DOCUMENT RESUME

ED 288 282 EC 200 752

AUTHOR	Baroody, Arthur J.
TITLE	Addition Learning by Mentally Handicapped Children.
SPONS AGENCY	National Inst. of Child Health and Human Development (NIH), Bethesda, Md.
PUB DATE	Apr 87
GRANT	NICHHD-HD-16757-02; NICHHD-HD-16757-03
NOTE	16p.; Paper presented at the Biennial Meeting of the Society for Research in Child Development (Baltimore, MD, April 23, 1987).
PUB TYPE	Reports - Evaluative/Feasibility (142) -- Speeches/Conference Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Cognitive Processes; Computation; *Discovery Learning; Elementary Secondary Education; *Mild Mental Retardation; Moderate Mental Retardation; *Number Concepts

ABSTRACT

The study investigated whether 15 children (ages 6-21) with IQs from 31 to 66 could spontaneously invent more efficient calculational procedures and abstract basic arithmetic relationships after individualized tutoring in computation. Experimental subjects were given training that focused on accurate computation but specific relationships and calculational shortcuts were not pointed out. As a result of the computational training, many experimental subjects spontaneously invented shortcuts for the concrete counting-all procedure they already knew including the "counting fingers strategy." More experimental than control children (who received training in nonarithmetical areas) discovered that applying the commutativity principle could shortcut their computational effort, and more experimental than control subjects mastered facts involving zero and one. (DB)

Addition Learning by Mentally Handicapped Children

Arthur J. Baroody
University of Illinois
at Urbana-Champaign

This research was supported in part by NICHD (NIH) Grants Numbered HD 16757-02 and -03.

I am indebted to principal Rena Gaspard, the teachers, and children of the Foreman Center, B.O.C.E.S. I, Monroe County, New York, whose cooperation made this study possible. Thanks are due to Cathleen Mason, Brian Burley, and Kathy Breen for their help in collecting the data.

Presented at the biennial meeting of the Society for Research in Child Development, Baltimore, MD, April 23, 1987.

Abstract

A training experiment was undertaken with 30 children who ranged in IQ from 31 to 66 to see if mentally handicapped children could spontaneously invent more efficient calculational procedures and abstract basic arithmetic relationships. Some experimental subjects did invent calculational shortcuts. The most common was what Siegler and Robinson (1982) call the "counting-fingers strategy": represent each addend with a finger pattern and then count all the fingers put up. Some even adopted what these researchers call a "fingers strategy": represent each addend with a finger pattern and, without counting, announce the total number of fingers put up. From their computational training, the experimental subjects apparently discovered the commutativity principle: The order of the addends does not affect the outcome. When presented commuted problems in sequence (e.g., when 3 + 5 followed 5 + 3), significantly more experimental subjects than control subjects shortcut their computational effort. That is, they did not bother to compute the sum of the second problem but simply stated the previously calculated sum. The experimental group also demonstrated significantly greater mastery of combinations involving zero and one, including those <u>not practiced</u>. Experimental subjects apparently induced a zero rule (adding zero leaves a number unchanged) and a rule for adding one: The sum is the number after the other term (e.g., 8 follows 7 when we count, so 1 + 7 is 8). Even mentally handicapped children can master the addition combinations involving zero and one by discovering and exploiting relationships rather than by practicing each combination separately (cf. Ashcraft, 1985; Siegler & Shrager, 1984).

Aims

Research (e.g., Baroody, 1987b; Carpenter & Moser, 1984; Groen & Resnick, 1977; Ilg & Ames, 1951) indicates that preschool and primary-level children spontaneously invent more efficient procedures for calculating the sums of single-digit addition problems (Resnick, 1983; Resnick & Ford, 1981). There is some evidence (e.g., Baroody & Gannon, 1984; Baroody, Ginsburg, & Waxman, 1983) that--without direct instruction--primary-level children learn basic arithmetic relationships, such as the commutativity principle (the order in which two addends are combined does not affect the outcome or sum). There is some data (Baroody, 1985; Olander, 1931; Thiele, 1938) that suggest children abstract and exploit relationships in mastering combinations involving zero (adding zero does not affect a number) and one (when adding one the sum is the number after the other addend in the count sequence). By exploiting relationships, such as the commutativity principle and the zero and one rules, children do not have to practice each single-digit combination in order to achieve mastery or efficient recall.

The aim of this training experiment was to see if children classified as mentally handicapped are capable of similar types of learning. Specifically, can such children:

(a) <u>invent</u> more economical counting procedures for adding;

(b) <u>abstract</u> the commutativity principle; and

(c) <u>induce</u> zero and one rules, which would transfer to unpracticed combinations.

Method & Subjects

Subjects were drawn from 11 classes in an upstate New York county-wide special education service agency. Screening for prearithmetic skills identified 30 children that were suitable for the study. The sample consisted of 24 children classified as moderately mentally handicapped (IQs ranging between 31 and 49) and 6 children classified as mildly mentally handicapped (IQs ranging from 52 to 66). Children ranged in chronological age from 6 years and 10 months to 20 years and 10 months. There were an equal number of males and females.

The sample was individually pretested on a calculational, commutativity, and mental-addition task. The children were randomly assigned to a control group and an experimental group. All children were individually tutored by one of three graduate assistants for a period of 20 weeks. There was a total of 51 20-minute sessions ($\underline{M}$ = 2.55 sessions per week). The control group was tutored on IEP mathematics objectives not related to arithmetic (e.g., identifying the value of coins, telling time to the half hour). The experimental group was given training that focused on helping them to compute accurately. The trainers did not point out specific relationships, such as the zero rule. Except for 1 + 6, 2 + 6, and 6 + 2. the experimental training involved problems with addends of 0 to 5 only.

The children were retested by testers who were blind to subject assignments. The mental-addition posttest included combinations that were not practiced during the training phase as well as those that were.

Tasks

Screening for prearithmetic skills. To qualify for the study, a child had to demonstrate competence in comparing the magnitude of numbers one to five, reading numerals to 10, producing sets of one to five objects, and enumerating 1 to 12 objects.

Computational task. This task consisted of randomly presenting a set of addition combinations to a child on two occasions. The first set consisted of 1 + 3, 1 + 9, 2 + 1, 2 + 4, 3 + 2, 3 + 6, 4 + 5, 5 + 3, 7 + 1, and 8 + 2; the second set consisted of the commuted counterparts of the combinations listed above. The child was instructed to figure out the answer any way he or she wanted--with blocks, fingers, or in his or her head. The solution strategy was scored using the criterion specified in Baroody (1987b). Accuracy was also noted.

Commutativity task. A sequence of addition sentences was presented. Half the time, a combination was followed by a commuted trial; the other half, by a noncommuted problem with a different sum. A child was scored as successful on the task if he or she did not compute the sum of the commuted combination but simply recorded the previously calculated sum. (Noncommuted trials were included to deter or detect a response bias).

Mental-addition task. The mental-addition task entailed randomly administering a set of 16 combinations 20 times in 7 or 8 sessions over the course of 4 weeks. A combination was presented as a written number sentence (e.g., 5 + 3) and verbally (e.g., "This says five and three. Quickly, how much is five and three altogether?"). The subjects were required to answer without computing. A time limit minimized the possibility that children mentally reconstructed sums by using a thinking strategy or by computing. The testing was audiotaped.

The test items included combinations of three different types: those involving zero, one, and numbers greater than one. Half the items were ascending (smaller-addend-first) combinations, the other half were descending (smaller-addend-last) combinations. Items (0 + 5, 0 + 9, 4 + 0, 6 + 0, 1 + 4, 1 + 7, 3 + 1, 8 + 1, 2 + 5, 3 + 4, 5 + 8, 7 + 9, 4 + 2, 5 + 3, 8 + 6, and 9 + 3) were presented in random order.

Three criteria defined mastery of combinations involving zero or one First, correct posttest responses for all four test items for a given type of problem had to exceed 85%. Mastery then entailed substantial success on two problems not practiced in the experimental condition as well as two that were practiced. Second, a subject had to respond discriminately to zero and one problems. Combinations involving zero were not considered mastered if the subject's predominant response to both combinations involving zero and one was the larger addend. Combinations involving one were not considered mastered if the subject's predominant response to both combinations involving one and zero was the larger addend plus one. Third, to discount random fluctuations in performance, the subject had to demonstrate a gain of 5 percentage points or more on the posttest.

Three-addend task. This task was administered on the posttest only. The procedures described for the mental-addition task were followed. The three-addend items were 0 + 0 + 2, 0 + 0 + 5, 3 + 0 + 0, 4 + 0 + 0, 1 + 1 + 4, 2 + 1 + 1, and 5 + 1 + 1.

Experimental Training

The experimental training consisted of four phases. In Phase 1, each addend of the addition problems was represented by dots within a 7.62 cm x 7.62 cm box on a 12.8 cm x 20.4 cm card (see Figure 1). The dots were arranged in a regular pattern as on a die. An empty box represented zero. Below each box the cardinal value of the addend was indicated by a numeral. A plus sign was positioned between the two numerals. A total of 36 cards was used to play a variety of math games (see Baroody, 1987, in press-a, for details). If the child did not respond or used his or her own strategy to generate an incorrect answer, the trainer had the child count the two sets of dots.

In Phases 2 to 4, the problems were represented on 7.7 cm x 12.8 cm cards using numerals only. In Phase 2, blocks were provided and, if needed, the child was instructed or helped to use a concrete counting-all procedure. In Phase 3, an abacus-like device with five red markers on one side and five green markers on other was provided. If needed, the child could compute the sum of a problem by sliding up the appropriate number of markers to represent each addend and then counting the number of markers of both colors in the up position. In Phase 4, nonresponders or incorrect responders were encouraged or helped to use their fingers to compute the sums of problems. Initially, the four phases each lasted 2 weeks; thereafter each phase was repeated in turn for an interval of 1 week.

Results

<u>Computational Shortcuts</u>. As a result of their computational training, many experimental subjects spontaneously invented shortcuts for the concrete counting-all procedure they were taught or already knew. The most common shortcut was what Siegler and Robinson (1982) call the "counting-fingers strategy": automatically representing each addend with finger patterns (rather than counting out objects) and then counting all the fingers displayed. Some children even adopted what Siegler and Robinson call the "fingers strategy": automatically represent each addend on fingers of each hand and then, without further counting, announce the total (sum). Though the experimental subjects learned concrete procedures for computing sums, none invented a mental algorithm. This parallels results (Baroody, 1987b) that indicate that kindergartners persist in their use of concrete computing procedures but find many ways to shortcut them.

<u>Commutativity</u>. During the training phase, many experimental subjects discovered that when commuted problems were presented successively, they could shortcut their computational effort by using previously computed sums. On the posttest, the experimental children significantly ($p < .05$, one-tailed, Fisher Exact 2 x 2 Test) outperformed those in control group on a simple problem-solving task that required the application of commutativity. When presented commuted pairs of problems in sequence (e.g., when 3 + 5 followed 5 + 3 instead of 3 + 1), experimental children did not bother to compute the sum of the second problem but simply stated the previously calculated sum.

<u>Mastery of facts involving zero and one</u>. Six of 10 experimental subjects mastered the combinations involving zero between the pre- and posttests (mean gain for those who achieved criterion was +56% correct; for

the experimental group as a whole, +30% correct). Only 1 of 12 controls achieved mastery (mean gain for this group was -5%). The difference is statistically significant (p = .012, one-tailed, Fisher Exact 2 x 2 Test). Thus, factors like maturation can be discounted (cf. Ashcraft, 1985). Furthermore, five experimental subjects achieved criterion on the three-addend task (p = .09, one-tailed, Fisher Exact 2 x 2 Test).

Four of 11 experimental children achieved criterion on the combinations involving one between the testing phases (mean gain for those achieving criterion was +47% correct; for the experimental group as a whole, +36%). None of the 14 control children who initially did not know such combinations did so (mean gain for the control group was +8%). The difference between the groups was statistically significant (p = .03, one-tailed, Fisher Exact 2 x 2).

Conclusions

Without explicit instruction, some experimental children did invent shortcuts for the concrete calculational procedure they were taught or already knew. Apparently, even children who are classified as mentally handicapped do monitor and spontaneously adjust their mathematical behavior (Baroody, 1987a). Helping such children make the relatively difficult transition from computing with objects to counting mentally may require more lengthy or direct instruction.

Without direct instruction, the experimental children apparently discovered that the order of the addends does not affect the outcome. These results are consistent with other data (e.g., Baroody & Snyder, 1983) that suggests that children classified as mentally handicapped abstract simple mathematical regularities.

The qualitative change in the experimental subjects' responses on the mental-addition task suggests that they learned a general rule for adding zero and one. These results challenge the view (cf., Ashcraft, 1985; Siegler & Shrager, 1984) that such combinations are internalized and stored individually (Baroody & Ginsburg, 1986). Even children classified as mentally handicapped can master addition combinations involving zero and one by discovering and exploiting relationships (rather than practicing each separately). In the case of adding one, a child need only to see the connection between these combinations and their existing knowledge of number successors (Baroody, 1987, in press-b). Once children grasp this (number-after) relationship (see Fuson, Richards, & Briars, 1982), they can solve efficiently any problem with one as an addend for which they know the other number's successor--including those not previously practiced (cf. Thorndike, 1922).

References

Ashcraft, M. H. (1985, April). Toward a model of retrieval and problem solving. Paper presented at the biennial meeting of the Society for Research in Child Development, Toronto.

Baroody, A. J. (1985). Mastery of the basic number combinations: Internalization of relationships or facts? Journal for Research in Mathematics Education, 16, 83-98.

Baroody, A. J. (1987a). Children's mathematical thinking: A developmental framework for preschool, primary, and special education teachers. New York: Teachers College.

Baroody, A. J. (1987b). The development of counting strategies for single-digit addition. Journal for Research in Mathematics Education, 18, 141-157.

Baroody, A. J. (in press-a). A guide to teaching mathematics in the primary grades. Boston: Allyn and Bacon.

Baroody, A. J. (in press-b). Kindergarteners' responses to simple addition combinations. Journal for Research in Mathematics Education.

Baroody, A. J., & Gannon, K. E. (1984). The development of the commutativity principle and economical addition strategies. Cognition and Instruction, 1(3), 321-329.

Baroody, A. J., & Ginsburg, H. P. (1986). The relationship between initial meaningful and mechanical knowledge of arithmetic. In J. Hiebert (Ed.), Conceptual and procedural knowledge: The case of mathematics (pp. 75-112). Hillsdale, NJ: Erlbaum.

Baroody, A. J., Ginsburg, H. P., & Waxman, B. (1983). Children's use of mathematical structure. Journal for Research in Mathematics Education, 14(3), 156-168.

Baroody, A. J., & Snyder, P. M. (1983). A cognitive analysis of basic arithmetic abilities of TMR children. Education and Training of the Mentally Retarded, 18(4), 253-259.

Carpenter, T. P., & Moser, J. M. (1984). The acquisition of addition and subtraction concepts in grades one through three. Journal for Research in Mathematics Education, 15, 179-202.

Fuson, K. C., Richards, J., & Briars, D. J (1982). The acquisition and elaboration of the number word sequence. In C. J. Brainerd (Ed.), Children's logical and mathematical cognition (pp. 33-92). New York: Springer-Verlag.

Groen, G. J., & Resnick, L. B. (1977). Can preschool children invent addition algorithms? Journal of Educational Psychology, 69, 645-652.

Ilg, F., & Ames, L. B. (1951). Developmental trends in arithmetic. The Journal of Genetic Psychology, 79, 3-28.

Olander, H. T. (1931). Transfer of learning in simple addition and subtraction. 2. Elementary School Journal, 31, 427-437.

Resnick, L. B. (1983). A developmental theory of numbers understanding. In H. P. Ginsburg (Ed.), The development of mathematical thinking. (pp. 109-151). New York: Academic.

Resnick, L. B., & Ford, W. W. (1981). The psychology of mathematics for instruction. Hillsdale, NJ: Erlbaum.

Siegler, R. S., & Robinson, M. (1982). The development of numerical understandings. In H. W. Reese & L. P. Lipsett (Eds.), Advances in child development and behavior, Vol. I (pp. 241-312). New York: Academic.

Siegler, R. S., & Shrager, J. (1984). Strategy choices in addition: How do children know what to do? In C. Sophian (Ed.), Origins of cognitive skills (pp. 229-293). Hillsdale, NJ: Erlbaum.

Thiele, C. (1938). The contribution of generalization to the learning of the addition facts. New York: Bureau of Publications, Teachers Coliege, Columbia University.

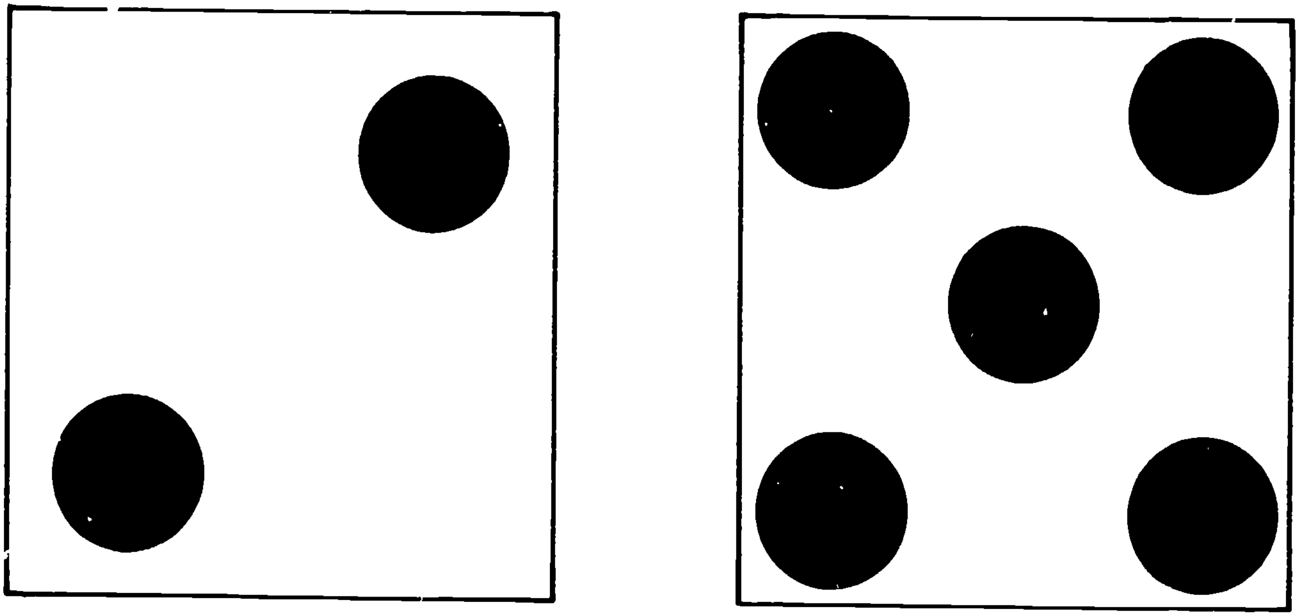
Thorndike, E. L. (1922). The psychology of arithmetic. New York: Macmillan.

Figure 1

Example of the Stimulus

Used in Phase 1 of the

Experimental Training



2 + 5

DOCUMENT RESUME

ED 288 283 EC 200 753

AUTHOR	Hall, Penelope K.; And Others
TITLE	The Presence of Word-Retrieval Deficits in Developmental Verbal Apraxia.
PUB DATE	Nov 86
NOTE	22p.; Paper presented at the Annual Convention of the American Speech-Language-Hearing Association (Detroit, MI, November 21-24, 1986).
PUB TYPE	Speeches/Conference Papers (150) -- Reports - Research/Technical (143)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Articulation Impairments; Communication Skills; Elementary Education; *Expressive Language; *Language Handicaps; *Receptive Language; *Speech Handicaps; Speech Skills; *Verbal Ability; Verbal Tests
IDENTIFIERS	*Apraxia (Speech); *Word Retrieval

ABSTRACT

Five children, aged 7-10 years, exhibiting Developmental Verbal Apraxia (DVA) were evaluated to determine the presence of word-retrieval problems. DVA is a symptom cluster including at least some of 21 potential symptoms, such as delayed speech development and severe articulation disorder. The Boston Naming Test (a picture confrontation naming task) and the Peabody Picture Vocabulary Test-Revised, Form L, were administered to all subjects. Evidence of word-finding problems was based on the number of correct responses, the speed with which responses were given, and other word-finding behaviors. Results indicated that the DVA children had more restricted receptive vocabularies, expressively identified fewer pictures correctly upon confrontation, identified the pictures more slowly than did normal children of the same age, and exhibited more behaviors often associated with word-finding problems (such as fidgeting and hitting their heads). A year later, two of the DVA children were administered the new German's Test of Word Finding, which confirmed the continuing presence of word-finding problems. It was concluded that children exhibiting DVA are thus at high risk to exhibit significant word-retrieval problems, and remedial objectives addressing these problems should be included in treatment programs of DVA clients so identified. Appended are tables detailing the research results. (JDD)

Info

THE PRESENCE OF WORD-RETRIEVAL DEFICITS IN DEVELOPMENTAL VERBAL APRAXIA

Penelope K. Hall

Donald A. Robin

Department of Speech Pathology and Audiology

Linda S. Jordan

Departments of Neurology and Speech Pathology and Audiology

University of Iowa

Iowa City, Iowa 52242

Paper presented at the national meetings of the

American Speech-Language-Hearing Association

Detroit, Michigan

November, 1986

THE PRESENCE OF WORD-RETRIEVAL DEFICITS IN DEVELOPMENTAL VERBAL APRAXIA

Penelope K. Hall, Donald A. Robin, and Linda S. Jordan

University of Iowa

Children exhibiting Developmental Verbal Apraxia (DVA) are frequently described as presenting a language disorder as well. During clinical work with DVA children the authors of this paper observed that many of the children appeared to present word-retrieval difficulties during expressive language attempts. This observation also was made by Aram and Glasson (1979) who commented that "several" of their eight DVA subjects were "anomic."

The focus of today's paper is to describe our pilot work in probing for the presence, or absence, of word-retrieval problems in this particular population of children.

Method

This study of possible word-finding problems was a pilot performed as a part of a larger project which is investigating a number of questions about the clinical entity of DVA. Our subjects were 5 DVA children and 5 normal children who were sex and age-matched to the DVA subjects.

The criteria for inclusion as a DVA subject are shown on Overhead #1.

1. Normal hearing at the time of testing, and having no history of prolonged loss, or chronic or prolonged ear infections
2. A measured intelligence quotient of 80 or above.
3. A diagnosis of DVA made by two or more members of the clinical faculty or staff at the University of Iowa Speech and Hearing Clinic.

The authors agree with Jaffee (1984) that DVA is a symptom CLUSTER in which no one characteristic or symptom must be present, in which no typically reported symptom is exclusively present, and in which not all symptoms of the cluster must be present. (Overhead # 2.) Review of the clinic records of the five selected subjects revealed clinical descriptions consistent with characteristics used in the literature to describe DVA. These include the presence of:

Delayed/deviant speech development

Severe articulation/phonological disorder

Vowel omissions or misarticulations

Presence of metathetic errors

Difficulty sequencing phonemes

Increase in errors as length or complexity of utterance increases

2 or 3 phoneme features in error

Inconsistent errors

Decreased intelligibility in conversational speech

Groping/silent posturing

Resistance to traditional articulation remediation techniques

Slow response to remediation

Prosodic disturbances

Presence of oral apraxia

Difficulty in performing and sequencing volitional oral movements

Slow, imprecise diadochokinetic rates

Evidence of language problems

Language reception better than expression

Presence of learning disabilities, reading and academic problems

Family history of speech problems, and

"Soft" neurological findings

The DVA subjects were two girls, ages 9-10 and 9-3, and three boys, ages 7-4, 8-11, and 10-3 at the time of testing.

Criteria for inclusion as a normal subject are shown on Overhead # 3.

1. Sex and age-matched to within 6 months of a specific DVA subject. In fact, two pairs of subjects were matched exactly to age, and the remaining three pairs were all matched within two months, with the normals being one or two months younger than their DVA match.
2. Exhibit normal articulation and having no history of articulation or language difficulties
3. Have normal hearing at the time of testing, and no history of chronic or prolonged ear infections or hearing loss
4. Have a measured IQ of 80 or above.

All subjects were administered the Boston Naming Test by Kaplan, Goodglass and Weintraub, 1983, which is a picture confrontation naming task. The test includes specified "stimulus cues" to be used to assure that the subjects do not misperceive the picture. Specified "phonemic cues" also can be provided by the examiner in an attempt to assess whether the stimulus word is in the subject's vocabulary, although responses made after phonemic cues are not included in the total number of correct items. The test has provisional norms for children, although the population on which these norms were based consisted of five children at each of six age levels from 5 1/2 through 10 1/2 years. In the present study, responses were taoulated on-line, as well as transcribed verbatim by the investigators from audio tapes. Response latency times were

calculated from the audio tapes as well. In addition, the revised Peabody Picture Vocabulary Test (Dunn & Dunn, 1981) was administered to all 10 subjects.

We examined our results for evidence of word-finding problems by looking at 1) the number, 2) the speed with which responses were given, and 3) other word-finding behaviors.

Results

Overhead 4 compares the number of correct responses on the Boston Naming Test which were achieved by each subject pair, with the DVA subjects consistently performing more poorly than the normal subjects. When comparing these performances to the mean number correct and to the standard deviations of the provisional norms developed for the test, the normal subjects in this study were within ±1 standard deviation, while the DVA subjects were 3 to 7 standard deviations below the provisional mean.

The speed with which responses were given also was investigated. This was done by a number of methods, such as computing mean response latencies from the time of picture exposure to the production of correct responses when no stimulus or phonemic cues were given, when stimulus cues were included, and when stimulus and phonemic cues both were included. These yielded differences in performances in four of the five subject pairs, with the four DVA children being slower in responding than were the normal children. The remaining subject pair (pair number 1) achieved comparable latencies on these analyses. However, the typical trend was most dramatically evident in all five subject pairs when the mean response latency was computed from the time of picture exposure to the first spontaneous utterance, either correct or incorrect. These differences in mean response latencies are shown by subject pairs on Overhead 5. The mean latency for the entire DVA group was 5.91 seconds,

compared to the mean response latency of 2.49 for the entire normal group. The DVA subjects, individually and as a group, were slower and responded to fewer times than the normal subjects, whether the responses were correct or incorrect.

It is interesting that differences in mean response latencies were most evident between the two subject groups when latencies for first responses, whether correct or incorrect, were calculated. An explanation may be that first spontaneous utterances which are incorrect may be on those items with which the child is having retrieval difficulties since errors increased as the children advanced in the test. Kaplan et al, the test developers, state that the test's vocabulary picture plates are ordered from easiest to most difficult. Butterfield and Butterfield (1977) take a posture that an individual's vocabulary reflects the language that is heard, so frequently mentioned words are the ones developing the greatest likelihood of retrieval and use by the individual. Conversely, less frequently heard words are less likely to be retrieved and used. Our results reflect that children have more problems as they advanced in the test to the items which constituted difficult, and presumably lower frequency, vocabulary items for them. Longer response latencies and more errors are made on these more difficult items, thus better tapping potential word-finding problems than are response latencies based only on correct responses, which may be words more frequently heard and used by the child and thus more easily retrieved.

During administration of the test the examiners noted behavioral components, both verbal and gestural, which were thought to be associated with word-finding problems. The DVAs were observed to use silent latencies and fillers, but rarely verbalized their tip-of-the-tongue experiences, although they confirmed this if questioned. Also noted were gestures such as hitting

their heads or tabletop and fidgeting. These behaviors were exhibited throughout the test administration. The normal group were more verbally overt when they experienced word-retrieval problems: "I remember the name in my head but can't get it out of my mouth." The normals also were noted to use fillers, and occasionally used gestures, particularly as they neared the end of the test with stimulus items having low frequency of occurrence.

The picture confrontation naming task requires production of vocabulary items. Therefore, we assessed the subjects' performance on a vocabulary comprehension task to determine whether poor performance in the confrontation naming task reflected inadequate vocabulary knowledge. The selected measure was the Peabody Picture Vocabulary Test-Revised, Form L, with the results depicted on the bar graph on Overhead 6. The percentile ranks achieved by the DVA subjects were consistently below those of the normal subjects. So, reduced vocabulary size could be a component in the results achieved on the Boston Naming Test.

Results shared in this paper indicated that the DVA children had more restricted receptive vocabularies, expressively identified fewer pictures correctly upon confrontation, identified the pictures more slowly than did normal children of the same age, and exhibited more behaviors often associated with word-finding problems. The DVA children exhibited more difficulties in retrieving specific words under a time constraint than did their matched normals. Word-retrieval problems seemed present in four of the DVA subjects, and possibly with the fifth subject as well.

The data presented in this paper was collected one year ago with the DVAs. Two of the five DVA children have received on-going services through our clinical facility during the intervening year. German's Test of Word Finding which was published earlier this year, was administered to these two subjects,

and confirmed the presence of word-finding problems. These children are subjects 3 and 4 on our overheads. Overhead 7 summarizes TWF results. Both children achieved percentages indicative of good comprehension on the test. Both children also were described as being "slow and inaccurate namers."

Clinical Implications

It is the opinion of the investigators that children exhibiting DVA are at high risk to exhibit clinically significant word-retrieval problems. We caution that this problem is one which must be carefully assessed, with qualitative observations and quantative measures being obtained, although Hall and Jordan (in press) stressed that word-finding problems may elude any single identification technique. It has been our experience that word-finding problems, especially with the DVA client, can be variable from day to day, so assessment might take place over several contact sessions. The speech-language pathologist also should be cautioned to carefully observe behaviors indicative of word-finding difficulties to ascertain these behaviors from the groping and silent posturing behaviors the DVA children also may exhibit. Further, once word-retrieval problems are identified, we urge that remedial objectives which directly address word-finding difficulties be included in the over-all treatment programs of these DVA clients.

References

Aram, D.M., and Glasson, C. (1979). Developmental apraxia of speech. Paper presented at the American Speech-Language-Hearing Association meetings, Atlanta, Georgia.

Butterfield, G., and Butterfield, E. (1977). Lexical codability and age. Journal of Verbal Learning and Verbal Behavior, 16, 113-118.

Dunn, L.M., and Dunn, L. M. (1981). Peabody Picture Vocabulary Test-Revised. Circle Pines, Minnesota: American Guidance Service.

German, D. (1986). The Test of Word-Finding. Allen, Texas: DLM-Teaching Resources.

Hall, P.K., and Jordan, L.S. (in press). An assessment of a controlled association task to identify word-finding problems in children. Language, Speech and Hearing Services in Schools.

Jaffe, M.B. (1984). Neurological impairment of speech production: Assessment and treatment. In J. M. Costello (Ed.), Speech Disorders in Children. San Diego: College-Hill Press, 157-186.

Kaplan, E., Goodglass, H., and Weintraub, S. (1983). The Boston Naming Test. Philadelphia: Lea and Febiger.

CRITERIA FOR DVA SUBJECTS

NORMAL HEARING

INTELLIGENT QUOTIENT OF 80 OR ABOVE

DIAGNOSIS OF DVA

PRESENCE OF DVA CHARACTERISTICS BY SUBJECT

	S#1	S#2	S#3	S#4	S#5
DELAYED/DEVIANT SPEECH DEVELOPMENT	?	X	X	X	X
SEVERE ARTICULATION/ PHONOLOGICAL DISORDER	X	X	X	X	X
VOWEL OMISSIONS OR MISARTICULATIONS		X	X	X	X
METATHETIC ERRORS	X	X	X	X	X
DIFFICULTY SEQUENCING PHONEMES	X	X	X	X	X
INCREASE IN ERRORS AS LENGTH OR COMPLEXITY OF UTTERANCE INCREASES	X	X	X	X	X
2 OR 3 PHONEME FEATURES IN ERROR	X	X	X	X	X

	S#1	S#2	S#3	S#4	S#5
INCONSISTENT ERRORS	X	X	X	X	X
DECREASED INTELLIGIBILITY IN CONVERSATIONAL SPEECH	X	X	X	X	X
GROPING/SILENT POSTURING	X	X	X	X	X
RESISTANCE TO TRADITIONAL ARTICULATION REMEDIATION		X	X		X
SLOW RESPONSE TO ARTICULATION REMEDIATION	X	X	X	X	X
PROSODIC DISTURBANCES	X	X	X	X	X
PRESENCE OF ORAL APRAXIA	X	X	X	X	X

	S#1	S#2	S#3	S#4	S#5
DIFFICULTY IN PERFORMING AND SEQUENCING VOLITIONAL ORAL MOVEMENTS	X	X	X	X	X
SLOW, IMPRECISE DIADOCHOKINETIC RATES	X	X	X	X	X
EVIDENCE OF LANGUAGE PROBLEMS	X	X	X	X	X
LANGUAGE RECEPTION BETTER THAN EXPRESSION	X	X	X	X	X
PRESENCE OF LEARNING DISABILITIES/ READING/ACADEMIC DIFFICULTIES	X	X	X	X	X
FAMILY HISTORY OF SPEECH PROBLEMS	X	X	X	X	X
"SOFT" NEUROLCCICAL FINDINGS	X	X	X	X	X

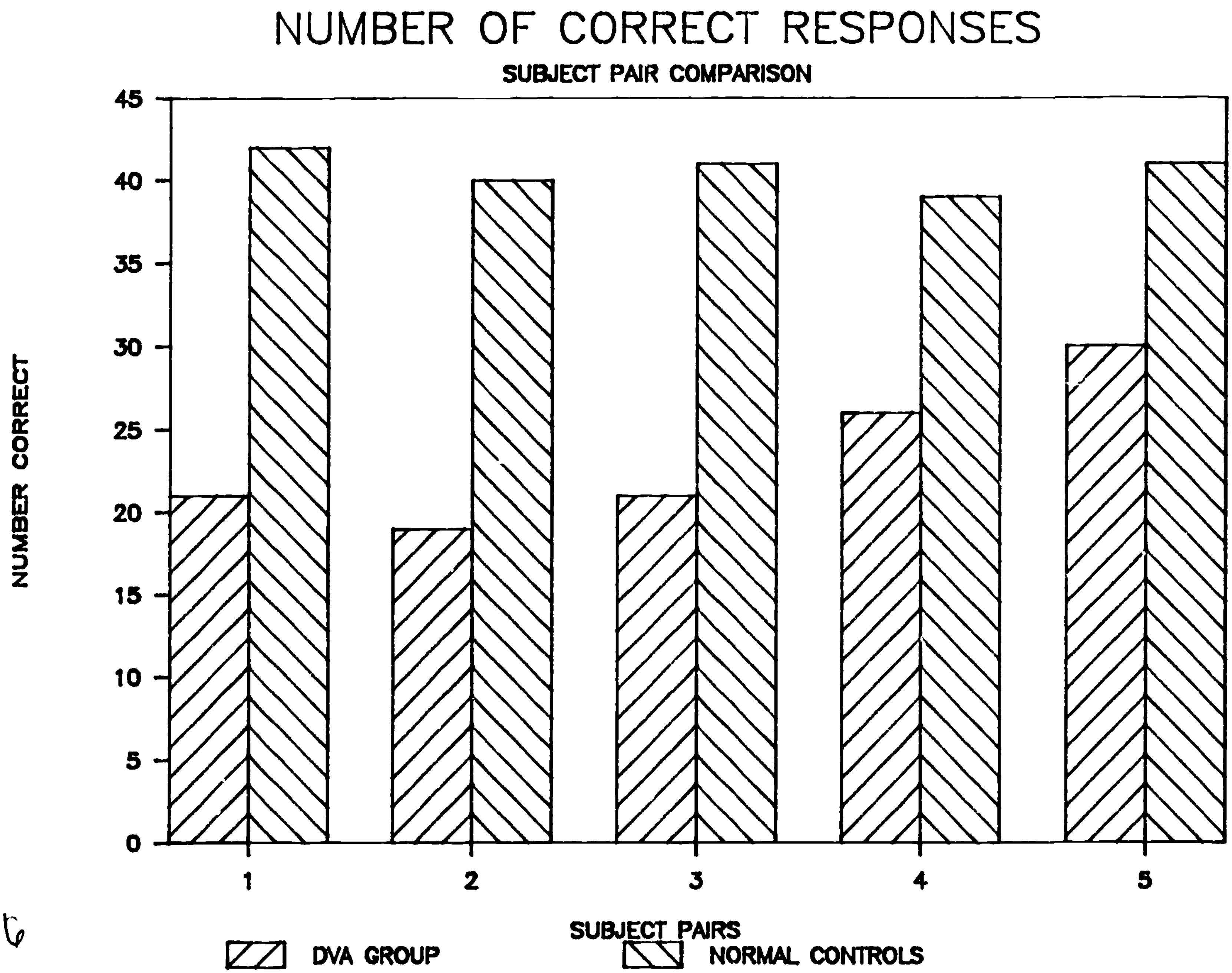
CRITERIA FOR NORMAL SUBJECTS

SEX AND AGE-MATCHED TO WITHIN 6 MONTHS OF A SPECIFIC DVA SUBJECT

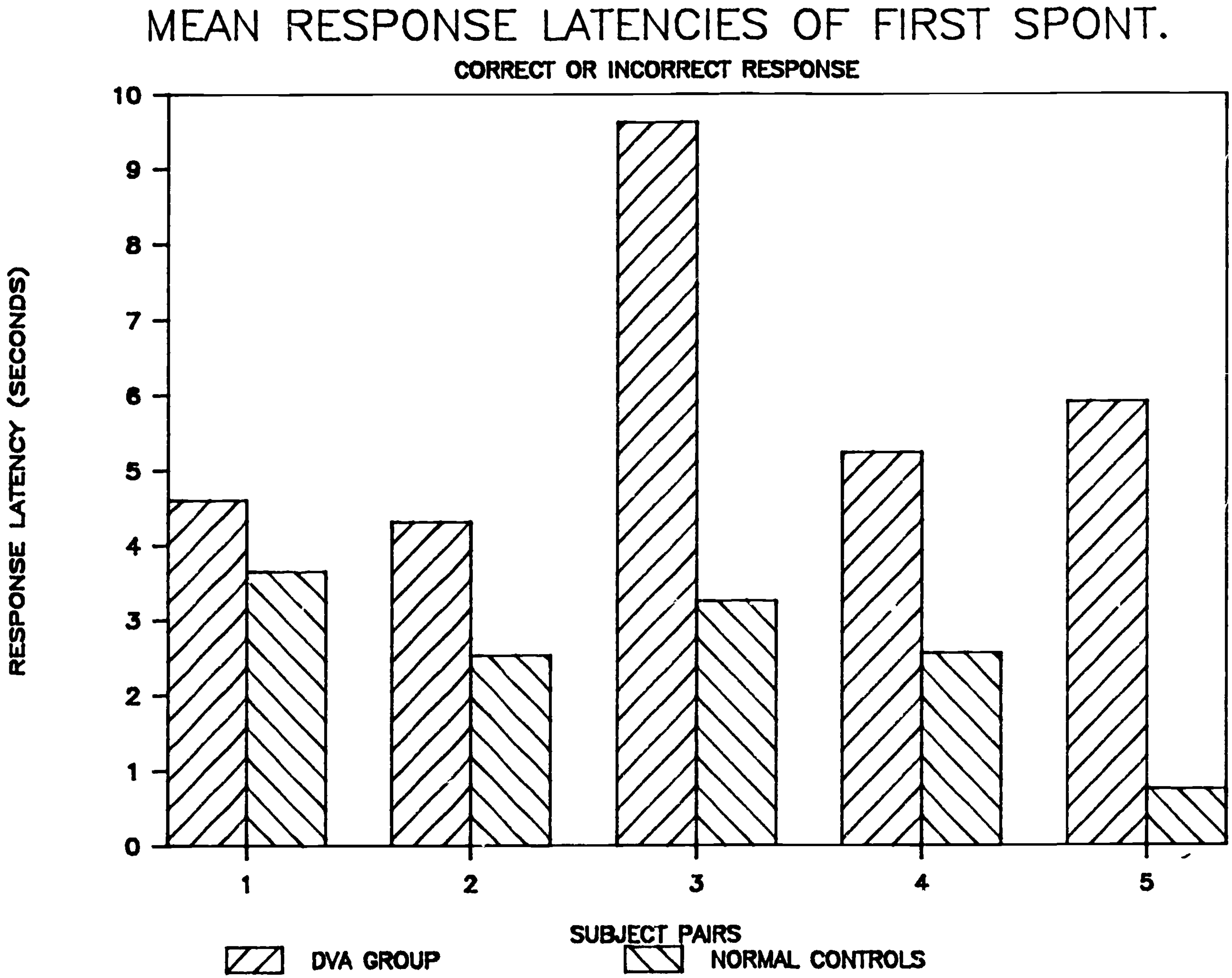
NORMAL ARTICULATION

NORMAL HEARING

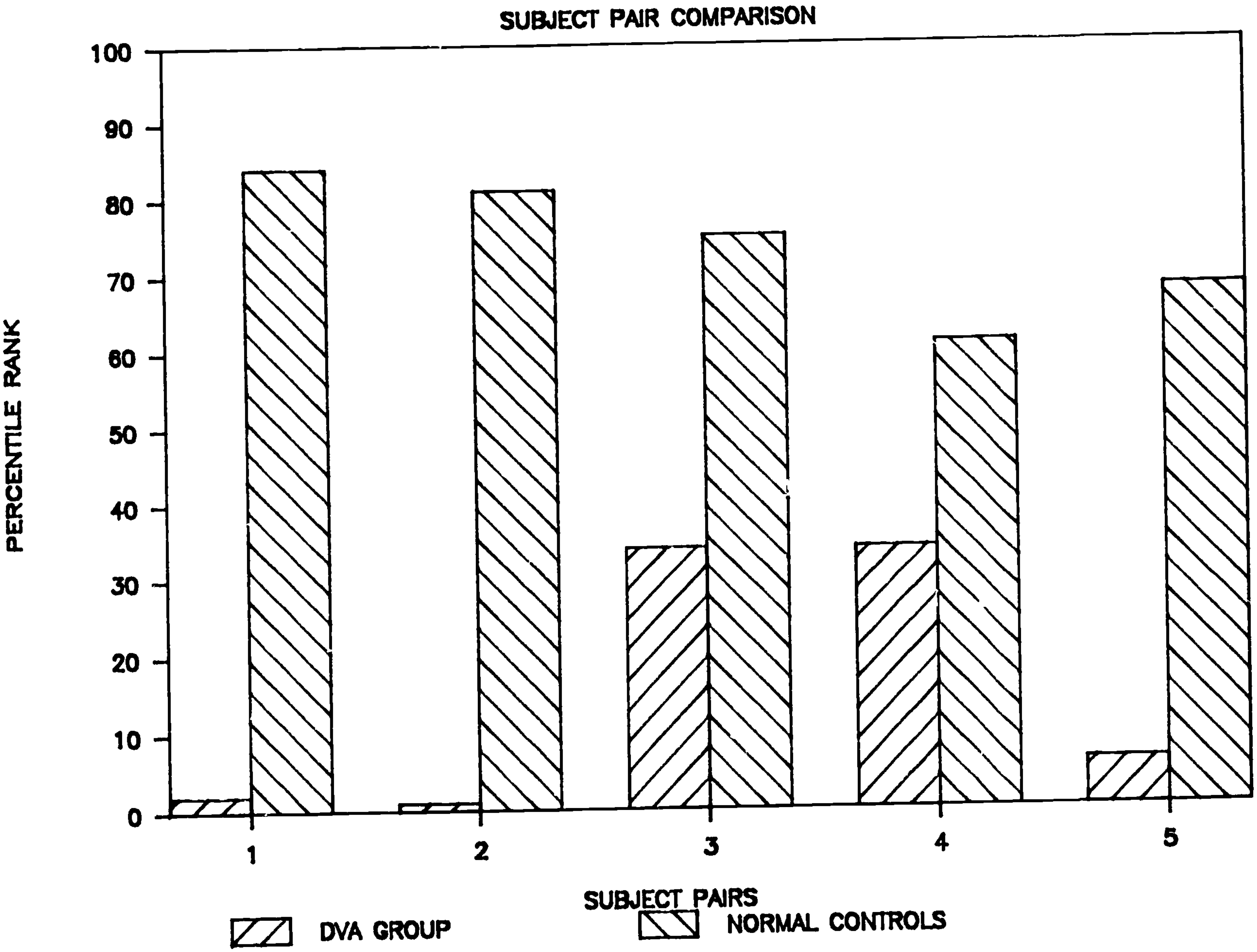
INTELLIGENCE QUOTIENT OF 80 OR ABOVE


NUMBER OF CORRECT RESPONSES
SUBJECT PAIR COMPARISON
NUMBER CORRECT
45
40
35
30
25
20
15
10
5
0
1
2
3
4
5
SUBJECT PAIRS
DVA GROUP
NORMAL CONTROLS

16


MEAN RESPONSE LATENCIES OF FIRST SPONT.
CORRECT OR INCORRECT RESPONSE
RESPONSE LATENCY (SECONDS)
0
1
2
3
4
5
6
7
8
9
10
1
2
3
4
5
SUBJECT PAIRS
DVA GROUP
NORMAL CONTROLS

PERCENTILE RANKS ON PPVT-R



RESULTS ON GERMAN'S TEST OF WORD-FINDING

	SUBJECT 3	SUBJECT 4
PERCENTILE RANK	BELOW 4TH.	4TH. FOR AGE 20TH. FOR GRADE
PERCENT OF COMPREHENSION	95% OR ABOVE	90% OR ABOVE
USE OF GESTURES	20% OF ITEMS	20% OF ITEMS
EXTRA VERBALIZATIONS	29% OF ITEMS	14% OF ITEMS
WORD-FINDING PROFILE	"SLOW AND INACCURATE NAMER"	"SLOW AND INACCURATE NAMER"