Positive Nomination Binomial Score Ranges

Range		Criterion Absent	Criterion Present	Row Total
<76	n	5	4	9
	%	55.6	44.4	10.6
76 to 85	n	8	7	15
	%	53.3	46.7	17.6
86 to 95	n	7	8	15
	%	46.7	53.3	17.6
96 to 105	n	5	14	19
	%	26.3	73.7	22.4
106 to 115	n	2	7	9
	%	22.2	77.8	10.6
116 to 135	n	4	7	11
	%	36.4	63.6	12.9
>135	n	1	6	7
	%	14.3	85.7	8.2
Column Total	n	32	53	85
	%	37.6	62.4	100.0

Note. HRI Item 44: Adjusts well to changes in the classroom routine.

Table D-1

Crosstabulation of Coie & Dodge (1983) Categorization by Newcomb & Bukowski (1983) Categorization.

Category	Newcomb & Bukowski					Row Total
	Popular	Average	Neglected	Rejected	Controversial	
Coie & Dodge						
Popular						
n	11	3				14
Row %	79	21				17
Column %	100	6				
Total %	13	4				
Average						
n		39		3		42
Row %		93		7		49
Column %		75		33		
Total %		46		4		
Neglected						
n		2	10			12
Row %		17	83			14
Column %		4	100			
Total %		2	12			

(table continues)

Category	Newcomb & Bukowski: Popular	Average	Neglected	Rejected	Controversial	Row Total
Coie & Dodge						
Rejected						
n		5		6		11
Row %		46		55		13
Column %		10		67		
Total %		6		7		
Controversial						
n		3			3	6
Row %		50			50	7
Column %		6			100	
Total %		4			4	
Column Total						
n	11	52	10	9	3	85
%	13	61	12	11	4	100

Table D-2

Crosstabulation of Coie & Dodge (1983) Categorization by Empirical Categorization.

Category	Empirical Method Popular	Average	Neglected	Rejected	Row Total
Coie & Dodge					
Popular					
n	14				14
Row %	100				17
Column %	52				
Total %	17				
Average					
n	9	32		1	42
Row %	21	76		2	49
Column %	33	67		13	
Total %	11	38		1	
Neglected					
n		10	2		12
Row %		83	17		14
Column %		21	100		
Total %		12	2		

(table continues)

Category	Empirical Method				Row Total
	Popular	Average	Neglected	Rejected	
Coie & Dodge					
Rejected					
n		5		6	11
Row %		46		55	13
Column %		10		75	
Total %		6		7	
Controversial					
n	4	1		1	6
Row %	67	17		17	7
Column %	15	2		13	
Total %	5	1		1	
Column Total					
n	27	48	2	8	85
%	32	57	2	9	100

Table D-3

Crosstabulation of Newcomb & Bukowski (1983) Categorization by Empirical Categorization.

Category	Empirical Method				Row Total
	Popular	Average	Neglected	Rejected	
Newcomb & Bukowski					
Popular					
n	11				11
Row %	100				13
Column %	41				
Total %	13				
Average					
n	15	37			52
Row %	29	71			61
Column %	56	77			
Total %	18	44			
Neglected					
n		8	2		10
Row %		80	20		12
Column %		17	100		
Total %		9	2		

(table continues)

Category	Empirical Method				Row Total
	Popular	Average	Neglected	Rejected	
Newcomb & Bukowski					
Rejected					
n		2		7	9
Row %		22		78	11
Column %		4		88	
Total %		2		8	
Controversial					
n	1	1		1	3
Row %	33	33		33	4
Column %	4	2		13	
Total %	1	1		1	
Column Total					
n	27	48	2	8	85
%	32	57	2	9	100

Appendix E

Table E-1

Popular Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical (n = 49)		Coie & Dodge (n = 32)		Newcomb & Bukowski (n = 30)	
Scale	M	SD	M	SD	M	SD
Achievement	50	11	48	10	48	10
Intellectual Screening	52	11	52	12	52	11
Development	49	10	47	9	47	9
Somatic Concern	51	11	50	9	50	9
Depression	51	12	50	10	50	11
Family Relations	51	11	50	10	49	10
Delinquency	50	11	49	12	49	12
Withdrawal	50	9	49	9	49	9
Anxiety	55	12	53	9	53	9
Psychosis	50	12	50	12	50	12
Hyperactivity	51	12	49	10	48	8
Social Skills	44	11	44	11	43	11

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

Table E-2

Average Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical (n = 61)		Coie & Dodge (n = 51)		Newcomb & Bukowski (n = 56)	
Scale	M	SD	M	SD	M	SD
Achievement	51	11	51	11	51	11
Intellectual Screening	54	13	54	13	53	14
Development	51	10	50	10	50	10
Somatic Concern	54	10	56	9	54	9
Depression	53	11	55	12	55	12
Family Relations	51	10	52	11	52	11
Delinquency	51	8	52	8	52	9
Withdrawal	51	9	52	9	53	10
Anxiety	55	12	58	12	57	13
Psychosis	54	10	54	10	55	10
Hyperactivity	51	9	51	11	51	12
Social Skills	48	10	48	11	48	11

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

Table E-3

Neglected Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical (n = 4)		Coie & Dodge (n = 16)		Newcomb & Bukowski (n = 14)	
Scale	M	SD	M	SD	M	SD
Achievement	70	16	56	14	56	15
Intellectual Screening	66	14	58	12	60	11
Development	71	7	57	11	58	12
Somatic Concern	50	5	52	11	52	11
Depression	51	11	50	9	48	8
Family Relations	54	15	51	13	51	13
Delinquency	52	6	52	7	51	7
Withdrawal	46	6	47	7	46	4
Anxiety	51	11	50	8	49	7
Psychosis	58	12	54	11	54	12
Hyperactivity	60	20	54	12	56	12
Social Skills	54	11	49	11	50	11

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

Table E-4

Rejected Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical		Coie & Dodge		Newcomb & Bukowski	
	(n = 21)		(n = 27)		(n = 29)	
Scale	M	SD	M	SD	M	SD
Achievement	52	11	51	11	52	11
Intellectual Screening	48	16	50	14	50	14
Development	50	9	51	10	50	10
Somatic Conern	56	12	53	12	55	11
Depression	58	12	55	12	55	11
Family Relations	55	11	54	10	54	10
Delinquency	60	14	57	14	58	13
Withdrawal	49	7	48	7	48	6
Anxiety	58	12	55	12	57	11
Psychosis	58	14	57	14	56	13
Hyperactivity	65	11	61	12	61	12
Social Skills	59	14	55	15	55	14

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

Table E-5

Controversial Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical		Coie & Dodge		Newcomb & Bukowski	
	(n = 1)		(n = 10)		(n = 7)	
Scale	M	SD	M	SD	M	SD
Achievement	52	-	58	13	52	11
Intellectual Screening	65	-	56	12	56	9
Development	59	-	56	11	53	12
Somatic Concerns	69	-	54	16	55	20
Depression	64	-	54	16	51	16
Family Relations	67	-	50	8	52	9
Delinquency	55	-	53	10	53	10
Withdrawal	55	-	54	13	53	12
Anxiety	66	-	61	16	59	16
Psychosis	52	-	50	10	51	12
Hyperactivity	36	-	56	14	57	11
Social Skills	45	-	46	8	45	8

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology. Insufficient n for empirical group for SD.

Appendix F

Table F-1

Correlations of Predictor Variables with Significant Discriminant Functions

	Categorization Method Discriminant Function		
Scale	Empirical	Coie & Dodge	Newcomb & Bukowski
Achievement	.07	.09	.37
Intellectual Screening	-.21	-.08	.08
Development	.03	.18	.26
Somatic Concern	.19	.00	.27
Depression	.23	.15	.24
Family Relations	.24	.23	.26
Delinquency	.54	.39	.45
Withdrawal	.01	-.20	-.16
Anxiety	.12	.00	.08
Psychosis	.38	.29	.41
Hyperactivity	.73	.74	.84
Social Skills	.62	.54	.63

Note. Underscored values are of those variables that were included in the last step of the respective analysis.

Appendix G

I agree to participate in a research project explained to me by Mr. Falk. I understand that the answers I give in this Project will not be shared with anyone else.

_____

Signature of Student

_____

Date

OR

I do not want to participate in the research project explained to me by Mr. Falk.

_____

Signature of Student

_____

Date

Appendix H

Dear Parents:

(Name of School) has agreed to participate in research on children's friendship and related behaviors. It is anticipated that the information collected in this study will be useful to educators in planning learning experiences and to professionals in helping children play more successfully with other children. We would like to request your permission for your child to join in our project.

The first part of the study will involve a 20 minute session conducted at the school. Children will be asked to tell us which of the children in their grade they especially like interacting with and which grademates they do not particularly enjoy interacting with.

After we have gathered this information, we will ask some of you to help in the second part of the project. Again, participation is voluntary. We will want to gather the opinions of the parents and teachers of some of the children. We are interested in how adults' views of children's behavior relate to the children's friendships. We hope that this information will help us to provide children with effective ways of making and maintaining friendships.

In our experience, the children find the questionnaires fun to complete, and teachers in the past have suggested that learning to complete forms like these is a good learning experience.

The purpose of this letter is to inform you of the study and to request permission for your child to participate. All information collected in this study will be treated with complete anonymity and confidentiality, and at the conclusion of the study all questionnaire information will be destroyed. You are of course free to request additional explanation of the study at any time, both before and after your child participates, and both you and your child are free to terminate your participation at any time if you desire to do so. Furthermore, your agreement to allow your child to participate in the first part of the project leaves you under no obligation to participate in the second part of the study.

We hope that you will agree to your child's participation in this project. Please fill out and sign the attached form if you are freely willing to give consent for your child to participate. If you do not wish for your child to participate, please check the appropriate box. Then, have your child return the form to school. In this way, we can be sure you saw the letter. Your child can earn a small prize

for returning the signed permission slip, whether or not you give your permission for your child to participate in the study. Your child will also be asked for permission before participating.

If you have any questions, please call Mr. Falk at [redacted] and he will try to answer them directly.

Sincerely,

Robert S. Falk, Ed.S.
Virginia Commonwealth
University

(Principal's name),
Principal,
(Name of School)

I am familiar with the research project discussed in the letter to parents dated 0/00/86. I understand that the information to be collected will treated with complete confidentiality and anonymity. I....

(check one)

____ Give my permission for my son/daughter

_____, to participate in the project.

(name)

____ Do not give my permission for my son/daughter

_____, to participate in the project.

(name)

_____

Signature

_____

Relationship to Child

_____

Date

Appendix I

Dear Parents:

As you may remember, about a month ago we wrote to you asking for the participation of your child in a study we are conducting at (name of school) on children's friendship and related behaviors.

Your child was selected randomly (by chance) for the second part of the study. We want to gather the opinions of the mothers and teachers of some of the children. We are interested in how adults' views of children relate to the children's friendships. We hope that this information will help us to provide children with effective ways of making and maintaining friendships.

Enclosed is a questionnaire for the mother to fill out and a permission form to obtain information from your child's teacher. All information collected in this study will be treated with complete anonymity and confidentiality, and at the conclusion of the study all questionnaire information will be destroyed. You are of course free to request additional explanation of the study at any time, both before and after you and your child's teacher participate, and both you and your child's teacher are free to terminate participation at any time if you or the teacher desire to do so.

If you wish to participate in the second part of this project, please follow the steps on the Instruction Page. We hope that you will agree to participate in this important project.

If you have any questions, please call Mr. Falk at [redacted] and he will try to answer them directly.

Sincerely,

Robert S. Falk, Ed.S.
Virginia Commonwealth
University

(Principal's name),
Principal,
(Name of School)

INSTRUCTIONS

1. First, complete the Permission Form. This will allow us to ask your child's teacher to complete a questionnaire concerning your child's behavior in school.

2. Complete all information on the Personality Inventory for Children (PIC) Revised Answer Sheet. Then read the instructions for the PIC and answer the questions on the answer sheet. Please use a pencil and fill in all questions. There are no "right or wrong" answers. Remember that your answers will be completely confidential. The inventory was primarily designed to be completed by the child's mother. If the mother is not available to complete the inventory, an adult who knows the child well may complete it. Be sure to show the rater's relationship to the child on the answer sheet.

3. As an incentive to return the materials, whether you complete them or not, you are offered a choice of three informative booklets. Please check the title of one booklet that interests you on the Permission Form. If you return all materials, you will receive this booklet.

4. Finally, have your child return the materials to school in the enclosed envelope.

I am familiar with the research project discussed in the letter to parents dated 0/00/86. I understand that the information to be collected will be treated with complete confidentiality and anonymity. I....

(check one)

____ Give my permission for my son's/daughter's teacher to complete a questionnaire describing my child's behavior at school.

____ Do not give my permission for my son's/daughter's teacher to complete a questionnaire describing my child's behavior at school.

_____ Name of Child

_____ Signature

_____ Relationship to Child

_____ Date

Check to receive one of the following booklets as a "thank-you" for returning these materials:

____ 1. How to Help Your Child Learn

____ 2. About Latchkey Children: Tips for Working Parents

____ 3. Keeping Your Child Healthy

Appendix J

Content of WPBIC Items (Walker, 1983).

1. Complains about others' unfairness and/or discrimination towards him/her.
2. Is listless and continually tired.
3. Does not conform to limits on his/her own without control from others.
4. Becomes hysterical, upset or angry when things do not go his/her way.
5. Comments that no one understands him/her.
6. Perfectionistic: Meticulous about having everything exactly right.
7. Will destroy or take apart something he/she has made rather than show it or ask to have it displayed.
8. Other children act as if he/she were taboo or tainted.
9. Has difficulty concentrating for any length of time.
10. Is overactive, restless, and/or continually shifting body positions.
11. Apologizes repeatedly for him/herself and/or his/her behavior.
12. Distorts the truth by making statements contrary to fact.
13. Underachieving: Performs below his/her demonstrated ability level.
14. Disturbs other children: teasing, provoking fights, interrupting others.
15. Tries to avoid calling attention to him/herself.
16. Makes distrustful or suspicious remarks about actions of others toward him/her.
17. Reacts to stressful situation or changes in routine with general body aches, head or stomach aches, nausea.

18. Argues and must have the last word in verbal exchanges.

19. Approaches new tasks and situations with an "I cant´t do it" response.

20. Has nervous tics: muscle-twitching, eye-blinking, nail-biting, hand-wringing.

21. Habitually rejects the school experience through actions or comments.

22. Has enuresis. (Wets bed.)

23. Utters nonsense syllables and/or babbles to him/herself.

24. Continually seeks attention.

25. Comments that nobody likes him/her.

26. Repeats one idea, thought, or activity over and over.

27. Has temper tantrums.

28. Refers to him/herself as dumb, stupid, or incapable.

29. Does not engage in group activities.

30. When teased or irritated by other children, takes out his/her frustrations(s) on another inappropriate person or thing.

31. Has rapid mood shifts: depressed one moment, manic the next.

32. Does not obey until threatened with punishment.

33. Complains of nightmares, bad dreams.

34. Expresses concern about being lonely, unhappy.

35. Openly strikes back with angry behavior to teasing of other children.

36. Expresses concern about something terrible or horrilbe happening to him/her.

37. Has no friends.

38. Must have approval for tasks attempted or completed.

39. Displays physical aggression toward objects or persons.

40. Is hypercritical of him/herself.

41. Does not complete tasks attempted.

42. Doesn´t protest when others hurt, tease, or criticize him/her.

43. Shuns or avoids heterosexual activities.

44. Steals things from other children.

45. Does not initiate relationships with other children.

46. Reacts with defiance to insturctions or commands.

47. Weeps or cries without provocation.

48. Stutters, stammers, or blocks on saying words.

49. Easily distracted away from the task at hand by ordinary classroom stimuli, i.e. minor movements of others, noises, etc.

50. Frequently stares blankly into space and is unaware of his/her surrounding when doing so.

Contents of HRI (Gesten, 1976).

1. Functions well even with distractions.
2. Feels good about himself or herself.
3. Applies learning to new situations.
4. Has a good sense of humor.
5. Is interested in school work.
6. Shares things with others.
7. Is well-behaved in school.
8. Is mature.
9. Approaches new experiences confidently.
10. Is a happy child.
11. Does oringinal work.
12. Can accept things not going his way.
13. Is pleased with his accomplishments.
14. Defends his views under group pressure.
15. Mood is balanced and stable.
16. Resolves peer problems on his own.
17. Copes well with failure.
18. Follows class rules.
19. Participates in class discussions.
20. Is able to question rules that seem unfair or unclear to him.
21. Uses teacher appropriately as resource.
22. Is affectionate towards others.
23. Is generally relaxed.
24. Is a self-starter.

25. Plays enthusiastically.
26. Completes his homework.
27. Has a lively interest in his environment.
28. Anger, when displayed, is justified.
29. Is trustworthy.
30. Works well without adult support.
31. Expresses ideas willingly.
32. Carries out requests and directions responsibly.
33. Uses imagination well.
34. Well liked by classmates.
35. Is good in artithmetic.
36. Tries to help others.
37. Is well-organized.
38. Faces the pressures of competition well.
39. Has many friends.
40. Works up to potential.
41. Thinks before acting.
42. Accepts legitimate imposed limits.
43. Knows his or her strengths and weaknesses.
44. Adjusts well to changes in the classroom routine.
45. Expresses needs and feelings appropriately.
46. Accepts criticism well.
47. Is a good reader.
48. Is comfortable as a leader and follower.
49. Functions well in unstructured situations.
50. Is spontaneous.

51. Works well toward long-term goals.
52. Works for own satisfaction, not just rewards.
53. Rarely requires restrictions or sanctions.
54. Is polite and courteous.

Appendix K

Publication Draft.

Sociometric Categorization of Childen: An Empirically Based Method

Robert S. Falk and Arnold L. Stolberg

Virginia Commonwealth University

This project was completed as a dissertation requirement by the first author under the supervision of the second author. Reprint requests should be addressed to Robert S. Falk, 1500 Huguenot Rd., Suite 101, Midlothian VA 23113.

Running head: SOCIOMETRIC CATEGORIZATION

Abstract

Recent methods used to identify children's sociometric groups have involved various combinations of sociometric scores and arbitrary inclusion/exclusion criteria. These arbitrary approaches to sociometric categorization result in limitations on the validity and generalizability of research in the area. An empirically based sociometric categorization method was devised to help remedy these limitations. The efficiency of the new method in classifying Popular, Average, and Rejected children was compared to that achieved by two arbitrary classification schemes. No significant difference was found between the three methods' ability to correctly classify cases into one of the three groups with parent ratings as predictor variables. However, two important groups (Neglected and Controversial children) were deleted from the comparison because of inadequate size. This placed an unintended limit on the validational comparison. Advantages of an empirical approach to sociometric classification and implications of the study are discussed in terms of the cognitive psychological concept of prototypes. Limitations of the current study together with possible directions for future research are presented.

Sociometric Categorization of Children: An Empirically Based Method

Sociometric assessment has been a popular method for investigating the social competence of children and the prediction of future adjustment difficulties (Asher & Hymel, 1981; Cowen, Pederson, Babigian, Izzo, & Trost, 1973). One of the earliest sociometric techniques, the peer-nomination measure (Moreno, 1934), has undergone considerable research and development. Typically, researchers using nomination sociometry obtain positive and negative nomination data from a group. Children might, for example, be asked to nominate three peers whom they enjoy playing with (positive nomination), and three peers whom they do not enjoy playing with (negative nomination). By considering positive and negative scores, children are classified into Popular (high positive, low negative), Neglected (low positive, low negative), Rejected (low positive, high negative), Controversial (high positive, high negative), or Average (extreme on neither positive nor negative scores) groups. Significant differences exist between these sociometric categories on behavioral, social, and cognitive indices (Asher & Wheeler, 1985; Dodge, Schlundt, Schocken & Delugach, 1983).

Two aspects of this general procedure result in significant limitations to sociometric applications. The first involves the type of scores used in assigning children to sociometric groups. Various combinations of raw scores, standard deviation units,

standardized scores, and binomial probability scores have all been used in classification procedures. Secondly, inclusion/exclusion criteria, or cutoff scores, are based on an arbitrary statistical decision regarding the "extremeness" of children's statements (positive and negative nominations) regarding their peers.

Types of Scores Used in Classification Procedures

Three general classification procedures are commonly used in sociometric classification. Classification may be based on (a) the frequency of nominations, in which case raw positive and negative nomination scores are used (e.g., Dodge, 1983); (b) on a normal distribution model, using either standard deviation scores or a standard normal distribution, often involving the combination of positive and negative scores to form "social impact" scores and "social preference scores" (e.g., French and Waas, 1985); or (c) on a probability model, where scores are based on the binomial probability distribution rather than population parameters or sample statistics (e.g., Newcomb & Bukowski, 1983). These three general procedures do not exhaust the sociometric classification schemes reported in the literature. One rather obvious limitation to the use of such a variety of procedures is that similar groups of children may not be identified across studies, limiting the generalizability of research findings (Kazdin, 1980).

Choice of Cutting Scores in Sociometric Classification

Arbitrary cutoff points are chosen to allow sociometric classification no matter which of the previously described methods is used. The illusion that boundaries between categories are distinct, created by the use of similar sociometric labels (Popular, Rejected, etc.) across research reports, is misleading. In truth, they are only artificially distinct. For example, in the normal distribution model, *z*-scores of 0.5, 1.0 or 2.0, or any other level of deviation from the mean, may be chosen for the classification criteria. In Newcomb and Bukowski's (1983) approach, a criterion probability level of .05 was chosen for determination of rare scores, while in a later article (Newcomb & Bukowski, 1984) a criterion probability level of $p<.10$ was used.

The objective of category formation includes the grouping of elements into clusters such that the elements within a cluster have a high degree of "natural association" among themselves while the clusters are "relatively distinct" from each other (Anderberg, 1973). Because membership in a sociometric category is based on arbitrary decisions rather than naturally occurring properties of individuals, heterogeneous groups may result, reducing the external validity of research involving sociometric groups. The use of different criterion levels for classification purposes in different studies reduces the generalizability of results, while the use of

quasi-diagnostic labels suggests just the opposite to the casual reader of the sociometric literature.

Purpose of the Study

The variety of arbitrary classification procedures used limits research based on sociometric data. The present study sought to remedy this limitation through the determination of empirically based cutting scores. It was proposed that binomial sociometric cutting scores based on observations of children's behavior would serve to increase the homogeneity of sociometric groups, increasing the association between research variables and sociometric categories. In turn, this would allow for greater generalization of findings across studies.

Method

Subjects and sociometric procedures

All children in the third, fourth, and fifth grades of two suburban elementary schools (N = 489) who had given their permission and had returned properly signed parental permission forms participated in a sociometric nomination procedure as part of a different research project (Falk & Stolberg, 1987) (N = 396, 81%). Children participated in peer nominations conducted in 38 groups. Students were asked to nominate three grademates they "especially like to do things with" (positive nomination) and three grademates they "don't like to do things with" (negative nomination) on typed

grade level rosters. Students participating in the peer nominations were assigned numbers and 120 children were randomly selected using a table of random numbers. Parents were contacted by a letter sent home with their child and asked for their permission to gather ratings from the child's teacher (described later under Criterion Data). Parents were also asked to complete the Personality Inventory for Children (PIC; Wirt, Lachar, Klinedinst, & Seat, 1984). Follow-up phone calls were made to non-respondents to maximize the return rate. Eighty-five of the original random sample returned signed permission forms, for a 71 percent return rate (Male N = 44, Female N = 41).

Parent and teacher ratings had also been gathered on an additional, non-random, sample of 53 children to meet the requirements of the previous study (Falk & Stolberg, 1987). This study had involved a sociometric classification scheme along the lines of Newcomb and Bukowski's (1983) procedure with a binomial criterion probability level of .10. For this expanded sample, random assignment had been continued past the original 120 children until each of five sociometric groups had 39 members or the sample from a particular group was exhausted. Data on these children were combined with the 85 randomly sampled children for use in validational discriminant function analysis (see Data Analysis

section). A total of 138 cases were available for analysis (Male N = 70, Female N = 68).

Measures

Sociometric scores

Total same-sex positive and negative scores were calculated for each child. Positive and negative raw scores were summed to obtain an impact score. Means and standard deviations for the binomial distributions of the three sociometric indices (positive nomination, negative nomination, and impact) were determined (Howell, 1982). Scores on the three sociometric indices were transformed into scores with a mean of 100 and a standard deviation of 15 because of the familiarity of this metric.

Criterion Data

Criterion data were collected from the children's teachers. These primary informants responded to 104 items contained in two inventories: the Walker Problem Behavior Identification Checklist (WPBIC) (Walker, 1983) and the Health Resources Inventory (HRI) (Gesten, 1976). These instruments were chosen because they assess indicators of pathology and competence related to sociometric status (Falk & Stolberg, 1987).

Walker Problem Behavior Identification Checklist. The WPBIC (Walker, 1983) consists of 50 descriptions of observable, maladaptive behaviors which were generated through interviews with

elementary school teachers. The WPBIC items describe child behaviors that are thought to interfere or compete with successful academic performance and/or school adjustment. Factor-analytically derived clusters make up five subscales of the WPBIC: Acting-out, Withdrawal, Distractibility, Disturbed Peer Relations, and Immaturity. Studies of the WPBIC's item variance indices, item validity indices, and item intercorrelations have been reported by Walker (1983).

Health Resources Inventory. The HRI (Gesten, 1976) is a 54 item inventory designed to assess competence behaviors. Items were drawn from prior health scales, literature statements concerning healthy functioning, and suggestions from teachers, mental health professionals, and parents. The HRI discriminates between clinically disturbed and normal children, and distinguishes levels of competence within a normative sample (Gesten, 1976). Factor analysis of the HRI has yielded five factors: Good Student, Adaptive Assertiveness, Peer Sociability, Follows Rules, and Frustration Tolerance.

Validation Measure

Personality Inventory for Children (PIC). The PIC (Wirt et al., 1984) was used as an independent source of data in validating the classification groups formed by empirically determined cutoff scores and two arbitrary methods of sociometric categorization. The

Revised Format, Parts I & II (Lachar, 1982) was used in this study. This 280 true-false item inventory yields normed scores on three validity scales, one screening scale (Adjustment, ADJ), 12 clinical scales, and four broad-band factor scales. Acceptable internal consistency and test-retest reliability has been reported for the Revised Format scales (Lachar, 1982). The clinical scales were used in the validation analysis.

Data Analysis

Data analysis occurred in four stages (see Results for more detailed descriptions). First, potential sociometric scale descriptors were identified by correlational analyses. Second, actuarial guidelines for sociometric indices were developed by determining the relationship between the frequencies of external criteria and ranges of binomial scores. In the third stage, cutoffs for sociometric classification were determined.

In the fourth stage, a validational comparison of the empirical method of sociometric categorization to the Coie and Dodge (1983) and Newcomb and Bukowski (1983) methods was performed. Three of the sociometric groups determined by each method ("Popular", "Average", and "Rejected") were used for discriminant function analysis, with PIC scores serving as predictor variables. The "Controversial" and "Neglected" groups were dropped from analysis due to insufficient numbers of cases in these groups (Tabachnick and Fidell, 1983).

McNemar's chi square test for change was applied to classification results to determine if classification improved as a result of categorization method (McNemar, 1969).

Results

Stage I: Identification of sociometric scale correlates

Point biserial correlations between the 50 dichotomous criteria (WPBIC) and each of the three sociometric indices (positive nomination, negative nomination, and impact) and Pearson correlations between the 54 ordinal criteria (HRI) and the three sociometric indices were calculated. The five external criteria (HRI and WPBIC items) which correlated most highly with each of the three sociometric indices were identified. Because of overlap, a total of eleven scale correlates were identified, with ad hoc significance levels ranging from <.0001 to .0062. These correlates are presented in Table 1, along with the strength of their correlation coefficients for all three sociometric indices.

Insert Table 1 about here

Stage II: Selection and placement of descriptors

The correlates identified in Stage I were first inspected to determine those that had uniquely high correlations with a given indice. Descriptors that correlated highly with the negative

sociometric scale were also found to correlate highly with the impact scale. The eleven scale correlates identified in Stage I were plotted in three dimensional space (axes = positive, negative, and impact indices) to identify possible groupings of correlates. Two groupings were apparent (see Figure 1) and were used for assignment of descriptors to either the positive or negative indices. Because impact scores were highly correlated with negative scores (r = .68, p<.0001) and only one of the eleven descriptors correlated higher with the impact scores than with the negative scores (Table 2), the redundent impact index was eliminated from further consideration.

Insert Figure 1 about here

Correlates were evaluated to determine the sociometric scale elevation range that was most descriptive for each correlate (correlate placement). The frequency (expressed as a percentage) with which a behavioral correlate was endorsed was determined for sociometric score ranges of ≤75, 76 to 85, 86 to 95, 96 to 105, 106 to 115, 116 to 135, and ≥136. The percentage of children receiving endorsement on particular items was determined for the range of 116 to 135 instead of the usual 10 point range to include an adequate number of subjects within the range. Correlate frequencies for

negative binomial scores are presented in Table 2, and correlate frequencies for positive binomial scores are presented in Table 3.

Insert Table 2 about here

Insert Table 3 about here

Binomial score ranges were inspected to determine cutoff points. Placements were made based on a point where the presence or absence of a particular correlate clearly exceeded the base rate of the sample. Additionally, an attempt was made to minimize the ratio of false positives to valid positives above the cutoff point. However, because the goal of the procedure was to provide accurate descriptive placements, the primary consideration in correlate selection was the location of scale score ranges most descriptive of each criterion (Lachar & Gdowski, 1979). Correlate placements were formulated from crosstabulation of score ranges and either the endorsement of a dichotomous WPBIC item or a score of 4 or 5 (item describes child "well" or "very well") on the Likert-type HRI items. The likelihood of a particular external criterion for each cutoff point is expressed in Tables 2 and 3 in the form of two percentages

separated by a slash mark: obtained criterion frequency below the correlate placement (sociometric score)/obtained criterion frequency above the correlate placement.

Table 2, WPBIC item 1 (Complains about unfairness) indicates that this correlate occurs in 24% of the total sample (base rate). The frequency of occurrence for this correlate increases dramatically at or above the binomial score of 136. Therefore, the correlate placement for this item was set at or above the negative peer nomination standard score of 136, and the likelihood of this particular external criteria expressed as >135(18/75). Correlate placements were also determined for those items where the lower end of the binomial score distribution was meaningful in predicting criterion absence. A second correlate placement was set at <76 for WPBIC item 1 (Table 2). In this instance, children obtaining negative peer nominations at or below a standard score of 75 received endorsement of the item "Complains about others' unfairness" at a frequency clearly below the base rate (seven percent as opposed to 24 percent), while 27% of the children above the placement received endorsement of the item, a level consistent with the base rate.

Stage III: Selection of sociometric classification cutoffs

The most common correlate placement (mode) for each end of the sociometric indices provided a cutting point to maximize the

behavioral homogeneity of children scoring above or below the cutting point. For example, six external correlates were determined for the upper end of the negative nomination sociometric index. A correlate placement of >105 was determined for one correlate, >115 for another, and >135 for four correlates. The modal correlate placement was >135. Therefore, the binomial score of 135 was chosen as the upper cutting point for the negative nomination index. The binomial score of 76 was chosen as the lower cutting point for the negative sociometric index. Correlate placements for the upper end of the positive sociometric index were bimodal (two at >95, two at >135). Therefore, because of the absence of a single modal cutpoint, the median correlate placement (>105) was chosen in an attempt to maximize behavioral homogeneity of children scoring highly on the positive sociometric index. The binomial score of 86 was chosen as the lower cutting point for the positive sociometric index.

Stage IV: Validity of empirically derived sociometric classification cutoffs

Validity of sociometric classification based on empirical cutoffs was evaluated by calculating discriminant functions derived from independent data (PIC scales completed by parents) for the empirically determined cutoffs and for the two sets of arbitrary classification schemes.

Sociometric Categorization 16

Sociometric Classification. Sociometric groups were formed by using the empirically derived cutoffs as described in the previous section: (a) Popular children were those who obtained a positive score above the upper cutoff (>105 and a negative score less than or equal to the upper cutoff (≤135; (b) Rejected children were those who received a negative score above the upper cutoff and a positive score less than or equal to the upper cutoff; (c) Neglected children were those who obtained a negative and a positive score below the lower cutoffs (<76 and <86, respectively); (d) Controversial children were those who received negative and positive scores above the upper cutoffs; (e) Average children were identified as all remaining individuals, with negative and positive binomial scores falling below the upper cutoffs and either negative or positive binomial score falling above the respective lower cutoffs.

Additionally, sociometric groups were formed using the Coie and Dodge (1983) classification procedure and the Newcomb and Bukowski (1983) procedure. Group membership according to the three classification methods is presented in Table 4 for the original random sample (N = 85), and for the expanded, non-random sample (N = 138). The small Controversial and Neglected groups in the expanded sample (n for empirical classification method = 1 and 4, respectively) were eliminated from subsequent analyses to avoid overfitting the data (Tabachnick & Fidell, 1983).

Insert Table 4 about here

Discriminant Function Analyses. Sociometric group membership for each of the three classification schemes was predicted from parent PIC ratings by the calculation of three stepwise discriminant function analyses (expanded sample mean PIC clinical scale scores for all groups and each sociometric categorization method are contained in Table 5). Groups were Average, Popular, and Rejected children from the expanded sample. Because no strong a priori reason existed for ordering the entry of variables, stepwise analyses were used. Variables were entered one variable at a time according to their minimization of the overall Wilk's lambda. Minimum F to enter and maximum F to remove was 1. Minimum tolerance level was .001.

Insert Table 5 about here

The sociometric groups were found to reliably differ along one dimension for all three categorization methods. The significant discriminant function for the empirical classification method accounted for 86% of the between group variability ($p<.0001$), while

the Coie & Dodge (1983) and Newcomb & Bukowski (1983) methods accounted for 80% (p=.0001) and 79% (p<.0001) of the between group variability, respectively. All three significant discriminant functions were found to maximally separate Rejected from Popular children, and secondarily, Rejected from Average children.

Children in the expanded sample were classified into groups based on the models generated by the three step-wise discriminant function analyses. Classification results are presented in Table 6. Cases in common (classified as either Average, Popular, or Rejected) between methods were identified and McNemar's (1969) chi square for change was used to test for differences in classification accuracy. No significant difference was found between the empirical method and either the Coie & Dodge (1983) or Newcomb and Bukowski (1983) methods ($\chi^2[1, N = 110] = 1.13$, $p>.05$; $\chi^2[1, N = 115] = .03$, $p>.05$, respectively). Further, no significant difference was found between the Coie & Dodge (1983) and Newcomb & Bukowski (1983) methods, $\chi^2(1, N = 110) = 2.00$, $p>.05$.

Insert Table 6 about here

Discussion

Sociometric Categorization

The empirical method of sociometric classification is not limited by the arbitrary cutoffs found in other sociometric categorization schemes. Unfortunately, two groups (Neglected and Controversial) had to be deleted from further analysis in this study because of inadequate size, resulting in an unintended limit on the validational comparison of the empirical method to two arbitray categorization methods.

The largest percentage of variance between the groups identified as Popular, Average, and Rejected by the three methods was accounted for by the empirically based method developed in this study. However, no significant difference in classification accuracy was found between the methods. While the categorization system developed in this study was clearly no less efficient than the comparison methods (Coie & Dodge, 1983; Newcomb & Bukowski, 1983), and therefore represents a potentially useful alternative approach to sociometric classification, results at this point must be considered equivocal, and a full comparison of categorization methods is called for.

A consideration of sociometric classification from cognitive psychological principles of categorization helps to understand the

results of this study, provide support for an empirically based method, and yield direction for future research.

Sociometric Categories as Prototypes. A prototype is a useful way of defining a concept or category. Many classification schemes in psychology and psychiatry assume that categories are logical, bounded entities, and that membership is defined by an individual's possession of a simple set of critical features. Further, it is frequently assumed that all individuals possessing the critical features have a full and equal degree of category membership (Rosch, 1978). In contrast, a prototype is a theoretical notion consisting of the organized collection of features or criterial attributes of members in a given category. All of these features characterize some members, but no one property is either necessary or sufficient for membership in the category. Members in a particular category may be better or poorer examples of the prototype.

While it may be argued that the criterial attributes of "extremeness" on sociometric indices are critical to membership in sociometric categories, researchers apparently find little that is critical about the level of extremeness in defining sociometric group membership, or even the type of sociometric indices the individuals are "extreme" on. Strauss, Lahey, Frick, Frame, and Hynd (1988) have noted that "although many different definitions of... sociometric groups have been used in previous studies... they

have generally identified similar groups of children" (p. 139). The "similarity" of the children identified is more important for researchers than a particular definition of group membership. Therefore, the formal criteria for inclusion of a particular child in a particular group in a particular sociometric study is neither a logical nor psychological necessity (Rosch & Mervis, 1975). Rather, children who come to be viewed as prototypical of the category "Rejected" are seen as such in proportion to the extent to which they bear a "family resemblance" to other members of the category. The prototypes of the "Rejected", "Neglected", or "Popular" child did not precede the formation of the category. Rather, our understanding of the prototypical "Rejected" child has followed from research involving individuals assigned to that category.

Rosch (1978) refers to the probabilistic concept of cue validity in arguing that there is generally one level of abstraction at which the most basic category cuts can be made. The validity of a given cue x, or attribute, as a predictor of a given category y, increases as the frequency with which cue x is associated with category y increases, and decreases as the frequency with which cue x is associated with categories other than y increases. Summation of all cue validities for a category results in the cue validity of an entire category. A category with high cue validity is, by definition, more differentiated from other categories than one of

lower cue validity. Further, Rosch believes "information rich bundles of perceptual and functional attributes" that occur in the natural world form natural discontinuities, and that basic cuts in categorization are made at these discontinuities (Rosch, 1978). The parallel between these principles of categorization and the current effort to form empirically defined sociometric groups is obvious.

Rejected, Average, and Popular Children. The results of the discriminant function analysis indicate that the Rejected group contains more individuals who are closer to the category prototype ("group centroid") than those in the Average and Popular groups. Two explanations stemming from the conceptualization of sociometric categories as prototypes help explain this. It may be recalled that only one modal upper cutoff was identified for the negative nomination binomial scores, as opposed to two modal cutoffs for the positive nomination binomial scores (Tables 2 and 3). With the choice of a median cutoff it is assured that attributes, in the form of teacher-endorsed observations, are frequently associated with both the Average and Popular groups. The Average and Popular categories represent "fuzzy sets" (McCloskey and Glucksberg, 1978). Attributes of the Rejected group, however, are less frequently associated with the other categories. By this line of reasoning, it would be expected that Rejected would be more differentiated from the other groups than Average and Popular would be from each other,

and that the Rejected group formed from an empirical effort to identify natural discontinuities in important attributes would result in greater differentiation than arbitrary methods of categorization. In fact, this is precisely the outcome of the validational discriminant function analyses.

Secondly, the predictor variables (PIC clinical scales) in the validational portion of the study are all measures designed to assess pathological attributes of children. Attributes reported in the literature and identified in this study which differentiate the prototypical Popular child from other categories involve pro-social behaviors. They are not thought to differ from Average peers on rates of aggression (Dodge, 1983). It is likely that discriminant function models based on the three different sociometric classification methods were most effective in discriminating the Rejected group from the Average and Popular groups not only because of the greater cue validity of the Rejected category, but also because the predictor variables were related more directly to the attributes which differentiate the prototypical Rejected child from the other two categories. A second measure, designed to more directly assess attributes related to the concepts of "prosocial behavior" and competence, would be more useful in the discrimination of the Popular group.

Neglected Children. The greatest limitations to the current study stem form the limited sample size and the attendant elimination of the Neglected and Controversial groups. This prevents validational comparison of the empirically determined Neglected and Controversial groups to the arbitrarily defined groups. However, there is reason to believe that the members of the empirically determined Neglected category share more family resemblance than those of the Coie and Dodge (1983) or Newcomb and Bukowski (1983) methods. With the empirical categorization method used in this study, relatively clear changes were demonstrated for certain correlates at the lower ends of the positive and negative sociometric scales, suggesting relatively high cue validity and probable distinctiveness of this group.

The distinctiveness of the empirical Neglected group is supported by inspection of mean PIC scores for this group versus those identified as Neglected using the arbitrary schemes. Four of the twelve PIC scale means are in the "clinical range" ($T>59$) for this group (Achievement, Intellectual Screening, Development, and Hyperactivity scales), compared to one scale for the Newcomb and Bukowski (1983) group (Intellectual Screening) and no scales for the Coie and Dodge (1983) group (Table 5) . Central features of the prototypical Neglected child, as reflected by PIC interpretive guidelines (Lachar & Gdowski, 1979) are likely to include limited

academic achievement; deficits in motor coordination, language skills, or cognitive functions; and poor social and academic adjustment associated with over-activity, distractibility, or provocation of peers. Similar attributes have been suggested directly (Dygdon, Conger, & Keane, 1987) and indirectly in the work of other researchers (Carlson, Lahey, & Neeper, 1984).

Low temporal stability of arbitrarily defined Neglected group children (Coie & Dodge, 1983; Newcomb & Bukowski, 1984) may be explained by the finding that these children are often classified as Average by the empirical method. Coie and Dodge found only 25% of their Neglected children being so classified after one year's time. During subsequent years, the Neglected children in Coie and Dodge's study spread across Neglected, Popular, and Average categories. They were more likely than chance to become Average and less likely than chance to become Rejected or Controversial. Of the 12 children identified as Neglected by the Coie and Dodge method, 10 (83%) were identified as belonging to the Average group by the empirical method developed in the current study. Coie and Dodge and others have suggested that Neglected children are not in need of intervention because they will likely move toward more positive social status simply with the passage of time. Another possibility is that many children who have been categorized as "Neglected" share few of the attributes associated with the prototypical Neglected child.

Rather, the arbitrary sociometric cutoff scores for group membership result in many children categorized as "Neglected" while sharing more attributes in common with the "Average" prototype.

Controversial Children. The Controversial group, so named because children in this group appear to share characteristics with both the Popular and Rejected groups (Coie, Dodge, & Coppotelli, 1982), may in fact consist of a great many children who are close to either the prototypical Popular child or the prototypical Rejected child, but not both. Criteria for inclusion in the Controversial group according to Newcomb and Bukowski's (1983) classification procedure are (a) children who receive a rare positive nomination and/or negative nomination score, and (b) if only one score is rare, a score above the mean on the other dimension. According to the correlate frequency information developed in the current study (Tables 3 and 4), many children classified with the Newcomb and Bukowski definition may be expected to have attributes more in common with either the Rejected or Popular prototypes, and with the Average group, but not with both Rejected and Popular. Newcomb and Bukowski (1984) found that Controversial children were likely to shift to any other sociometric category over time, except for the Neglected group. Interestingly, 33% of the random sample identified as Controversial by the Newcomb and Bukowski method in the current study were classified as Popular under the empirical method, with

another 33% being classified as Rejected and another 33% classified as Average. It appears likely that many children who have been categorized as "Controversial" share few of the attributes associated with the prototypical Controversial child. Rather, the arbitrary sociometric cutoff scores for "Controversial" group membership result many children who share more attributes in common with the "Rejected", "Popular", and "Average" prototypes than they do with each other. Unfortunately, research on this group will probably remain limited by the small proportion of children classified as Controversial, whatever the classification method (Bukowski & Newcomb, 1985).

Conclusions

Classification based on arbitrary criteria results in "fuzzy" or diffuse group boundaries, threatening the internal validity of research involving sociometric groups. Generalizability of research on sociometric groups is reduced by the use of a variety of arbitrary classification schemes. The effects of these weaknesses are seen in the lack of temporal stability of arbitrarily formed groups and inconsistent findings between studies.

Future research on empirical sociometric classification methods may help researchers apply the concept of social status in a more standardized way and in a way that reflects the natural discontinuities in children's social behavior. Future attempts to

refine sociometric categories should maximize the overlap of attributes discernible from a variety of data sources: peer assessment, behavioral observation, self-report, and reports of significant adults. An investigation of the organization of the attributes associated with the various sociometric groups might further theory development in the social competence and social skills fields (see Dygdon et al., 1987 for an interesting study of the structure of peer-generated correlates of sociometric status).

Adaptive social behaviors may vary as a function of demographic variables, including age, sex, socioeconomic status, and minority status. Because of the relatively small sample size in this study, no effort was made to investigate or control the effects of race or socioeconomic status on sociometric status. No attempt was made to investigate whether or not external correlates of sociometric status were sex specific. Future research should attempt to determine sociometric status correlates that may be specific, or limited in application, to particular socioeconomic status groups, age groups, racial groups, and gender groups. Clearly there is a great need for research which addresses these types of issues (Scarr, 1988).

The categorization method determined in this study must be viewed as a preliminary approach to refining sociometric classification. Its major weakness stems from the relatively small N of the study. The use of a larger sample would allow inclusion of

the Neglected group, and hopefully the Controversial group, in validational efforts. The use of a larger sample would allow explicit attention to the effects of demographic variables on sociometric status. In addition, finer discrimination in sociometric score ranges could be accomplished while retaining adequate numbers of subjects. This, in turn, would allow for more confidence and precision in locating cutoff points where the natural discontinuities in category attributes occur.

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Table 1

Correlation of External Criteria with Sociometric Indices

Criteria	Positive Index	Negative Index	Impact Index
WPBIC 1: Complains about others' unfairness and/or discrimination towards him/her.....	-.21	.46	.27
WPBIC 3: Does not conform to limits on his/her own without control from others.....	-.05	.51	.44
WPBIC 4: Becomes hysterical, upset, or angry when things do not go his/her way.....	.06	.31	.33
WPBIC 8: Other children act as if he/she were taboo or tainted.....	-.08	.40	.32
WPBIC 27: Has temper tantrums.....	.00	.30	.29

(table continues)

Sociometric Categorization 36

Criteria	Positive Index	Negative Index	Impact Index
WPBIC 31: Has rapid mood shifts: depressed one moment, manic the next..	-.10	.46	.36
HRI 4: Has a good sense of humor.....	.35	-.13	.15
HRI 25: Plays enthusiastically.....	.32	-.18	.07
HRI 34: Well liked by classmates.....	.44	-.45	-.09
HRI 39: Has many friends.....	.46	-.38	.00
HRI 44: Adjusts well to changes in the class-room routine.....	.33	-.23	.04

Note. Underlined correlation coefficients indicate sociometric index descriptor assignment.

Table 2

Correlate Frequencies for Negative Binomial Scores

Correlate	Base Rate	Score Ranges <75	76-85	86-95	96-105	106-115	116-135	>136	Cut-off Scores
WBPIC 1	24	7	14	13	11	57	33	75	>135(18/75) <76(7/27)
WPBIC 3	15	0	0	13	11	29	44	50	>115(7/47) <86(0/27)
WPBIC 4	11	0	5	13	0	43	11	25	>105(5/25) <76(0/25)
WPBIC 8	4	0	5	0	0	0	0	25	>135(1/25)
WPBIC 27	6	0	10	0	0	14	0	25	>135(4/25)
WPBIC 31	1	0	0	0	0	0	0	13	>135(0/13)

Note. WPBIC 1: Complains about unfairness. WPBIC 3: Does not conform to limits. WPBIC 4: Becomes hysterical, upset, or angry. WPBIC 8: Taboo or tainted. WPBIC 27: Temper tantrums. WPBIC 31: Rapid mood shifts.

Table 3

Correlate Frequencies for Positive Binomial Scores

Correlate	Base Rate	Score Ranges ≤75	76-85	86-95	96-105	106-115	116-135	≥136	Cutoff Scores
HRI 4	73	67	47	60	89	89	82	86	>95(56/87)
HRI 25	75	67	53	67	89	87	82	86	>95(62/87)
HRI 34	65	44	40	67	74	78	73	86	>135(63/86) <86(42/74)
HRI 39	56	33	27	53	63	86	73	86	>105(47/77) <86(29/67)
HRI 44	62	44	47	53	74	78	64	86	>135(60/86) <96(49/74)

Note. HRI 4: Sense of humor. HRI 25: Plays enthusiastically. HRI 34: Well liked. HRI 39: Many friends. HRI 44: Adjusts well to changes.

Table 4

Group Membership By Classification Method - Random Sample

	Sociometric Group				
Method	Popular	Average	Neglected	Rejected	Controversial
Empirical.....	27 (32%)	48 (57%)	2 (2%)	8 (9%)	0 (0%)
Coie & Dodge (1983).....	14 (17%)	42 (49%)	12 (14%)	11 (13%)	6 (7%)
Newcomb & Bukowski (1983)..	11 (13%)	52 (61%)	10 (12%)	9 (11%)	3 (4%)

(table continues)

Group Membership By Classification Method - Extended Sample

	Sociometric Group				
Method	Popular	Average	Neglected	Rejected	Controversial
Empirical.....	51 (37%)	61 (44%)	4 (3%)	21 (15%)	1 (1%)
Coie & Dodge (1983).....	32 (23%)	51 (37%)	16 (12%)	27 (20%)	12 (9%)
Newcomb & Bukowski (1983)..	30 (22%)	56 (41%)	14 (10%)	29 (21%)	9 (7%)

Table 5

Popular Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical		Coie & Dodge		Newcomb & Bukowski	
	(n = 49)		(n = 32)		(n = 30)	
Scale	M	SD	M	SD	M	SD
Achievement	50	11	48	10	48	10
Intellectual Screening	52	11	52	12	52	11
Development	49	10	47	9	47	9
Somatic Concern	51	11	50	9	50	9
Depression	51	12	50	10	50	11
Family Relations	51	11	50	10	49	10
Delinquency	50	11	49	12	49	12
Withdrawal	50	9	49	9	49	9
Anxiety	55	12	53	9	53	9
Psychosis	50	12	50	12	50	12
Hyperactivity	51	12	49	10	48	8
Social Skills	44	11	44	11	43	11

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

(table continues)

Average Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical		Coie & Dodge		Newcomb & Bukowski	
	(n = 61)		(n = 51)		(n = 56)	
Scale	M	SD	M	SD	M	SD
Achievement	51	11	51	11	51	11
Intellectual Screening	54	13	54	13	53	14
Development	51	10	50	10	50	10
Somatic Concern	54	10	56	9	54	9
Depression	53	11	55	12	55	12
Family Relations	51	10	52	11	52	11
Delinquency	51	8	52	8	52	9
Withdrawal	51	9	52	9	53	10
Anxiety	55	12	58	12	57	13
Psychosis	54	10	54	10	55	10
Hyperactivity	51	9	51	11	51	12
Social Skills	48	10	48	11	48	11

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

(table continues)

Neglected Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical (n = 4)		Coie & Dodge (n = 16)		Newcomb & Bukowski (n = 14)	
Scale	M	SD	M	SD	M	SD
Achievement	70	16	56	14	56	15
Intellectual Screening	66	14	58	12	60	11
Development	71	7	57	11	58	12
Somatic Concern	50	5	52	11	52	11
Depression	51	11	50	9	48	8
Family Relations	54	15	51	13	51	13
Delinquency	52	6	52	7	51	7
Withdrawal	46	6	47	7	46	4
Anxiety	51	11	50	8	49	7
Psychosis	58	12	54	11	54	12
Hyperactivity	60	20	54	12	56	12
Social Skills	54	11	49	11	50	11

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

(table continues)

Rejected Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical		Coie & Dodge		Newcomb & Bukowski	
	(n = 21)		(n = 27)		(n = 29)	
Scale	M	SD	M	SD	M	SD
Achievement	52	11	51	11	52	11
Intellectual Screening	48	16	50	14	50	14
Development	50	9	51	10	50	10
Somatic Concern	56	12	53	12	55	11
Depression	58	12	55	12	55	11
Family Relations	55	11	54	10	54	10
Delinquency	60	14	57	14	58	13
Withdrawal	49	7	48	7	48	6
Anxiety	58	12	55	12	57	11
Psychosis	58	14	57	14	56	13
Hyperactivity	65	11	61	12	61	12
Social Skills	59	14	55	15	55	14

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology.

(table continues)

Controversial Group PIC Scale Means by Categorization Method

	Sociometric Categorization Method					
	Empirical		Coie & Dodge		Newcomb & Bukowski	
	(n = 1)		(n = 10)		(n = 7)	
Scale	M	SD	M	SD	M	SD
Achievement	52	-	58	13	52	11
Intellectual						
Screening	65	-	56	12	56	9
Development	59	-	56	11	53	12
Somatic Concern	69	-	54	16	55	20
Depression	64	-	54	16	51	16
Family						
Relations	67	-	50	8	52	9
Delinquency	55	-	53	10	53	10
Withdrawal	55	-	54	13	53	12
Anxiety	66	-	61	16	59	16
Psychosis	52	-	50	10	51	12
Hyperactivity	36	-	56	14	57	11
Social Skills	45	-	46	8	45	8

Note. Scale means reported in T scores. Positive deviation from the mean of 50 suggests increasing likelihood of pathology. Insufficient n for empirical group for SD.

Table 6

Classification Results

Empirical Method

	Predicted Group Membership		
Actual Group	Popular	Average	Rejected
Popular	63%	26%	12%
Average	46%	44%	10%
Rejected	10%	14%	76%

Percent of total cases correctly classified: 56%

Coie & Dodge (1983) Method

	Predicted Group Membership		
Actual Group	Popular	Average	Rejected
Popular	59%	19%	22%
Average	31%	49%	20%
Rejected	19%	19%	63%

Percent of total cases correctly classified: 55%

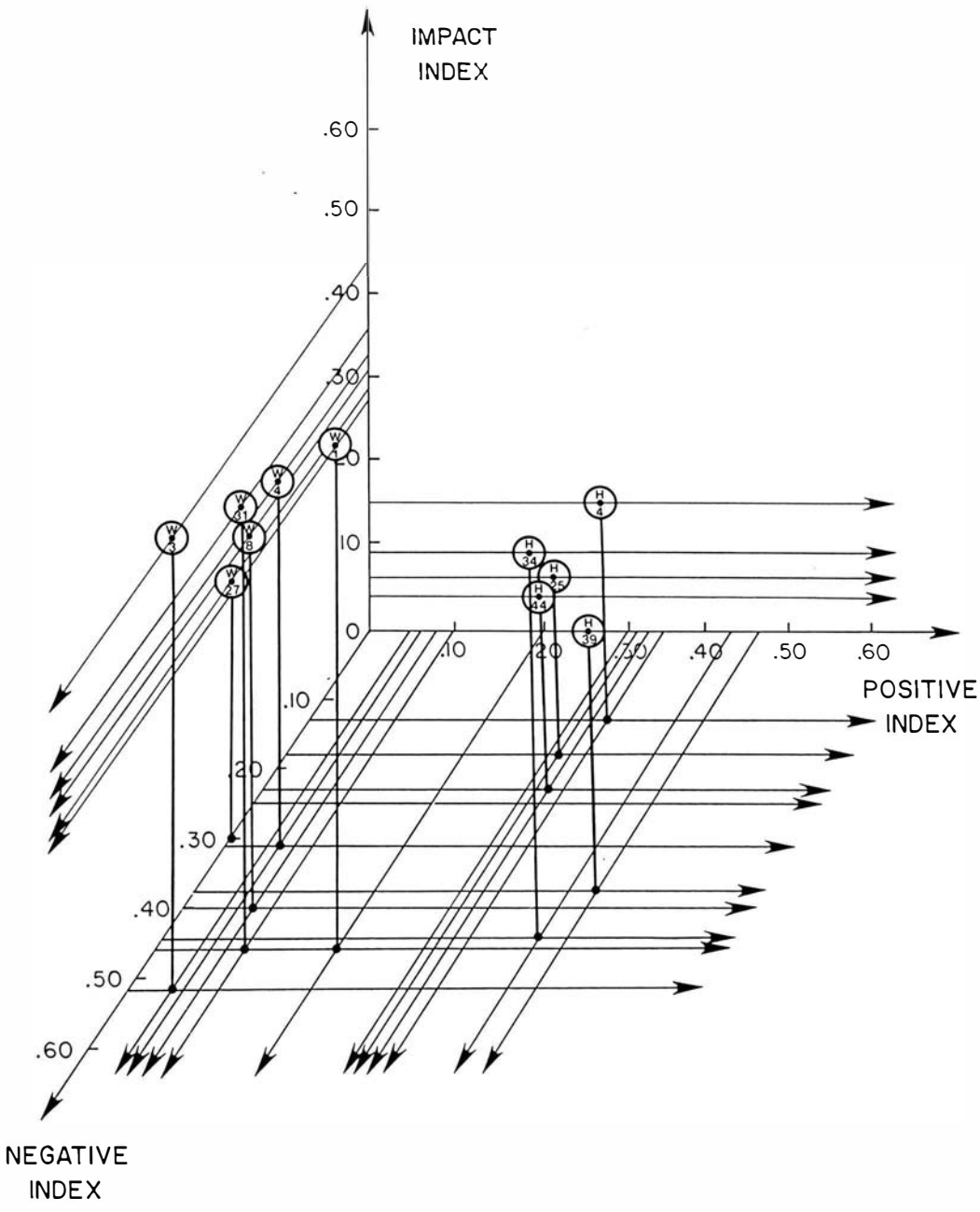
Newcomb & Bukowski (1983) Method

	Predicted Group Membership		
Actual Group	Popular	Average	Rejected
Popular	70%	17%	13%
Average	25%	54%	21%
Rejected	21%	14%	66%

Percent of total cases correctly classified: 61%

Figure Caption

Figure 1. Three dimensional plot of scale correlates (W = WPBIC, H = HRI).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