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ABSTRACT

This study investigated developmental changes in semantic structure, focusing on whether changes could account for differences in the concepts acquired by children and those acquired by adults. Semantic structure was determined at each of four age levels (6, 9, 12 years and college students). Two indications of developmental change were observed in the factorial structures. First, the youngest children showed a large general factor (essentially evaluative) which tended to break down with age. Second, the structure developed from two independent factors at 6 years of age, to four factors at 9, to five factors at 12 and college age. Changes in semantic structure helped clarify some of the developmental differences in concepts noted in earlier studies. (Author/DP)

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DEVELOPMENT OF NATURAL LANGUAGE CONCEPTS: II
DEVELOPMENTAL CHANGES IN SEMANTIC STRUCTURE

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Abstract

The present study was undertaken to determine if developmental changes in semantic structure could, to some extent at least, account for differences between the concepts acquired by children and those acquired by adults. Semantic structure was determined at each of four age levels (6- 9- 12-years-of-age and college students). Two indications of developmental change were observed in the factorial structures. First, the youngest children showed a large general factor (essentially evaluative) which tended to break down with age. Second, the structure developed from two independent factors at 6-years-of-age, to four factors at 9, to five factors at 12 and college age. Changes in semantic structure helped clarify some of the developmental differences in concepts noted in earlier studies.

DEVELOPMENT OF NATURAL LANGUAGE CONCEPTS: II. DEVELOPMENTAL CHANGES IN SEMANTIC STRUCTURE

Saltz and Hamilton (1968) and Saltz and Medow (1971) have found marked signs of concept disruption in young children under conditions of affective inconsistency between the attributes assigned to a concept. For example, 8-year-olds tend to deny that a man can remain a father if he becomes a drunkard. Told that a good baseball player (who catches well and hits many home runs) becomes a liar, many of these children not only deny that he could still be a good baseball player, the also deny that he can catch well or hit home runs. Such results suggest that young children see aspects of the environment as much more highly correlated than do adults. Most adults, for example, could readily accept the proposition that a bad man (e.g., a drunkard) could be a father.

While we know that young children appear to see attribute relationships differently from adults (Saltz, Soller and Sigel, 1972) there is much to be learned about the nature of such differences. The present study is concerned with sketching the developmental changes in attribute structure.

Ervin and Foster (1960) have proposed that a number of crucial semantic dimensions may be relatively undifferentiated or fused in young children. To investigate this, they started with two of the semantic factors isolated by Osgood and his associates (e.g., Osgood, Suci and Tannenbaum, 1957) the evaluative and potency factors. For example, in investigating the potency factor, Ervin and Foster (1960) showed six-year-old children two balls, one of which was larger than the other, and asked the children, "Is one stronger and one weaker, or are they both the same strength?" These children showed a strong tendency to claim that the bigger ball was stronger than the smaller. In general, Ervin and Foster report, the six-year-olds tended to use the potency terms (i.e., big, strong, and heavy) in an extremely correlated fashion. Similar results were obtained for a set of words from Osgood's evaluative factor (i.e., good, pretty, clean, and happy). By 12-years-of-age this tendency dropped considerably for both factors.

Based on these results, Ervin and Foster suggested that for many young children the three potency words, above, all had the same meaning and were interchangeable; similarly the evaluative words all had one meaning.

While Ervin and Foster showed that semantic attributes within a connotative factor are much more highly inter-related for younger children than for older, they did not investigate differences in semantic structure between factors. It is possible, for example, that the tendency to assign common meanings to attributes extends between factors, for younger children, so that the distinction between potency and evaluation may be obscured (e.g., metaphorically, "big boy" and "good boy" can be synonymous phrases). This would lead to a more undifferentiated structure for attribute dimesnions at the younger age levels.

This latter issue was examined comprehensively by DiVesta (1966) using the semantic-differential. Children in school grades 2 to 7 rated each of 100 concepts on 27 bi-polar adjective scales: the correlations between the 27 adjective dimensions were then factor analyzed. The factors obtained were very similar across the various ages tested. DiVesta (1966) concluded that the connotative modes of experiencing the environment, and of encoding the experiences, have stabilized by the time a child is in second grade.

A number of questions are left unanswered by the DiVesta study. First, since he used Osgood's semantic-differential technique, including group presentation of concepts and attributes in written form, DiVesta was forced to use children who were at least in the second grade and could read. (Non-readers were eliminated from the study). Thus his youngest group was at least 7-8 years of age. This is perhaps two-years-older than the group tested by Ervin and Foster in which the high relationship between attribute dimensions was observed. Second, DiVesta felt that many of his younger children did not know the meaning of all concepts which he had them rate. The most likely effect of such ignorance would be to attenuate the corelation between attributes for these children. If, as the data from Ervin and Foster (1960) suggest, the younger children are characterized by higher correlations between attribute dimensions, attenuation of such correlations would make the results for the younger children more similar to those found in the older children. This could account, in part at least, for the lack of difference between ages observed in DiVesta's data.

Finally, it should be noted that DiVesta, following the lead of Osgood, et.al. (1957), used a varimax rotation to determine semantic structure. This type of rotation breaks up any general factor that may occur in the data. Since the Ervin and Foster data suggest that inter-ocrrelations between attribute dimensions may be much higher in younger children than in older, the possibility of finding a general factor in the semantic structure of the youngest children should not be precluded by the means of analysis.

The present study re-examined the issue of developmental changes in attribute structure, using a procedure that differed from that of DiVesta in several ways. First, the children as young as six-years-of-age were tested. This necessitated the second deviation from the procedure used by DiVesta; the present experiment involved individual administration of the tests. A third difference was the use of scale-on-scale comparisons of attributes, much like that used by Ervin and Foster (1960), while DiVesta used a concepts-on-scales analysis. In the scale-on-scale analysis, an attribute value from one scale is compared directly with that of another scale. For example, the scales good-bad and happy-sad would be compared directly by telling a child that someone is good and then finding out if this implied, for the child, that the person is also happy.

The concepts-on-scales technique, on the other hand, involves using each attribute scale to rate many different concepts; the attributes are then correlated across concepts. This procedure, while very common, is indirect if the final product desired is a comparison of attribute dimensions. The indirect nature of this method could lead to several problems. One problem found by DiVesta is that young children may not understand the meaning of all concepts employed; if the primary concern is the inter-relationships between attributes, and the concepts are used merely as a vehicle to measure these inter-relationships, lack of comprehension of the concepts contributes only to error variance. Another difficulty with the concepts-on-scales analysis used by DiVesta is that is is at the mercy of the distribution of variances for each attribute scale across the concepts examined. For example, if all the concepts used in a given study are evalued as good by a group of children, it is likely that an evaluative factor will not emerge at all in that study; all the evaluative attribute-scales will have the same score on all concepts, thus there will be no variance attributable to evaluation and all the relevant correlations among evaluative scales will collapse to zero.

Finally, the present study differed from DiVesta's in that it employed rotational techniques which made it more likely that a general factor might emerge if one were present in the data.

Method

Subjects

A total of 240 Ss were tested. Of these, 160 children came from three Catholic schools (two in Windsor, Ontario, one in Detroit, Michigan) situated in both middle-class and working-class districts. Eighty of these children were 6-years-old, forty 9-years-old, and forty 12-years-old. Approximately half of them were boys, half girls. Parental occupations were obtained, and the ratio of blue-collar to white-collar occupations of parents was kept almost perfectly constant between the ages (23/17 at age 6; 23/17 at age 9; and 21/19 at age 12). In addition, 80 college students, enrolled in an introductory psychology course at Wayne State University were tested (48 males, 32 females).

Materials

Attribute dimensions were selected so as to sample as large a range of meanings as possible, and yet consist of words which were comprehensible to young children. The review of semantic-differential literature by Snider and Osgood (1969) was used as a source of attribute dimensions, and the Thorndike and Lorge (1963) norms were used to select words which occur frequently in the language. It was possible to find adjectives of very high frequency in the English language (used at least 50 to 100 times per million of words) and suitable diversity to represent the "positive" pole for a reasonable variety of semantic dimensions. "Negative" words proved to be much less often used and consequently were more difficult for very young children than the positive ones; nevertheless, some of the less frequently used adjectives (such as cowardly or excitable) had to be included to obtain bipolar scales.

The final set of 16 bipolar scales (i.e., 16 pairs of antonyms) was: <u>kind/cruel</u>, <u>honest/dishonest</u>, <u>friendly/unfriendly</u>, <u>tame/wild</u>, <u>smart/silly</u>, careful/not-careful, calm/excitable, beautiful/ugly, clean/dirty, happy/sad, young/old, big/small, strong/weak, brave/cowardly, hard working/lazy, active/not active.

Four pairs of pictures of fictitious animals were used with these dimensions. The two pictures of each pair were mirror images.

Procedure

Each S was tested individually. An S was presented with a pair of pictures and was told that these represent some strange animals he had never before seen and about which "we know only one thing." One animal was then characterized as having one attribute (e.g., kind) and the other animal as having the opposite attribute (e.g., cruel). He was then asked to evaluate the two animals on the remaining 15 dimensions, presenting one dimension at a time in a random order. For example: "If this animal is kind and this other is cruel, do you think that one of them is more friendly and the other more unfriendly, or are they the same?" If the S considered one friendlier than the other, he was required to point out which one. The order of presentation of the words, the sides on which the positive or negative attributes were given, etc. were all randomized. Each child was asked if he understood the words, and if necessary, a word was explained to him (this occurred rarely).

Since we wished to find the relationships between 16 bipolar scales, a complete matrix of judgments for each S would have involved judging each of the 16 scales, as standards, against the remaining sets of 15 scales. Using this procedure outlined above, this would have required 240 judgments from each child, with great repetition of traits to be used as comparison stimuli and as standards. Since it was felt that this would strain the attention span of the children, each S was shown only four dimensions as standards (each set of standards accompanied by a different pair of animal-illustrations). Each of the four standards was judged on the remaining 15 attribute scales for a total of 60 judgments per S. The four standards shown each S were determined randomly, with the limitation that all standards be judged equally often over the 40 or 80 Ss in an age group. Note that the use of different Ss to rate different concepts was established as a precedent in several earlier studies, such as DiVesta (1966) and Akute (cited in Osgood, 1962, p. 17). This procedure is justified on the grounds that, since Ss are used as measuring instruments, rather than points in the sample space, there is no requirement that every S judge every concept.

Statistical analysis

The judgments of relationships between attributes were converted into an index of co-relation, using a procedure similar to that cited by Shepard (1962, p. 235). Each judgment was scored +1 if the S associated the positive ends of the two dimensions being related (e.g., chose the kind animal as clean); a judgment was scored zero if the S saw no association between the two dimensions being compared; and -1 was scored if the positive end of one dimension was associated with the negative end of the other (e.g., if S chose kind animal as dirty). Scores in each matrix cell were divided by the number of Ss who judged each comparison of attributes; this produced a co-relation index that ranged from +1.00 to -1.00. The complete 16 X 16 matrix of word comparisons had 10 judgments per cell at the age levels of 9 and 12, and 20 judgments per cell for the 6 year-olds and university students.

It is much easier to determine the underlying structure of this type of matrix if the two halves can be averaged to produce a single, symmetrical matrix. In the present study, a symmetrical matrix would mean that any given word (e.g., word-1) would produce the same pattern of co-relations with other words in the matrix whether word-1 were the standard and all the other words were the comparison stimuli, or if word-1 were a comparison stimulus successively evaluated against each of the other words as the standards.

This characteristic of symmetry can be evaluated relatively simply by means of Spearman rank-order correlations (*rhos*). A Spearman *rho* was calculated between the pattern of co-relations for each word as the standard stimulus as opposed to the pattern for the same word as a comparison stimulus. This procedure produced 16 *rhos* per matrix. At each age level these *rhos* tended to be high, indicating that the matrices were, indeed, relatively symmetrical (e.g., told that an animal was *kind*, all the six-year-olds said he was *honest*; told that the animal was *honest*, they all said that he was *kind*. To illustrate the magnitude of these *rhos*, at each age they were transformed to *Z*s, these were averaged and retransformed to *rhos*. The average *rhos* obtained were as follows: At age 6, *rho* = .522; at age 9, *rho* = .512; at age 12, *rho* = .640; for university students, *rho* = .702. It should be noted that at the earliest ages the *rhos* tended to be attenuated by the large number of co-relations that were tied at 1.00. In other words, the somewhat lower *rhos* for the younger children do not represent inconsistent comparisons of the original stimulus words; on the contrary, the *rhos* were attenuated by too great a stability.

These *rhos* were judged large enough to justify averaging of the two sides of each matrix to make the matrices symmetrical for purposes of further study. This led to a set of matrices in which the distinction between standard and comparison stimuli was eliminated and each comparison of two attribute dimensions was judged by 20 *S*s at ages 9 and 12, and by 40 *S*s at age 6 and by university students.

The possibility was considered of analyzing the data by means of non-parametric, multi-dimensional scaling techniques, such as the Guttman-Lingos. It was finally decided that, despite violating certain of the assumptions underlying factor analysis, this technique came closest to answering the questions most basic to the present research.

Since the co-relations indices calculated above ranged from +1.00 to -1.00, these matrices of co-relations can be factor analyzed as though the cell entries were Pearson _rs_. While the magnitude of the factor loadings obtained by this technique will not be identical to those obtained from Pearson _rs_, the factor structures will prove to be virtually identical, and the loadings within each factor obtained using the present procedure will be highly correlated with the loadings obtained using Pearson _rs_. Separate factor analyses were conducted at each age level.

Results

Are there systematic differences in semantic structure of children as a function of age? A number of indices suggest that, for the youngest children tested, the semantic structure is largely dominated by a single general factor; this structure becomes more complex with age. First, this is indicated by the fact that in only 5% of the judgments did children 6-years-of-age say that two attribute dimensions were unrelated. The corresponding data for children at 9-and 12-years-of-age, and for college aged _Ss_, were 36%, 35%, and 63%, respectively. A similar pattern is seen in the percentages of variance found in the first factor extracted at each age level by means of the unrotated principal axes solution. These percentages were 68%, 57%, 40%, and 36% for _Ss_ 6- 9- 12-years-of-age, and for college students, respectively.

Turning to the rotated factorial data, both varimax and quartimax solutions were obtained at each age level. Only factors with eigen-values over 1.0 were retained for rotation.

Since the quartimax solution tends to preserve a general factor if one occurs in the principal axes solution, let us examine the results of the quartimax solutions first. Tables 1 to 4 present the factorial structures for 6- 9- and 12-year-old children and the college students, respectively.

Note, in these tables, that the cognitive structures at the successive age levels demonstrate increased differentiation of meaning in two ways. First, we find a movement from a strong general factor, at the early ages, to a break-up of the general factor at later ages. The quartimax solution in Table 1 shows that, for the 6-year-olds, Factor 1 (the evaluative factor)

Insert Table 1 about here

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is a general factor on which every attribute shows some degree of positive loading. The quartimax rotation for the 9-year-olds (see Table 2) shows that

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Insert Table 2 about here

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the general factor has begun to break-up and other factors are making a stronger appearance. By 12-years-of-age, Table 3 shows that the evaluative

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Insert Table 3 about here

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factor has reduced even further in size, and there is no longer any sign of the general factor in the quartimax solution. The structure found for the college students (see Table 4) is extremely interesting as it is almost identical to that of the 12-year-olds. This virtual identity exists despite the very different backgrounds of the two groups (e.g., the greater homogeniety of the college students in terms of social class and IQ, the greater homogeniety of the 12-year-olds in terms of religious education).

Insert Table 4 about here

The second indication of the development of differentiation between dimensions of meaning, from the quartimax rotation, is that the number of factors in the cognitive structure increases between 6-and 12-years-of-age. At 6-years-of-age, only two factors are extracted (see Table 1). The first is the general factor, which appears to be primarily evaluative and is characterized most strongly by attributes such as kind/cruel, clean/dirty, and friendly/unfriendly. The only other factor to emerge is that of potency as represented by big/small, brave/cowardly, and strong/weak.

At age 9 (Table 2), four factors emerge. The strongest is still the evaluative, but this factor is no longer general since two of the attributes load negatively on this factor. The potency factor is again strong at this age. The two other factors are somewhat unclear in interpretation. Factor 4 appears to be the early form of Osgood's activity factor since is is defined by attributes such as active/not active and calm/excitable. It is interesting to note how this factor changes with age in Tables 3 and 4. For the older children the activity factor will lose its "excitable" characteristic and take on the characteristic of "hard working". Also, for the older children this factor will lose the negative affect found in the 9-year-olds, associated with dirty and ugly. Finally, Factor 3 for the 9-year-olds appears to be a second evaluative factor, one based on physical appearance as opposed to the social basis of Factor 1.

The quartimax solutions for the 12-year-olds and the college students are very similar. Both yield five factors, and for the first time we find a clear indication of the three dominant factors reported by Snider and Osgood (1969) as appearing in adult meaning structures across many cultures. These are the evaluative, potency, and activity factors. Again, as in the 9-year-olds, there is both a social-evaluative factor (Factor 1) and an appearance-evaluative (Factor 5). The final factor found in this study appears to represent intelligence and carefulness (Factor 4).

Let us now compare the quartimax rotation with the more traditional varimax. The greatest difference between these solutions was for the 6-year-olds (see Table 1). The quartimax permitted the appearance of a general factor, while the varimax did not. For the 12-year-olds and the college students the two types of rotations produced almost identical results (see Tables 3 and 4), suggesting that the quartimax does not force a general factor, and that if no general factor exists, the two types of solutions will be almost identical.

The evidence for a general factor found in the 6-year-old group is very interesting and deserves further comment. This factor is so strong, for these youngsters, that it appears to produce a distortion of physical reality when the physical attributes are inconsistent with the evaluative characteristics of a stimulus. Big/small provides a good example of this tendency. Size is an objective physical characteristic which can be judged on the stimulus cards presented to the children in this study. In every comparison, the two animals shown to a child were the same size. Further, the pictures were never removed from view during the test. Despite this, there was a marked tendency for the youngest children to distort their judgments of size so as to be consistent with the evaluative characteristics of the standard attributes which assigned, by the experimenter, to the picture of an animal. For example, some Ss were told that one animal was friendly and one unfriendly, and were then asked, "Is one animal big and the other one small?" There was a marked tendency for the 6-year-olds to respond that the friendly animal was bigger than the unfriendly. Table 5 indicates the percentages of Ss at

Insert Table 5 about here

6- 9- and 12-years-of-age who considered an animal to be bigger if it was first given another positive attribute by the experimenter. (The positive attributes in Table 5 are a random selection; the data are similar for the other positive attributes.)

Finally, there is some evidence to suggest that complexity of factor structure is significantly related to age and sex, but not to social class or intelligence. The index of complexity employed was the number of comparisons between pairs of dimensions on which a child indicated that the dimensions were unrelated (e.g., the kind animal is neither stronger nor weaker than the cruel animal). Since complete data on social class and intelligence were not available for the college students, this group was omitted from the analysis and only the 6- 9- and 12-year-olds were compared in an analysis of variance. Older children were more likely to state that two dimensions were unrelated than were younger children, $F(2, 114) = 47.2$, $p < .001$. Girls were more likely to state that two dimensions were unrelated than boys, $F(1, 114) = 7.2$, $p < .01$. On the other hand, a comparison of children whose fathers were in blue collar versus white collar occupations failed to approach significance. Similarly, a categorization of the children by their teachers on the basis of intelligence tests and class performance failed to show a relationship to performance on the experimental task.

Discussion

Why will a young child insist that a father who becomes a drunkard is no longer a father? The present data suggest that, to some extent at least, the psychological characteristics of natural language concepts will be determined by the organization of the underlying semantic structure within the child. At early stages of the child's development, the dimensions of the semantic space are not yet independent. Therefore, if the concept of <u>father</u> is located at the positive end of the evaluative dimension, it will be very difficult for the child to accept a person as an instance of this concept if that person contains attributes that are strongly at the negative end of the dimension.

The data of the present study support Ervin and Foster (1960) in their contention that many attribute dimensions are highly correlated for young children, and that these correlations decrease in magnitude with age. However, our results are even more extreme than theirs. Ervin and Foster compared evaluative attributes with each other, and potency attributes with each other, but did not compare evaluative and potency attributes with each other. Based on their analyses, they concluded that all evaluative attributes tended to have one meaning, and all potency attributes to have a different meaning for 6-year-olds. The present study involved all possible comparisons between attributes, and found that for the 6-year-olds there was only a relatively weak indication of independent potency factor, and no activity factor at all; the children produced a large general factor that included all the others to some extent, and this factor was largely evaluative in nature.

Does this high correlation between attribute dimensions at the younger ages indicate, as Ervin and Foster (1960) suggest, that these children do not realize that the attributes have different meanings? While there are no definite data on this issue, the writers believe Ervin and Foster incorrect. Many young children gave spontaneous explanations for their judgments that indicated the children thought of the attributes as correlated but not identical. For example, one child said that the tame animal would be clean because, if it was tame someone would take care of it and keep it clean. In short, the "halo" effect seemed to be much stronger for younger children than for older.

Comparing our factor analysis of semantic attributes to that of DiVesta (1966), a number of differences emerge. DiVesta found virtually no change in semantic structure between, approximately, the ages of 8 to 13. We, on the other hand, found a sizeable systematic increase in differentiation between 6- and 9-years of age, and somewhat smaller increases in differentiation between 9- and 12-years-of-age. At this point the writers feel that the differences are largely due to different procedures: (1) individual testing of children in this study, as opposed to written, group testing by DiVesta; (2) use of scale-on-scale comparison technique in this study, as opposed to DiVesta's use of scales-on-concept technique in which many of the children apparantely did not understand the meaning of all the concepts being tested; and (3) our use of quartimax rotation which permits the emergence of a general factor, as opposed to DiVesta's use of the varimax which prevents the emergence of a general factor. DiVesta's use of a written test to measure semantic structure was probably particularly difficult for the second graders in his study.

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Footnotes

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Table 1

Semantic Structure for Six-Year-Olds

Varimax and Quartimax Rotations

Dimensions	Quartimax Factor 1	Quartimax Factor 2	Varimax Factor 1	Varimax Factor 2	Varimax Factor 3	Varimax Factor 4
kind-cruel	.9679	-.0710	.8367	.2084	.4298	.2059
honest-dishonest	.8413	.0988	.8073	.2728	.1649	.2782
friendly-unfriendly	.8973	-.1582	.5691	.1603	.6317	.3487
tame-wild	.7539	.1777	.5896	.4111	.3249	.0424
smart-silly	.8381	.5404	.6823	.6794	.0327	.4048
careful-not careful	.8297	.0528	.6288	.2078	.2268	.7280
calm-excitable	.6869	-.1751	.8534	-.0324	.1163	.0068
beautiful-ugly	.8618	-.0658	.5063	.2913	.6926	.0831
clean-dirty	.9512	.0496	.4520	.4086	.7173	.4110
happy-sad	.7904	.1055	.4723	.4360	.5881	-.0677
young-old	.3051	-.5465	.0218	-.2974	.6932	.0441
big-small	.0535	.8495	-.0350	.7796	-.3386	.0505
strong-weak	.4886	.6686	.2091	.7900	.0795	.1572
brave-cowardly	.5212	.7409	.2391	.9091	.1382	-.0906
hard working-lazy	.6816	.5306	.4311	.7205	.1974	.1037
active-not active	.4030	.5050	.0031	.6339	.2123	.3461
Variances	8.3856	2.9676	4.5846	4.3279	2.8277	1.2855

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Semantic Structure for Nine-Year-Olds

Varimax and Quartimax Rotations

Dimensions	Quartimax Factor 1	Quartimax Factor 2	Quartimax Factor 3	Quartimax Factor 4	Varimax Factor 1	Varimax Factor 2	Varimax Factor 3	Varimax Factor 4
kind-cruel	<u>.9458</u>	-.1020	.2574	-.0295	<u>.8733</u>	.0312	.2871	.3547
honest-dishonest	<u>.8837</u>	.1612	-.0056	-.1770	<u>.8452</u>	.2950	.0301	.1892
friendly-unfriendly	<u>.9136</u>	-.1779	-.0304	-.2517	<u>.9548</u>	-.0313	.0048	.1344
tame-wild	<u>.8011</u>	-.0404	-.0243	.3277	<u>.6031</u>	.0565	-.0085	<u>.6200</u>
smart-silly	<u>.7692</u>	.3974	-.0468	-.0209	<u>.6455</u>	.5041	-.0169	.2847
careful-not careful	<u>.8986</u>	.2522	-.1703	.2950	<u>.6652</u>	.3638	-.1470	<u>.6250</u>
calm-excitable	.4899	.0479	-.3242	.5325	.2380	.0331	-.3233	<u>.6583</u>
beautiful-ugly	.5326	.0740	<u>.6608</u>	.4160	.2807	.1147	<u>.6658</u>	<u>.6030</u>
clean-dirty	.4909	.0489	.2530	<u>.6225</u>	.1814	.0796	.2507	<u>.7699</u>
happy-sad	.4416	.4004	.4732	-.0611	.3438	.4539	.4932	.1246
young-old	-.0723	-.0150	<u>.8392</u>	-.0909	-.0604	-.0344	<u>.8385</u>	-.1000
big-small	.1146	.5019	-.2729	-.0041	.0392	.5171	-.2633	.0351
strong-weak	-.0342	<u>.9688</u>	.1519	.0010	-.1858	<u>.9498</u>	.1612	-.0163
brave-cowardly	.4934	<u>.8600</u>	.1388	.0823	.2770	<u>.9131</u>	.1615	.2691
hard working-lazy	<u>.6210</u>	<u>.6167</u>	-.0619	.0229	.4611	<u>.6976</u>	-.0357	.2642
active-not active	.3149	.4952	.2606	-.5068	.3987	.5577	.2910	-.3382
Variances	6.2575	3.0176	1.8215	1.4107	4.3861	3.5151	1.8700	2.7360

Table [illegible]

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Semantic Structure for Twelve-Year-Olds

Varimax and Quartimax Rotations

Dimensions	Quartimax					Varimax				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
kind-cruel	.9425	.0082	-.0071	.0304	-.1185	.9427	.0137	.0076	.0806	-.0807
honest-dishonest	.8016	.0215	.0699	.1580	-.0978	.7928	.0249	.0819	.2004	-.0719
friendly-unfriendly	.9434	-.0911	.1122	.0604	.1913	.9301	-.0866	.1272	.1275	.2209
tame-wild	.7293	-.0892	-.2046	.1842	.2464	.7154	-.0877	-.2726	.2211	.2699
smart-silly	.2548	.0055	-.0312	.7878	-.0040	.2134	-.0013	-.0247	.8002	.0070
careful-not careful	.2060	.2492	.1588	.7514	.2628	.1532	.2417	.1643	.7717	.2726
calm-excitable	.3965	.1298	-.4293	.4891	.2209	.3687	.1261	-.4161	.5110	.2358
beautiful-ugly	.1095	.0084	.0790	-.0142	.7076	.0967	.0074	.2308	-.0125	.7106
clean-dirty	.0427	.0319	-.0510	.2056	.7151	.0700	.0281	-.0495	.2012	.7170
happy-sad	.4606	.0752	.4859	.1102	.2756	.4373	.0762	.4933	.1317	.2902
young-old	.0865	-.3621	.4707	-.2658	-.0050	.0957	-.3594	.4713	-.2664	-.0046
big-small	-.0987	.8600	-.1468	.0319	.0705	-.1057	.8587	-.1407	.0357	.0698
strong-weak	-.1416	.9239	.2307	.0997	-.0381	-.1549	.9221	.2282	.1010	-.0403
brave-cowardly	.3717	.6337	.2369	.1541	.0190	.3545	.6343	.2428	.1789	.0327
hard working-lazy	.2971	.3449	.6122	.5648	-.0135	.2555	.3410	.6183	.5808	-.0015
active-not active	-.1301	.2351	.9728	.0992	.0153	-.1520	.2330	.9708	.0909	.0115
Variances	3.7912	2.4025	2.2226	1.9947	1.3341	3.5578	2.3365	[illegible]	2.1279	1.3756

Table

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Semantic Structure for University Students

Varimax and Quartimax Rotations

Dimensions	Quartimax					Varimax				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
kind-cruel	.9096	-.1141	.0641	.1919	-.1048	.9090	-.1149	.0885	.1116	-.0783
honest-dishonest	.6518	-.0101	.2448	.1776	-.0224	.6445	-.0059	.2592	.1854	-.0007
friendly-unfriendly	.9029	-.0436	.0943	-.1407	.1153	.8986	-.0425	.1109	-.1271	.1462
tame-wild	.7032	-.1410	-.3041	.4116	-.1533	.7082	-.1506	-.2813	.4173	-.1523
smart-silly	.1606	.1567	.0723	.7148	.0142	.1501	.1573	.0724	.7170	.0068
careful-not careful	.1446	-.1610	.0484	.9220	.0575	.1299	-.1609	.0548	.9245	.0469
calm-excitable	.6905	.2609	-.2645	.3590	.1700	.6871	.2536	-.2600	.3714	.1753
beautiful-ugly	.0579	-.0031	.0434	.0814	.6569	.0372	.0006	.0278	.0938	.6575
clean-dirty	.1357	-.1190	-.0605	.6325	.3937	.1175	-.1198	-.0642	.6411	.3848
happy-sad	.6392	.0668	.4448	-.0793	.3824	.6195	.0778	.4462	-.0646	.4126
young-old	-.0097	-.2321	.2057	-.5630	.3866	-.0187	-.2249	.2002	-.5565	.4025
big-small	-.1171	.8438	-.0953	.0783	-.1074	-.1108	.8410	-.1146	.0758	-.1186
strong-weak	-.0333	.7711	.4502	.0382	.0252	-.0421	.7817	.4305	.0386	.0310
brave-cowardly	.1570	.4464	.3979	-.2748	.1304	.1492	.4562	.3867	-.2703	.1476
hard working-lazy	.1711	.0784	.9036	.3920	-.2536	.1541	.0978	.9116	.3888	-.2333
active-not active	.0775	.0903	.9518	-.2396	.2300	.0537	.1139	.9443	-.2353	.2327
Variances	3.5907	1.7462	2.5813	2.7448	1.1108	3.5245	1.7725	2.5571	[illegible]	[illegible]

Table 5

Percentages of 6- 9- and 12-Year-Old Children Who

Distorted their Ratings of Size so as to be

Consistent with Some Other Evaluative Attribute

Age of Children	Percentages of Children Who Rated an Animal as "Bigger" when the Experimenter Described the Animal as:					
	Friendly	Tame	Careful	Active	Clean	Brave
6	80	80	80	80	90	100
9	20	20	20	10	30	40
12	10	10	20	10	10	30