Journal of Personality and Social Psychology
1970, Vol. 14, No. 1, 55–65

ON THE DESCRIPTION OF SUBCULTURAL LEXICONS: A MULTIDIMENSIONAL APPROACH[1]

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The purpose of this study was to describe the differences in the multidimensional structure of social- and personality-trait words as a function of experience within a specific subculture. Fifteen freshmen and 15 seniors at Princeton University ascribed 60 trait adjectives, 20 of which belonged to the student slang lexicon, to people they knew. Disassociation measures between pairs of traits were used to provide a multidimensional scaling (MDS) solution. A two-dimensional solution provided a satisfactory fit for the freshman data, while a three-dimensional solution was needed to provide a satisfactory fit for the senior data. Axes for these solutions were located by multiple-regression techniques, using data obtained from independent samples of subjects who provided unidimensional scale-ratings of the trait words. For the freshman solution, the two dimensions of intellectual-academic desirability and social desirability provided a satisfactory interpretation of the semantic space. For the senior solution, an additional dimension, Princeton social desirability, was required to provide a satisfactory interpretation. These data, as well as differences between freshmen and seniors in the locations of particular trait names, provide a quantitative description of the acquisition of a specific subcultural lexicon.

A familiar aspect of relatively permanent groups or subcultures is the specialized slang or jargon lexicons that are specific to each group. Photographers refer to hypothiosulfate of soda solution as "hypo," graduate students refer to comprehensive examinations as "comps," and Princeton undergraduates refer to some of their fellow students as "lunches" or "wonks." One indicant of an individual's acquisition of membership in a subculture is his acquisition of the connotative and denotative meanings of the words that are unique to that subculture's specific lexicon. The present authors undertook to evaluate the differences among the meanings of social- and personality-trait adjectives as understood by freshmen at Princeton University, who are novices to the subculture, and seniors, who are full-fledged members. The choice of the Princeton undergraduate body was dictated, aside from matters of convenience, by its relative isolation, and by the relative homogeneity of its students. In addition, the students have developed an extensive idiosyncratic lexicon which is not familiar to outsiders.

The specific question of concern was the applicability of multidimensional scaling (MDS) to the assessment of the acquisition of a subcultural lexicon. Would MDS solutions reflect differences in the meanings of words, and, possibly, of their dimensionality, between initiates to a subculture (e.g., fresh-

[1] Based in part on an unpublished master's thesis by the first author submitted to Princeton University. This research was supported by Office of Naval Research Contract N 0014-67-A-0151-0006, and National Science Foundation Grant GB-3402, to Princeton University, and by Public Health Service Grant HD-01910. Reproduction in whole or in part is permitted for any purpose of the United States Government. The computer facilities used in this work were supported in part by National Science Foundation Grants NSF-GJ-34 and NSF-GU-3157, and typing and proofing services were provided by Educational Testing Service. The authors wish to acknowledge the assistance of Lewis Andrews in collecting some of the data reported here. The following data have been deposited with the National Auxiliary Publication Service: (*a*) coordinates of the 60 lexical items and traits in the MDS solutions for the freshmen and seniors; (*b*) successive intervals scale values for the unidimensional trait ratings; (*c*) results of the cluster analysis of the disassociation measures. Order Document No. 00757 from National Auxiliary Publications Service of the American Society for Information Service, c/o CCM Information Sciences, Inc., 909 3rd Avenue, New York, New York 10022. Remit in advance $3.00 for photocopies or $1.00 for microfiche and make checks payable to: Research and Microfilm Publications, Inc.

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TABLE 1

LIST OF TRAIT NAMES USED IN THE STUDY

1 wonk	21 scientific	41 wavering
2 stud	22 industrious	42 clumsy
3 star	23 intelligent	43 unreliable
4 lunch	24 imaginative	44 unsociable
5 meatball	25 serious	45 unpopular
6 punter	26 shrewd	46 unhappy
7 grind	27 practical	47 vain
8 faceman	28 sociable	48 boring
9 Wilcox type	29 popular	49 humorless
10 Princeton Charlie	30 happy	50 cold
11 Cottage type	31 warm	51 pessimistic
12 Ivy type	32 honest	52 irritable
13 Cannon type	33 tolerant	53 dishonest
14 Key & Seal type	34 helpful	54 superficial
15 Colonial type	35 sincere	55 good natured
16 jock	36 frivolous	56 humorous
17 independent	37 foolish	57 modest
18 ceptsman	38 unintelligent	58 determined
19 bull thrower	39 wasteful	59 discriminating
20 gut hopper	40 irresponsible	60 persistent

men) and experienced members of that subculture (e.g., seniors)? Rosenberg, Nelson, and Vivekananthan (1969) found that MDS provided a useful representation of the dimensional structure of personality-trait adjectives. Would MDS be sufficiently sensitive to reflect the difference between the dimensional structure of social- and personality-trait words of subculture novices and members?

MDS is a method of data analysis based upon a geometric model which represents a set of objects as points in space. The distance between points reflects the similarity of the objects they represent. Given a set of objects, such as trait names or adjectives, MDS provides an estimate of the number of dimensions necessary to represent the interrelationships between those objects. Two separate but related hypotheses concerning the change in word meanings can be tested. First, do specific subcultural words differ with respect to their locations in a hypothetical geometric space as a function of experience in a subculture? Second, does the dimensional structure also differ as a function of that experience, that is, does such experience generate an additional dimension? Specifically, Rosenberg et al. found that a two-dimensional solution provided a satisfactory model for the dimensional structure of common personality-trait terms. One possible effect of experience in a subculture is the addition of a dimension specific to that subculture. Thus, a two-dimensional solution would be expected for the freshman lexicon, but a three-dimensional solution might be necessary for the senior lexicon.

Accordingly, Rosenberg et al.'s procedure was applied to a sample of the Princeton undergraduate lexicon. In essence, this method entails: (a) selecting lexical items to be studied; (*b*) obtaining distance estimates between these items; (*c*) obtaining an MDS solution to represent these distances spatially; (*d*) once the properties, or dimensions of the lexical space are inferred for the MDS solution, obtaining ratings of each of the lexical items on each of the inferred properties or dimensions, and using multiple-regression techniques to determine the location of the axes in the lexical space corresponding to the inferred dimensions of that space. Details of the rationale for using these techniques may be found in Rosenberg et al. (1968).

METHOD

Selection of lexical items and subjects. The 60 items employed are listed in Table 1. Items 1–20 refer to a broad spectrum of student activities, values, and attitudes, and were selected with the aid of undergraduate informants. All of these terms are used frequently enough so that all students could have been expected to have heard them. Furthermore, all have been in use for at least the last 4 years. Items 21–60 were selected from those used by Rosenberg et al. to represent a fair sample of the semantic space occupied by trait adjectives. In addition to providing semantic space markers for the Princeton items, these items can be used to compare the results obtained in this study with the results reported by Rosenberg et al.

Table 2 presents lexical definitions of the Princeton items. These definitions were obtained by asking an independent group of 30 juniors and seniors to write short definitions of each item, avoiding, as much as possible, the use of slang words. The three most frequent definitions for each item were then presented to another group of 30 juniors and seniors, who ranked the definitions in terms of their validity. The definitions finally obtained thus represent a consensus provided by the members of the subculture.

In addition to the 60 subjects who provided the definitions for the Princeton lexicon sample, 15 freshmen and 15 seniors performed a sorting task to provide the data for the MDS analysis. Eighty-three additional freshmen and 84 additional seniors performed a rating task on the 60 items, each subject rating each item on one of four properties as described subsequently. All subjects volunteered and were paid for their services.

Sorting task for MDS. Each of the 15 freshmen and 15 seniors was given a pack of 60 index cards, each containing one of the items of Table 1. Using Rosenberg et al.'s instructions, subjects were told to sort the cards into an arbitrary number of categories, with each category representing some real

person whom they knew. Each word could be placed into only one category, and subjects were permitted to use a miscellaneous category for words which could not be appropriately placed into any other category. These subjects were tested in groups of four, and were allowed to reassign traits among their categories until they signaled that they had completed the task.

One important consideration was the timing of the task administration, especially for the freshmen. Ideally, freshmen should be tested after they had heard the Princeton words used, but before they had overlearned their meanings, that is, before they had become members of the subculture. If given too early, too many of the Princeton words would be placed in the miscellaneous category; if given too late, the freshmen might not differ from the seniors. Therefore, the task was administered in November, 2 months after the freshmen had arrived on campus.

The disassociation measure (δ_{ij}) developed by Rosenberg et al. served as the dissimilarity measure for the MDS analysis. Basically, this measure reflects the number of times any two items, *i* and *j*, are *not* assigned to the same person, and is derived from (*a*) a disagreement score, d_{ij}, the number of subjects in a group who place words *i* and *j* into different categories, that is, attribute them to different people, and (*b*) a measure of indirect association, which takes into account the disagreement scores of *i* and *j* with the other items. Details of the derivation of Equation 1, which was used to obtain δ_{ij} for each trait pair, may be found in Rosenberg et al. and in Friendly (1968):

$$\delta_{ij} = \sum_{k \in T} (d_{ik} - d_{jk})^2 \qquad [1]$$

where *T* is the set of items.

Trait ratings. The MDS solution yields the locations of items in an *n*-dimensional space, but does not provide an unambiguous set of criteria for location of axes in that space. Initial consideration of the MDS solutions for the freshmen and senior data led to the following tentative interpretations:

1. For the freshmen, the MDS solution could be described in terms of two dimensions, general social desirability, and intellectual-academic desirability.

2. For the seniors, the MDS solution was best described in terms of three dimensions, general social desirability, Princeton social desirability, and intellectual-academic desirability.

Accordingly, an item-rating task was given to two groups of freshmen and three groups of seniors. Each subject in this task was given a list of the 60 trait-items in a single random order. The freshmen were asked to rate the traits on either a general social desirability scale ($n = 48$) or an intellectual-academic desirability scale ($n = 35$). The seniors rated the traits on one of three scales: general social desirability ($n = 25$), Princeton social desirability ($n = 27$), and intellectual-academic desirability ($n = 32$). These subjects were given the following instructions:

TABLE 2

LEXICON OF PRINCETON WORDS

Word	Meaning
wonk	an introverted student who studies all the time; generally considered to be physically unattractive.
stud	a good-looking student who is successful with women; cool and detached.
star	1. center of attention; 2. athletic ace.
lunch	a graceless, socially unattractive student.
meatball	same as lunch, only more physically and intellectually unattractive.
punter	student who studies little; devotes himself to unproductive activities (i.e., television).
grind	a student who studies diligently for long periods of time; a periodic wonk
faceman	1. an attractive student who makes a good first impression; 2. always selling himself.
Princeton Charlie	stereotype of the traditional Princeton student.
Cottage type	stereotype of person belonging to Cottage Club, a selective and prestigious eating club; generally considered conservative and superficial.
Ivy type	stereotype of person belonging to Ivy Club, a selective and prestigious eating club; generally considered aristocratic and snobbish.
Cannon type	stereotype of person belonging to Cannon Club, a selective and well-known (though not prestigious) eating club; generally considered to be a crude, unintelligent jock.
Colonial type	stereotype of person belonging to Colonial Club, a selective and somewhat prestigious eating club; generally considered to be a pseudointellectual, nonathletic culture buff.
Key and Seal type	stereotype of person belonging to Key & Seal Club, a selective but socially undesirable eating club; generally considered lunch.
Wilcox type	stereotype of person belonging to the Woodrow Wilson Society, a nonprestigious eating society with open membership; seen as bearded, long haired, nonathletic, radical, and wonkish.
jock	an athlete.
independent	1. a rebel; 2. dropout from the club system.
ceptsman	a person who gets through his courses knowing a few important ideas and having a fluid pen; a lazy scholar.
gut hopper	a "gut" is an easy course; hence, a student who takes only easy courses.
bull thrower	student who speaks often but says little; a blatherer.

We are interested in how people use words, particularly descriptive words. This questionnaire contains a number of trait-adjectives. Your task is to rate each of these trait-adjectives on a scale according to whether a person who exhibited each of these traits would be good or bad in his (*name of scale inserted here*) activities. Your judgments will be made on the following scale:

0 1 2 3 4 5 6 7 8 9 10

where 0 represents the worst, and 10, the best.

Analysis of trait ratings. Scale values were determined for each item on each of the five scales by the method of successive intervals using the least-squares solution due to Diederich, Messick, and Tucker (1957). The method of successive intervals was used to determine unidimensional scale values from the trait rating data, since use of the group average or median ratings does not generally produce scales with measurement properties as strong as those of an interval scale. An interval scale could be obtained from average ratings if the intervals between response categories on the rating sheet were psychologically equal, but this condition rarely holds for verbal materials (Cliff, 1959; Jones & Thurstone, 1955; Mosier, 1941). Thus the method of successive intervals would seem appropriate.

However, in order for this or any other unidimensional method to be applicable, it is necessary to verify that there exists but one "point of view" among the subjects of each group, that is, that the subjects are sufficiently homogeneous with respect to their ratings. In quantitative terms, this assumption is equivalent to the condition that the matrix of ratings of stimuli by subjects be of Rank 1, which for practical purposes will hold if the first principal component of this matrix accounts for most of the variance. This assumption was tested by applying an Eckart-Young (1936) decomposition in terms of latent roots and vectors (Tucker, 1960, 1964) to the subject by subject cross-products matrix for each rating group. In this procedure, each successive latent root yields a measure of the variance accounted for by the corresponding principal component. For the freshmen, the largest root accounts for 93% and 92% of the variance in the ratings of intellectual-academic and social desirability, respectively. For the seniors, the largest root accounts for 92%–94% of the variance on each of the three scales used. Mean-square ratios (an analogue of the F test; see Tucker, 1960) indicated that only these largest roots were reliable in all cases, suggesting that only one main point of view was represented in each of the five rating groups. These considerations indicated that the method of successive intervals is, in fact, appropriate to the present data and could be used in multiple regression to relate each of the scale properties to the relevant multidimensional solution.

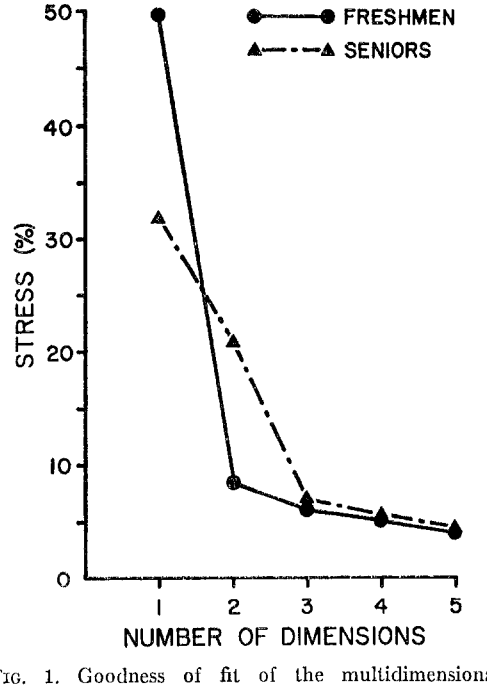

FIG. 1. Goodness of fit of the multidimensional scalings for the freshman and senior data.

RESULTS AND DISCUSSION

Multidimensional scaling. A version of Kruskal's (1964a, 1964b) computer program was used for multidimensional scaling. The scaling was performed in the Euclidean metric, handling ties by the primary approach (Kruskal, 1964b), and computing stress with Kruskal's Formula 1 which normalizes the raw stress by the Euclidean norm of the interpoint distances.

Dimensionality. The appropriate dimensionality of a set of objects is, in Kruskal's program, estimated by obtaining a one-dimensional solution, a two-dimensional solution, a three-dimensional solution, and so on until the fit is satisfactory and no real improvement is obtained by adding dimensions. Stress, a percentage measure of goodness of fit, was calculated separately for the solutions for the freshmen and senior data. If a multidimensional configuration fits the data perfectly, then the rank order of the distances calculated from this configuration will be identical to the rank order of the data (δ_{ij}), and the stress will be 0%. To the extent that these rank orders diverge, the stress will exceed zero. Figure 1 presents obtained stress as a function of the number of dimensions fitted to the item data. For the freshman data, little

decrease in stress is obtained beyond a two-dimensional solution. For the senior data, a three-dimensional solution seems necessary for a satisfactory fit (Kruskal suggests that a stress of 5% is "good," while 10% is "fair"). These data are thus in accord with the notion that the acquisition of a specific subcultural lexicon involves, at least in part, the acquisition of a semantic dimension relevant to the specific values of that subculture.

The differences in the MDS solutions are not attributable to global response-style differences between freshmen and seniors in the sorting task. There were no reliable differences between the two groups in the number of categories (persons) used to sort the stimuli ($t = .387$, $df = 28$, $p > .40$), or the number of items placed in the miscellaneous category ($t = .253$, $df = 28$, $p > .40$). Additionally, the freshmen were not more disposed to place the Princeton items in the miscellaneous category. For the Princeton words there was no reliable difference between groups in the number of such words placed in the miscellaneous category ($t = 1.31$, $df = 28$, $p > .20$). Therefore differences in the MDS configurations for the groups must represent real differences in understanding of the words rather than differences of response style in the sorting task.

Interpretation of dimensions. Inspection of the configuration of the items obtained from the freshman data suggested two dimensions. Along one dimension, words such as warm, sociable, happy, and popular were opposed to such words as unsociable, boring, unpopular, and humorless. This was interpreted as a social desirability dimension. Another dimension was characterized by the polarization of words such as industrious, scientific, persistent, and serious versus irresponsible, foolish, and unreliable. This dimension was interpreted as intellectual-academic desirability. These two dimensions are analogous to the two denotative dimensions suggested by Rosenberg et al. for their MDS solution of personality-trait adjectives, and were the basis for the instructions given to the two freshman groups who rated the items on a social desirability and an intellectual-academic desirability scale, respectively.

The configuration of the items obtained from the senior data led to similar interpretations, but with the addition of a third dimension. With respect to this third dimension, suggested by the stress measure, items like faceman, stud, sociable, and popular were contrasted with lunch, Wilcox type, and Key and Seal type. This suggested a specific Princeton social desirability dimension, similar to, but not identical with, general social desirability.[3]

TABLE 3

GOODNESS OF FIT OF INDEPENDENT PROPERTIES TO THE MULTIDIMENSIONAL CONFIGURATIONS

Dimension	Linear regression (R)	Nonlinear regression (η)
Freshmen		
Intellectual-academic	.891	.900
Social desirability	.918	.924
Seniors		
Intellectual-academic	.823	.827
General social	.860	.888
Princeton social	.884	.902

One item, the word independent, presented difficulties. In the context of the undergraduate slang lexicon, an independent is someone who belongs to no formal social system. However, the word was interpreted by many subjects in its ordinary sense. Given this ambiguity, ratings of this word were omitted from the analyses.

The scale values obtained from the trait ratings were used to locate axes in the MDS configuration by both linear and nonlinear regression (Carroll & Chang, 1966). The summary of the correlations between each scale property and the best fitting axes in the two- and three-dimensional configurations is presented in Table 3. For both the freshman

[3] In order to assess the reasonableness of the MDS solution and to determine the extent to which the interpretations have generality beyond the particular method of data analysis chosen, a confirmatory procedure was applied. This consisted of a hierarchical cluster analysis (Johnson, 1967) of the same dissociation measures between trait words that were input to the MDS analysis, and yields groups of trait items that are maximally similar in terms of these measures. To the degree to which the two methods are congruent, the clusters found will lie in nonoverlapping, compact regions of the multidimensional space. Examination of the MDS plots with the clusters mapped onto them (not presented here, but included with the NAPS material; see Footnote 1) indicated strong agreement between the two methods.

and senior data the fit is extremely good. Indeed, even a stringent null hypothesis, $R < .70$, may be rejected with confidence ($p < .05$) for each property. Nonlinear regression does not improve goodness of fit, and since there is no reason to reject linear regression, the data were treated as linear.

The two-dimensional configuration for the freshman data, with the axes determined by linear regression, is presented in Figure 2. These axes are oblique, with an angle of 56 degrees. This result is comparable to the data reported by Rosenberg et al. (1968). Using linear regression of median trait ratings, they reported an angle of 65 degrees between social and intellectual desirability axes for an MDS configuration of 60 trait-adjectives, 40 of which were used in the present study. As in the Rosenberg et al. study, the nonorthogonality may be attributed to the location of the social desirability axis. Traits that are intellectually desirable or undesirable, such as intelligent and unintelligent, are rated high and low, respectively, on both scales. On the other hand, trait words which refer to specifically social attributes, such as social and unsociable, tend to be rated as neutral on the intellectual-academic desirability scale. With respect to the locations of the 40 trait-adjectives selected from their study, the freshman MDS configuration closely matches the configuration obtained by Rosenberg et al.

The locations of the Princeton words in the freshman configuration do not always correspond to the lexical definitions produced by upperclassmen, indicating that the freshmen have not yet learned all the meanings of those words (see Table 1). The words meatball, lunch, and wonk are considered to be highly similar in meaning, as indicated by their proximity to one another. Yet their definitions indicate clear denotative differences between them. Wonk, for example, should, according to the lexical definition, be rated high on the intellectual-academic desirability scale, and was so rated by the seniors (see below). The unidimensional ratings lend further support to the notion that the freshmen have not yet learned the meanings of some of these terms. More precisely, they have acquired the idea that a word like wonk is pejorative, but have failed to learn the extent of the evaluative meaning, and have also failed to discriminate between social and intellectual criteria. Wonk had the largest variability in the ratings on the intellectual-academic scale for the freshmen, suggesting that there was a fair degree of ambiguity or variation in meaning among these raters. In this particular case, the distribution of judgments covered the entire range of the scale, from best to worst.

Other slang words were sorted and rated appropriately by the freshmen. These tended to be terms whose meanings are relatively easy to acquire, and which did not present sharp conflicts between the two dimensions. Thus "cept," a contraction of the word "concept," has been used to form ceptsman, referring to a student who learns only the key ideas and facts of a course in order to do well. This word seems to have been acquired quite adequately by the freshmen. Wonk, in contrast, would be a perfectly respectable nonsense syllable for most people and represents a most difficult cept for freshmen to learn.

Further differences between the freshmen and senior data are of interest. The senior data are presented in Figure 3, which represents the projection of the three-dimensional space onto the plane formed by the axes which best fit intellectual-academic and general social desirability. (Due to limitations of space only one plot of the senior configuration is presented. The other two plots have been deposited with the NAPS material—see Footnote 1.) Comparing this configuration with the freshman configuration, several aspects of change are apparent. Wonk, for the seniors, occupies a position congruent with its lexical definition. It is good on the intellectual-academic dimension, slightly bad on the general social dimension, and worse on the Princeton social dimension (not shown). In addition, wonk, lunch, and meatball, which are very close to one another in the freshman configuration, are now separated, clearly indicating that the seniors differentiate between them as the freshmen did not. In general, the Princeton words occupy more extreme positions in the senior configuration than in the freshman. This is not attributable to a general drift from the neutral point. Rather, the Princeton words have tended to become more

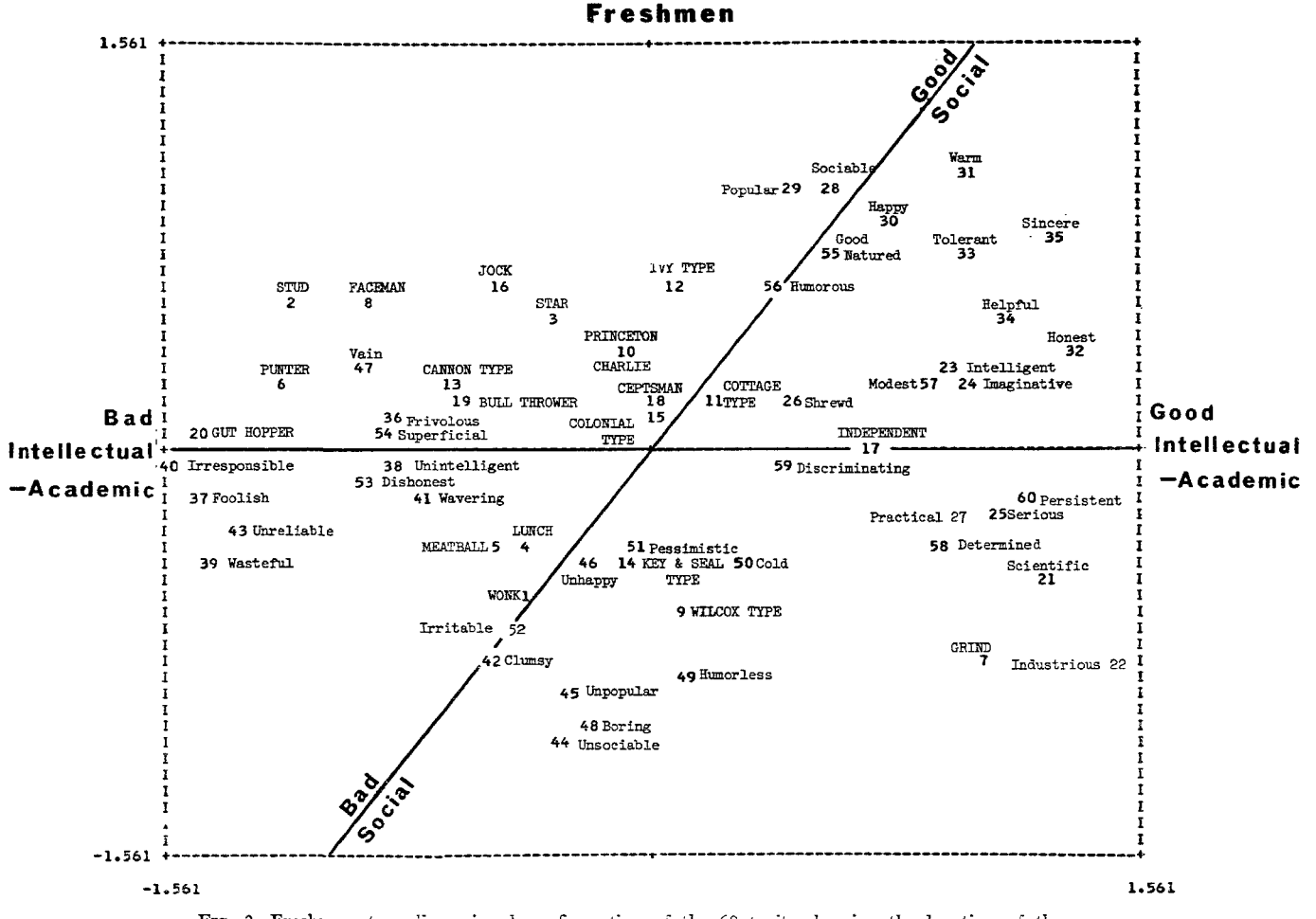

FIG. 2. Freshman two-dimensional configuration of the 60 traits showing the location of the axes best fitted by linear regression.

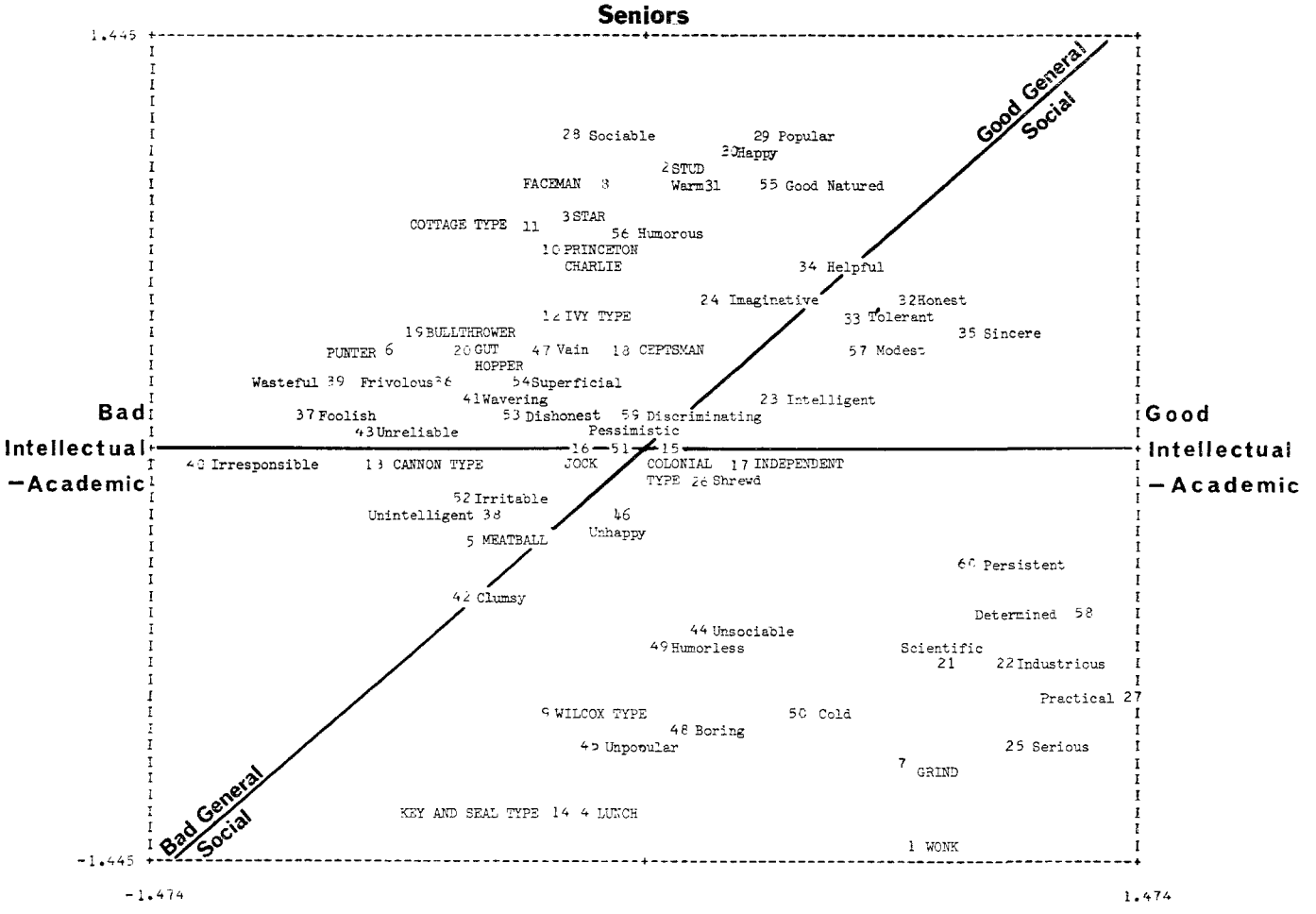

FIG. 3. Senior three-dimensional configuration plotted in the plane formed by intellectual-academic desirability and general social desirability.

polarized along the two social dimensions, and more so along the specific Princeton social dimension than on the general social dimension. For example, faceman and stud have moved from positions representing rather poor intellectual and neutral social desirability to positions which are academically neutral, moderately good on general social, and extremely good on Princeton social. Similarly, lunch and Key and Seal type are only slightly below neutral on both dimensions for the freshmen. For the seniors, the intellectual-academic ratings are essentially unchanged, but the social ratings have dropped considerably.

Viewing the acquisition of a subcultural lexicon as a matter of concept formation, these results are to be expected. Unfamiliar jargon terms, when heard initially, will tend to evoke a rather global response. In order to use the terms appropriately, it is necessary to learn which attributes of their referents are criterial, for example, what distinguishes wonks from non-wonks. When the attributes are correlated in experience (e.g., traits which are "good" intellectually tend also to be "good" socially), initiates to a language community would be expected to confuse them. There are several possible factors involved in the discrepancies of usage between the freshmen and seniors. First, the more highly correlated the attributes, the less frequent encounters with discrepant instances will be. Thus, freshmen may rate lunch, a fairly pure social term (see Table 2), low on intellectual-academic desirability because the students to whom they have heard the term attributed are also rather dull-witted. With increased acculturation, however, this academic component of lunch will be unstable across different contexts and will tend to become more neutral. A second possibility is the use of prediction in situations where the value of a term on one attribute is known and the initiate is asked to rate the term on another attribute where the value is unknown. In such cases, prediction of the unknown component from the value that is known will ordinarily be appropriate to the extent that the attributes are correlated in experience. Additionally, if the prediction is done rationally, it is to be expected that the predicted value will be less extreme than the value on the known dimension, thus exhibiting something akin to regression toward the mean. This appears to be the case with wonk for the freshmen, who appropriately rate it low on social desirability, but who have not learned the common intellectual-academic denotation of the term and rate it low on this scale also.

It is interesting to note the similarity of these results to those of a developmental study of adjective usage among children in the first and sixth grades of elementary school (Ervin & Foster, 1960). The children were asked to describe pictures of girls' faces using the words happy, good, pretty, and clean, and a set of objects using heavy, big, and strong. In comparing pictures and objects which differed on only one attribute, the first-grade children more often than the sixth graders erroneously said that the objects differed on dimensions other than the one actually contrasted. The more easily identified attributes, such as big and clean, were confused with others least often.

While the interpretations of the axes in the senior configuration seem to have considerable intuitive appeal and fit quite well in terms of the linear regression (Table 3), their location in the three-dimensional space raises some question of their mutual independence. The intellectual-academic and general social axes occupy relative positions which are roughly comparable to those of the freshman configuration, the angle between them being 50 degrees for the seniors. The Princeton social axis, however, is separated from the general social axis by only 12 degrees and hence accounts for relatively little of the space, independent of the latter. The correlations and angles between these dimensions are presented in Table 4.

An alternative dimension which might be used to characterize the configuration of the seniors, independently of general social desirability, is introversion-extroversion. Such a dimension seems to characterize the items in Figure 3 going from sociable, faceman, stud, warm, and star, all of which denote outgoing people, down to unsociable, cold, serious, grind, and wonk, which are descriptive of introverted people. In contrast to the evaluative dimensions discussed earlier, introversion-

TABLE 4

SENIOR CONFIGURATION: CORRELATIONS AND ANGLES BETWEEN AXES

Dimension	INT	G-SOC	P-SOC
INT		49.6	58.6
G-SOC	.489		12.0
P-SOC	.318	.942	

Note.—Entries below the diagonal give the correlations between successive intervals scale values of the seniors' trait ratings. All correlations are significant ($df = 58$, $p < .01$ or better). Entries above the diagonal give the angles, in degrees, between the axes fitted to these scale values in the senior three-dimensional configuration. INT = intellectual-academic desirability; G-SOC = general social; P-SOC = Princeton social.

extroversion is a descriptive component, and may be useful for representing nonevaluative factors involved in judgments such as those made by subjects in the sorting task.

Individual differences. The previous discussion was based on the assumption that the senior and freshmen MDS configurations each represented a single point of view, with individual differences within the groups representing random variations from this point of view. To what extent do the present data support such an assumption? Johnson [4] suggested a clustering analysis for assessing individual and group differences in sorting tasks of the kind used here. A distance function is defined between pairs of subjects which reflects the extent to which their sortings resemble one another. Given the sortings S_a and S_b produced by two subjects, Johnson developed a measure based on the intersection, $S_a \cap S_b$, of the sortings. The clusters in the intersection contain those items which were placed in the same category by both subjects. Hence, two subjects will be similar in this analysis to the extent to which they classify the same items together. The measure also takes into account the number and size of the categories used by the subjects, so that two subjects will not differ merely because they used different numbers of categories.

The sortings of the 15 freshmen and 15 seniors were used to compute a 30×30 matrix of dissimilarities between all pairs of subjects. Using this matrix as input to Johnson's cluster analysis program (Johnson, 1967), two large homogeneous subject clusters were obtained, one of freshmen only, and one of seniors only, along with three smaller, mixed clusters. To test the null hypothesis that the freshmen and seniors could be considered as samples drawn from the same population, the subjects in the five clusters were classified in terms of group membership, and chi-square was applied. This hypothesis was rejected at the .03 level of confidence, $\chi^2\,(4) = 11.07$. These data indicate that the subjects in each group sorted the items more like the members of their own group than like the members of the other group. While individual differences undoubtedly exist, two main "points of view" corresponding to class membership do seem to be represented in the MDS data.

[4] S. C. Johnson, unpublished manuscript entitled "Metric clustering," Bell Telephone Laboratories, Murray Hill, New Jersey, 1968.

Conclusions

The initial hypothesis, that MDS would reflect changes in semantic structure as a function of group membership, has been amply confirmed. First, the MDS solutions for the two groups resemble the MDS solution obtained by Rosenberg et al. (1968) with respect to the 40 words common to the two studies. Second, the specific subcultural lexicons differed as expected: the experienced group members, the seniors, exhibited greater differentiation between jargon terms, and, in addition, had apparently acquired a dimension of meaning specific to their subculture. This latter finding is similar to the findings reported by Tannenbaum and McLeod (1967) in a study of the socialization of law students. A number of law students in each class year rated a series of concepts relating to law school on a set of semantic differential scales. There was a progressive increase in the number of common factors for the scales with increasing number of years in law school, and Tannenbaum and McLeod (1967) concluded:

> Among the more subtle but important features of an increased degree of socialization is the capacity to differentiate—to make finer distinctions in the relevant cognitive material. Such a tendency may be in part a function of the addition of novel cognitions, accrued as the individual is exposed to new role-related behavior. But as new concepts are introduced and adopted, they have to be differentiated from existing ones. We have alluded to such a capacity by hypothesizing use of more independent factors with increasing socialization [p. 34].

The addition of a third dimension in the senior MDS solution may be interpreted as just such an additional factor, albeit not independent of other factors, resulting from socialization.

In more general terms, the present data have implications for the study of changes in and acquisition of meaning. As an individual becomes a member of a group, the meanings of familiar words change, and new words are acquired. These changes in an individual's lexicon may be measured in a variety of ways: associative relations will change (Deese, 1965), connotative meanings will change (Tannenbaum & McLeod, 1967), and, as shown, similarities between words, as well as their multidimensional structure, will change. That is, not only are new words acquired and fit into a semantic space, but the dimensions of that space itself are altered. The MDS approach should, therefore, be quite useful for evaluating the success of a socialization process, as well as for the investigation of the structure of connotative and denotative meaning.

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(Received March 21, 1969)