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ABSTRACT

To secure information relative to the developmental aspects of their meaning system as measured by the semantic differential technique, 154 residential students from the New York State School for the Deaf at Rome, New York were divided into five groups according to age and academic grade level and were administered a semantic differential. It was known from a previous investigation that the adjectives used as pole words were frequently, diversely, and independently used by deaf students and that they were derived on the basis of experimental investigation. Data supported the following findings: that the manner in which the youngest Ss experienced their environment and the language mechanism they utilized to encode their experiences appeared idiosyncratic, and that the middle group of Ss demonstrated the presence of strong evaluation and potency dimensions as have been found in investigations with normally hearing children. (GW)

A DEVELOPMENTAL STUDY

OF

DEAF CHILDREN'S SEMANTIC SYSTEM*

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An area of language behavior which has and continues to receive considerable attention in the literature concerns the semantic aspects of linguistic behavior. One approach to examination of this behavior has been reported by Osgood, Suci and Tannenbaum (1957) and is referred to as the semantic differential technique. In the past 15 years, the semantic differential has been applied to a variety of measurement problems in experimental, social and clinical psychology (Snider and Osgood, 1969).

Osgood, Suci and Tannenbaum (1957) reported the semantic differential as a procedure for indexing connotative meaning based upon the theory of verbal mediation. The development of the semantic differential as a tool for the assessment of meaning has been described in detail by Osgood (1952); Osgood, Suci, Tannenbaum (1967); and Osgood, Archer and Miron (1962). As can be seen in Slide I, the procedure is characterized by a combination of scaling and association methods in which individuals are presented with a number of antonymous pairs of adjectives such as "good-bad," "tall-short," and "fast-slow." The adjectives are separated by a seven point scale. A subject is given a concept and required to rate it with respect to one of the seven points on each scale. This procedure may be followed utilizing a number of different scales across several concepts. A particular semantic differential then consists of a number of scale items which are bipolar in nature and several concepts which are to be rated within the space bounded by the antonymous pairs of adjectives. This creates a subject X concept X scale

TABLE 1

Example of Response Sheet
used in the Semantic Differential Study

(Concept word)

Good	1 : 2 : 3 : 4 : 5 : 6 : 7	Bad
Little	1 : 2 : 3 : 4 : 5 : 6 : 7	Big
Tall	1 : 2 : 3 : 4 : 5 : 6 : 7	Short
New	1 : 2 : 3 : 4 : 5 : 6 : 7	Old
Large	1 : 2 : 3 : 4 : 5 : 6 : 7	Small
Sad	1 : 2 : 3 : 4 : 5 : 6 : 7	Happy
Fat	1 : 2 : 3 : 4 : 5 : 6 : 7	Thin
Pretty	1 : 2 : 3 : 4 : 5 : 6 : 7	Ugly
Nice	1 : 2 : 3 : 4 : 5 : 6 : 7	Naughty
White	1 : 2 : 3 : 4 : 5 : 6 : 7	Black
Hard	1 : 2 : 3 : 4 : 5 : 6 : 7	Soft
Weak	1 : 2 : 3 : 4 : 5 : 6 : 7	Strong
Sour	1 : 2 : 3 : 4 : 5 : 6 : 7	Sweet
Red	1 : 2 : 3 : 4 : 5 : 6 : 7	Blue
Many	1 : 2 : 3 : 4 : 5 : 6 : 7	Few
Bright	1 : 2 : 3 : 4 : 5 : 6 : 7	Dim
Short	1 : 2 : 3 : 4 : 5 : 6 : 7	Long
Clean	1 : 2 : 3 : 4 : 5 : 6 : 7	Dirty
Cold	1 : 2 : 3 : 4 : 5 : 6 : 7	Hot
Wet	1 : 2 : 3 : 4 : 5 : 6 : 7	Dry

matrix of data which can be subjected to factor analysis in order to delineate the independent dimensions of the behavior responsible for the making of semantic judgments of this nature.

The numerous investigations reported utilizing the semantic differential technique to investigate the factor make-up of the meaning system in adults are summarized in Snider and Osgood (1969). Briefly, these studies have utilized a wide range of concepts, different sets of scales and have employed subjects from the various countries of the world. The generalized results of these investigations have lead to the conclusion that three major factors of meaning are involved in the behavior underlying the making of meaningful judgments. The most frequently found factor has been termed Evaluation (Table 2) and is defined by scales such as "good-bad," "pretty-ugly," and "right-wrong." Potency is usually the second factor found in semantic differential studies. Heavy loadings on scales such as "little-big," "weak-strong," and "short-long" usually define this construct. The third dimension referred to as Activity is evident in the loadings on scales such as "slow-fast" and "still-moving."

DiVesta (1966) has studied the development of the affective meaning system in children utilizing the semantic differential technique. The subjects were 100 normal hearing children in grades 2 through 6 who rated 20 concepts to each of the 27 scales reported in an earlier investigation. The results (Table 2) indicated that the Evaluation, Potency, and Activity dimensions usually evident in semantic differential studies with adults were present in these children as low as the second grade level. Further, additional factors were reliably demonstrated which DiVesta termed Warmth, as measured by scales like "cold-hot" and "wet-dry," Tautness (loose-tight, soft-hard) and a Novelty-Reality factor which was evident

TABLE 1:

DiVesta: The Semantic Structures of Children

Summary of DiVesta (1966) Loadings for Major Scales Associated with Six Varimax Factors Based on the Mean Ratings of 100 Concepts on 27 Scales.

Factors-scales	Grade 2	3	4	5	6	7
Evaluation						
good-bad	93	95	96	95	95	93
friendly-unfriedly	92	95	94	92	92	93
pretty-ugly	83	90	84	86	87	87
right-wrong	80	87	92	93	90	91
sweet-sour	70	85	81	84	89	88
funny-sad	74	80	74	78	78	80
Percent of TV	18.58	22.04	21.50	22.67	24.26	24.24
Potency						
little-big	86	90	86	84	87	83
light-heavy	76	70	68	69	74	65
weak-strong	67	75	47	43	50	59
short-long	66	78	75	81	79	72
smooth-rough	37	30	56	45	36	37
Percent of TV	11.51	12.90	10.27	9.60	11.06	10.41
Activity						
quiet-loud	69	69	62	65	69	73
slow-fast	69	64	82	79	81	79
still-moving	67	40	70	70	81	78
last-first	53	20	34	37	18	16
dull-sharp	33	65	57	65	41	55
not brave-brave	44	24	64	70	53	56
Percent of TV	9.75	8.31	11.13	11.70	10.29	10.80
Warmth						
cold-hot	80	88	89	89	86	85
wet-dry	68	75	74	68	63	81
blue-red	65	78	75	72	77	63
Percent of TV	7.80	8.32	7.54	7.48	7.02	7.11
Tautness						
loose-tight	82	77	84	81	82	75
soft-hard	64	83	81	81	80	81
Percent of TV	7.64	9.29	8.18	9.19	8.68	8.59
Novelty-reality						
round-square	63	75	75	67	58	72
same-different	61	36	74	53	68	66
real-make believe	10	67	61	67	68	58
new-old	39	38	60	45	66	37
Percent of TV	5.81	7.28	9.37	7.44	7.65	7.24

in the loadings of the "new-old" and "same-different" scales.

In the area of deafness, Green (1971) and Green and Miron (1971) reported the development of specific semantic differential scale items for use with residential deaf students. Later, Green and Shepherd (1973) sought to qualify the semantic system of 33 deaf students. The results (Table 3) indicated the presence of the Evaluation and Potency factors usually evident in the meaning systems of normal hearing individuals. However, other factors such as Activity, Warmth, Tautness, and Novelty-Reality which have been reliably demonstrated in normal hearing children were not evident in the semantic system of these deaf children.

The purpose of the present investigation was to study the semantic structure of deaf children of varying ages in order to secure information relative to the developmental aspects of their meaning system as measured by the semantic differential techniques.

Procedure

The individuals employed were 154 residential students from the New York State School for the Deaf at Rome, New York. The subjects were divided into five groups determined by age and academic grade level. Each subject in each group was administered a semantic differential comprised of the scale items reported by Green (1974) and the concept words utilized by DiVesta (1966). Care was taken to parallel investigations with normal hearing children so that appropriate conclusions could later be drawn.

The raw data for the investigation was each individual's response to each scale for each concept. This generated a scale X concept X subject matrix of data for each group. An inter-correlation matrix of scales taken across mean concept ratings was the subject of a factor analysis utilizing the Principle-Components procedure and rotated by the Varimax method.

TABLE 3

Major Varimax Loadings for 33 Deaf Students on 28 Scales* (Green and Shepherd, 1973)

Factors - Scale	Loadings
Evaluation	
nice-naughty	-.96
good-bad	-.95
sad-happy	.94
clean-dirty	.92
pretty-ugly	.92
rich-poor	-.90
best-worst	.85
sour-sweet	.83
new-old	.83
white-black	.80
fat-thin	.73
bright-dim	.73
quiet-loud	.63
real-make believe	.46
Percent of TV**	41.35
Potency	
little-big	.95
large-small	-.94
short-long	.87
weak-strong	.86
tall-short	.86
fast-slow	.70
Percent of TV	16.79
Factor No. 3	
cold-hot	.82
wet-dry	.82
round-square	.67
hard-soft	-.64
Percent of TV	12.50
Factor No. 4	
still-moving	.84
different-same	.76
Percent of TV	6.22
Factor No. 5	
many-few	.90
Percent of TV	5.26
Factor No. 6	
red-blue	.84
Percent of TV	4.01

* Based on mean ratings of concepts
** Total variance.

Results

The methodology for the data analysis in this investigation followed similar studies with deaf children (Green, 1971; Green and Shepherd, 1973; and Green, 1974) and normal hearing children (DiVesta, 1966) in order to facilitate comparison to the present investigation.

This analysis yielded factor structures for each age group. Inclusion of the factor structures for each age group would be impractical. Consequently, this presentation will deal with only groups 1 and 3 which were felt to be representative of our total sample.

For purposes of comparison, it is desirable to examine the data from group III initially. An inspection of Table 4 indicates that semantic structure of this group contains the familiar evaluation dimension as indicated by high loadings on such scales as "good-bad," "pretty-ugly," and "sad-happy," etc. Factor II appears to be a potency dimension as seen in the loadings for the "little-big," "tall-short" and "large-small" scales. Factor III has strong loadings on only two scales indicating a high degree of specificity and probably the process of denotation. Group III of this investigation then presents a pattern similar to the one found in an earlier investigation of deaf children (Green and Shepherd, 1973). This pattern is somewhat reminiscent of normal hearing children in that the Evaluation and Potency factors are clearly present. However, factors termed Activity, Warmth, Tautness and Novelty-Reality are not in evidence in our Group III as they have been found to be in normal hearing children as young as seven years (DiVesta, 1966).

Group I as portrayed in Table 5 presents an entirely different composite which appears not to be comparable to other groups of deaf children nor is it similar to the data reported on normal hearing children (DiVesta, 1966). As can be seen in this Table, the loadings are spread throughout the extracted factors in no readily

TABLE 4

Varimax Rotated Factor Matrix
for the 28 Scales on the Mean Concept Ratings
for the 36 Deaf Subjects in Group III

Scales	Factors					
	I	II	III	IV	V	VI
Good - Bad	.96	-.15	.02	.07	-.13	.01
Little - Big	-.30	.90	.20	-.10	.20	-.04
Tall - Short	.29	-.92	-.02	-.02	.04	-.02
New-Old	.90	-.28	.03	-.03	.04	.04
Large - Small	.27	-.92	.06	.05	-.11	.13
Sad - Happy	-.92	.19	.19	-.10	.18	-.04
Fat - Thin	-.69	.06	.10	.10	.16	.32
Pretty - Ugly	.96	-.15	-.05	.08	-.09	-.00
Nice - Naughty	.96	-.21	-.07	.09	-.12	.01
White - Black	.84	-.22	.14	.07	-.10	.08
Hard - Soft	-.31	-.60	.14	-.07	.36	.53
Weak - Strong	-.61	.61	.06	-.21	.16	-.22
Sour - Sweet	-.78	.26	-.12	.10	.47	-.02
Red - Blue	-.23	-.08	.85	-.36	-.06	-.04
Many - Few	.05	-.12	-.20	.93	-.02	.05
Bright - Dim	.86	-.29	-.08	.04	-.20	.16
Short - Long	-.33	.86	.05	-.03	.20	.02
Clean - Dirty	.92	-.28	-.06	-.03	-.15	-.02
Cold - Hot	-.27	.46	-.03	.14	.80	.17
Wet - Dry	.72	.17	.18	-.16	.42	.06
Best - Worst	.94	-.16	.07	.12	-.16	.01
Rich - Poor	.90	-.36	.02	.01	-.08	.10
Quiet - Loud	.81	-.13	-.07	.14	.06	-.32
Fast - Slow	.31	-.52	-.25	.16	-.10	.63
Still - Moving	.07	.15	.91	.02	-.02	.01
Round - Square	.56	.13	.09	.25	-.64	.20
Different - Same	.24	-.58	.45	.36	.18	-.19
Real - Make Believe	.64	-.18	.03	.38	-.11	-.40

TABLE 5

Varimax Rotated Factor Matrix
for the 28 Scales on the Mean Concept Ratings
for the 41 Deaf Subjects in Group I

Scales	Factors					
	I	II	III	IV	V	VI
Good - Bad	-.60	.38	-.10	.49	-.32	-.21
Little - Big	.91	.04	.17	-.03	.02	-.17
Tall - Short	-.75	.11	.37	.02	-.02	.33
New - Old	-.28	.69	.25	.47	.16	-.03
Large - Small	-.58	.34	-.41	-.06	.18	.06
Sad - Happy	.57	-.33	.36	-.22	.37	.40
Fat - Thin	.10	-.10	.19	-.29	.11	-.71
Pretty - Ugly	-.17	.64	-.40	.47	-.02	.02
Nice - Naughty	-.59	.17	-.26	.28	-.36	.19
White - Black	.12	.07	-.04	.86	.05	.08
Hard - Soft	.08	.12	.87	-.05	.08	-.28
Weak - Strong	.21	-.75	.05	.18	-.22	.07
Sour - Sweet	.32	.05	.72	-.27	-.14	.32
Red - Blue	-.08	.16	-.15	.17	-.10	.04
Many - Few	.05	.81	-.09	-.03	-.05	.05
Bright - Dim	-.56	.05	-.04	.40	.27	-.36
Short - Long	.43	.17	.38	.00	-.47	-.14
Clean - Dirty	-.30	.18	-.27	.67	-.18	.10
Cold - Hot	.07	-.24	.77	-.01	.08	.01
Wet - Dry	.08	-.10	.15	.27	-.14	-.02
Best - Worst	.01	.88	.03	.12	-.09	-.04
Rich - Poor	-.57	.14	-.35	.31	.19	-.02
Quiet - Loud	.21	.13	.22	-.61	-.58	.02
Fast - Slow	-.14	.57	-.08	.57	.24	.05
Still - Moving	-.08	.05	-.21	.30	-.08	-.18
Round - Square	-.25	.01	.04	.03	.19	.83
Different - Same	.12	.23	.10	.09	.82	.08
Real - Make Believe	.15	-.01	-.58	.22	.02	-.43

apparent pattern. The prominant Evaluation and Potency factors found in Group III and in earlier studies of both deaf and normal hearing children do not appear to be evident in these younger deaf children (Group I).

Discussion

The findings of this investigation pose a number of questions. Initially, one may want to inquire as to the nature of the responses of these deaf individuals which would lead to the factor structure obtained. It is known from a previous investigation (Green, 1974) that the adjectives used as pole words were frequently, diversely and independently used by deaf students and that they were derived on the basis of an experimental investigation. This would imply that what is being examined is not whether the judgment can be made but it signifies how and in what manner a known quantity (scales) are applied to the meaningful rating of concepts. The lack of a definite factor structure (Table 6) in the youngest group of deaf children indicates the ratings of any one of these individuals had little in common with the total group. The responses of this group were scattered throughout the space bounded by the two adjectives in no apparent systematic fashion. The children in this group appear to be individually unique in their semantic judgment. That is, the manner in which they experience their environment and the language mechanism utilized to encode their experiences appears idiosyncratic.

This can be contrasted with Group III (Table 6) who demonstrated the presence of strong evaluation and potency dimensions as have been found in investigations with normal hearing children. Any one individual in group III responds within the semantic space bounded by the polar adjective across a number of varied concepts in a systematic fashion. This group appears to be making differential semantic judgments in a manner at least similar to normal hering children.

It now may be possible to speculate why the students in Group I respond

TABLE 6

Summary of three Varimax Rotated Factors Relative to the loading on II

Factors/Scales	Age Groups Group I $\bar{X}$ = 8.6 yrs.	Group III $\bar{X}$ = 12.6 yrs.	Group V $\bar{X}$ = 16.8 yrs.
Evaluation			
Good - Bad	.60	.96	.89
Pretty - Ugly	.17	.96	.85
Nice - Naughty	.59	.96	.92
Best - Worst	.01	.94	.94
Sad - Happy	.57	.92	.89
Clean - Dirty	.30	.92	.86
New - Old	.28	.90	.58
Bright - Dim	.56	.86	.71
White - Black	.12	.84	.80
Quiet - Loud	.21	81	.72
Sour - Sweet	.32	.78	.56
Wet - Dry	.08	.72	.23
Potency			
Tall - Short	.75	.92	.84
Large - Small	.58	.92	.45
Little - Big	.91	.90	.83
Short - Long	.43	.86	.39
Hard - Soft	.08	.60	.36
Factor III			
Still - Moving	.21	.91	.09
Red - Blue	.15	.85	.06

differently from their older counterparts in Group III and from children with normal hearing. According to Osgood (1957) meaning can be viewed as a representational mediation process and viewed in terms of the acquisition of signs and assigns. Factors such as cultural variables, rules governing learning, and the response capabilities of sensory mechanisms dictates that many signs and combination of signs and their subsequent assigns are quite stable across individuals. However, there are still a number of signs and especially assigns which are unique to each individual.

Deaf children, however, present an auditory system which is not operational and thus have to engage in the sign learning process without the benefit of hearing. Their individual experiences which are contiguous to auditory stimuli are not acquired in the usual manner. They would not be presented with the same opportunity to acquire assigns as would children with normal hearing. Consequently, individual deaf children would acquire a unique and highly individual system of signs which may bear no relation to those used by normal hearing children or even other deaf children. Hence, the corpus of signs and assigns available to young deaf children can best be described as idiosyncratic.

Group III, on the other hand, displays a factor structure which is somewhat similar to normals. However, it is one which lacks the richness of young normal hearing children. The difference between this group and the younger deaf children is probably the effects of classroom experiences which would, at least generally, have a common basis on all students in a particular class or even a particular curriculum. Consequently, the sign as in the learning process is similar for the older group.

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