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Spontaneous Use of Manual Precision Skills by Trainable, Educable and Average Children

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SPONTANEOUS USE OF MANUAL PRECISION SKILLS BY TRAINABLE, EDUCABLE AND AVERAGE CHILDREN

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CHAPTER I

INTRODUCTION

Educators are continually searching for effective ways of helping children to succeed and to achieve scholastically. The most successful educators have analyzed student needs, set conditions for learning and provided experiences that could help each student fulfill his own needs with independence and with dignity.

The fulfillment of an individual's need to manipulate his environment effectively with his hands is quite dependent upon the dexterity of the individual. There are degrees of efficiency in his use of manual prehension that facilitate or inhibit an individual's interaction with and control of his environment. Adaptation of the use of the hand or fingers for manipulation of objects in the environment by alternation between use of the power or the precision grip as needed does not appear to be universally achieved or spontaneously effected. Some children seem to attend to the purpose of a movement or manipulation without having the skills necessary for successful achievement of a movement. They are subsequently thwarted in their attempts to manipulate objects efficiently without realizing that the movements themselves are in need of being adapted for success.

Trainable mentally retarded and educable mentally retarded children have been guided into areas of work that

require the use of gross motor skills because they lack eye-hand coordination or because they have visual-motor difficulties. An evident assumption of too many educators is that the cause of visual-motor difficulties lies mainly in the visual limitations or disorders of each subject and in his lack of large-muscle control.

Gunzburg (1966) and Bayley (1969) include in their tests and scales for motor development tasks which require the use of some of the finest and most precise hand and finger movements. Neither author analyzes which of the fingers of the hands are the most effective tools.

In the Oseretsky Tests of Motor Proficiency (Doll, 1946), there is an emphasis on motor speed, coordination and efficiency, and on success in accomplishing tasks. Although these tests demand considerable manual dexterity, a note by the author of the test to the administrator of the test says: "It is unimportant which finger or fingers are used"(Doll, 1946, p. 23). It is never suggested that the use of specific fingers (most specifically, those which determine use of the precision grip) might facilitate efficiency and motor proficiency.

It is evident from these considerations that an important element with regard to the development of the manual precision skills has been overlooked by some educators. An investigation into the spontaneous use of some manual precision skills by institutionalized trainable mentally retarded and educable mentally retarded as compared to the use of these skills by average achieving elementary school children is relevant at this time and may produce some significant information with regard to the use of these skills.

Statement of the Problem

Since manual precision skills are vital for some tasks and for successful manipulation of objects in the environment, it is important to ascertain whether or not young trainable mentally retarded and educable mentally retarded children are as apt to use these skills as are young average achieving elementary school children.

Purpose of the Study

The purpose of this study was to determine if there was a significant difference between the precision skills of trainable mentally retarded (TMR), educable mentally retarded (EMR), and average achiever (AA) groups of children as observed in their spontaneous use of the precision grip.

Definition of Terms

Average achievers (AA). Children who were students in regular elementary school classes and who were operating at the average scholastic range for their grade levels.

Educable mentally retarded (EMR). Children who because of retarded intellectual, social or motor development could not benefit from full time regular class instruction and who were classified as EMR by psychologists on the basis of files at the institution where they were residents.

Trainable mentally retarded (TMR). Children who because of retarded intellectual and social development were not eligible for programs for the educable mentally retarded

and who were classified as TMR by psychologists on the basis of files at the institution where they were residents.

Manual power grip. A grip which ". . . produces stability when an object is held in a kind of clamp. This clamp is formed by . . ." fingers, palm and thumb when the hand ". . . exerts maximum pressure on an object it is holding" (Buettner-Janusch, 1966, p. 323).

Manual precision grip. A grip which ". . . produces stability when an object is pinched between the flexed [forefinger] and the opposing thumb . . ." when the hand holds an object with maximum accuracy of control" (Buettner-Janusch, 1966, p. 323).

Manual prehension. ". . . positions the hand assumes when it holds an object . . ." securely and stably (Buettner-Janusch, 1966, p. 323).

Limitations of the Study

Each group was limited to children who clearly were trainable mentally retarded, educable mentally retarded or average achievers.

The children were without visible physical, neurological or sensory handicaps.

The AA group was limited to children who were operating within the average scholastic range for their grade levels and who could be matched with the TMR and EMR groups with regard to age and sex.

Hypotheses

It was hypothesized that: There would be no statistically significant differences between the spontaneous use of the precision grip by TMR, EMR and AA groups: and there would be no statistically significant differences between the spontaneous use of the precision grip by TMR, EMR or AA groups on individual manipulative tasks as recorded on the Precision Grip Checklist (see Appendix A).

Related Research

Children of varying abilities differ in their spontaneous ways of coping with objects and other elements which must be manipulated manually in the environment. These varying abilities (or lack of them) in adapting to the environment are the foci of volumes of research in the area of the motor skills. Recent studies (Caldwell and Soule, 1965; Dingman and Silverstein, 1964; Dunsing and Kephart, 1965; Elkin, 1967; Francis and Rarick, 1951; Guskin and Spicker, 1968; Hofmeister, 1969; Keogh and Keogh, 1967; Latchaw and Egstrom, 1969; Piaget, 1954, 1969; Rabin, 1957; Rubin, 1968; Sloan, 1951; Strong, 1964; and Webb, 1969) have directed research to aspects of development and performance in the areas of human movement and motor proficiency.

Bayley (1969) has constructed a Motor Scale of Infant Development in addition to her Mental Scale of Infant Development. In the Manual for the administration of these scales it is stated that "Motor abilities play important roles in the development of the child's orientation toward his environment, and they influence the quality of his

interactions with the environment [p. 3]." It is further stated that "The development of manipulatory skills, which is seen most clearly in infancy, facilitates the development and employment of the various basic mental processes [p. 3]."

Kellogg and Kellogg (1967) researched comparatively the prehension skills of their own child and those of an ape of the same age as that of the child. Their child used the precision grip spontaneously and easily, but the closest approximation of the ape to the use of the precision grip was the bringing together of the thumb and the forefinger, nail against nail, in order to grasp the object.

Gesell and Armatruda (1947) devised an examination technique which includes the developmental diagnosis of motor skills of children who range in age from four weeks to forty-two months. They observed closely the infants' voluntary manual actions and photographed examples of developmental growth in the use of the precision grip.

Cratty (1968) theorizes that there are relationships between the quality and quantity of obvious motor output of children, and their ability and/or inclination to engage in various tasks within the classroom. He speculates that failure of children on the playground may be compensated for by withdrawal from any activity: "Some boys and girls may totally reject themselves and refuse to function at any kind of tasks mental or motor because of continual rejection in motor activities highly prized by their peers [p. 531]."

Carlson and Ginglend (1961) who specialize in play activities for retarded children emphasize the fact that ". . . retarded children do not learn naturally, as normal children do, by imitation and observation. They have to be taught to perform each task [p. 18]."

Distefano, Jr., Ellis and Sloan (1958) found that scores on ". . . several motor tasks were significantly correlated with MA [p. 234]."

Dybwad (1968) considers the functioning of adaptive behaviors to be ". . . normally expected from a person of a particular age by the community (or culture) of which he is a part [p. 44]." If there is an impairment in the adaptive behaviors there is increased difficulty in functioning effectively in the community.

Bruner (1968) speaks of ". . . the emergence of a sharply defined distinction between power grip and precision grip . . . [p. 4], and of ". . . human manipulatory behavior . . . [p. 5]." He elaborates: "On the manipulatory side, there may be evolutionary as well as developmental parallels in the differentiation of manual prehension into a power or 'holding' grip and a precision or 'operating' grip [p. 62]." The important differentiation is that between ". . . holding and operating upon what is held . . . [p. 63]."

Buettner-Janusch (1966) states that ". . . precision evolved as far as we can tell through development of voluntary control over each digit of the hand" and that "all prehensile movements of the human hand combine the two basic grips of precision and power [p. 323]."

Since manual precision skills are necessary and normal functions of the hand it is important that retarded children not be found lacking in these skills. Review of literature on the development and use of the hand showed that the power grip and the precision grip are considered as basic to prehensile movements.

None of the related research indicated that a comparative study had been undertaken on the spontaneous manual precision skills of trainable mentally retarded, educable mentally retarded and average achieving children. This study attempted to make such a comparison with the hope that children who might be wanting in the spontaneous use of the precision skills might be identified and trained in these same skills.

CHAPTER II

METHOD

Subjects

The forty-five subjects consisted of three groups each having fifteen children within a range of seven through thirteen years of age. One group were TMR, the second group were EMR and the third group were AA children. The TMR and the EMR children were institutionalized children from Rainer School, Buckley, Washington. The AA children were from Holy Family Elementary School, Auburn, Washington.

Procedure

The three groups were matched for sex and age.

TMR and EMR children were classified on the basis of the institutional files by the psychologists at the institution.

The AA children consisted of students who were operating within the average scholastic age range for their respective grade levels. Any average achieving child who was clearly of superior intellectual ability or who was a slow learner was excluded from the study. The AA children were identified by means of concensus between the school principal and the teachers of the children under consideration as subjects for the study.

Each subject was given twenty-five tasks (Table 1) to perform manually. The checklist administrator demonstrated

TABLE 1

INDIVIDUAL TASKS ON PRECISION GRIP CHECKLIST

1.	picking up cord
2.	holding cord
3.	holding plastic pieces while putting them on cord
4.	opening watch case
5.	picking up watch from the opened case
6.	turning watch crown to set hands
7.	replacing watch in case
8.	closing watch case
9.	winding toy dog
10.	setting toy on table or floor
11.	putting pegs in holes
12.	moving cardboard feather on book cover into upright position
13.	turning pages of book
14.	replacing feather on book in original horizontal position
15.	picking up small plastic plane
16.	poising plane for flight
17.	holding rubber baseball in throwing position
18.	picking up three coins of varying sizes
19.	erasing with large rubber eraser
20.	marking on blank page with pencil
21.	cutting across page with scissors
22.	holding paper (while cutting with scissors)
23.	picking up eraser, pencil and scissors
24.	zipping case closed
25.	unscrewing lid of plastic bottle

each grip for which a point might have been assigned, as he explained each task, and before the child was asked to perform each task. There was no time limit for any of the tasks. A record was kept of the number of times that the spontaneous use of the precision grip occurred during the performance of each task by each subject, i.e., a count was made of the number of times when the thumb and forefinger were gripping an object simultaneously. Inclusion of the second finger was optional, but omission of the forefinger in any grip was considered as non-use of the precision grip (see Appendix A and B for checklist and directions for its administration).

Treatment of Data

Arithmetic means, standard deviations, variance and standard errors were computed. The significance of differences between means was computed by use of the t-test.

CHAPTER III

RESULTS

Twenty-five manipulative tasks were given to three groups: AA, EMR and TMR. In order to compare the performance of each group with the other two groups the t-test was used. Comparisons were made between AA and EMR, AA and TMR and EMR and TMR on each of the twenty-five tasks, on total group scores, and on group mean ages.

Significant differences between groups were found on seven of the tasks. The data (see Table 2) showed that on four tasks there were significant differences at the .05 level of confidence; on three tasks there were significant differences at the .01 level of confidence; and on four tasks there were significant differences at the .001 level of confidence.

Tasks which showed significant differences between groups at the .05 level of confidence were: Task Thirteen, comparing EMR with TMR groups; Task Fourteen, comparing AA with EMR; Task Twenty, comparing AA with EMR; and Task Twenty-two, comparing AA with TMR groups. (It is noteworthy to mention that on Task Thirteen the TMR group scored significantly higher than the EMR group.)

Tasks which showed significant differences between groups at the .01 level of confidence were Task Four, comparing AA with EMR; Task Thirteen, comparing AA with TMR; and Task Eighteen, comparing AA with EMR.

TABLE 2

TASKS FOR WHICH THE DIFFERENCE IN PERFORMANCE BETWEEN AA-EMR, AA-TMR, OR EMR-TMR WAS STATISTICALLY SIGNIFICANT

Tasks	Mean Scores AA	EMR	t	Mean Scores AA	TMR	t	Mean Scores EMR	TMR	t
4. Opening watch case	.800	.333	2.824**						
13. Turning pages of book	6.933	1.933	6.358***	6.933	4.066	3.439**	1.933	4.066	2.344*
14. Replacing movable feather	.866	.533	2.066*	.866	.266	4.025***			
17. Holding ball in throwing position	.933	.133	7.099***	.933	.200	5.821***			
18. Picking up coins	2.933	2.200	3.157**						
20. Marking with pencil	1.000	.666	2.646*						
22. Holding paper				1.000	.666	2.645*			

* Significant at .05 level of confidence.
** Significant at .01 level of confidence.
*** Significant at .001 level of confidence.

Tasks which showed significant differences between groups at the .001 level of confidence were: Task Thirteen, comparing AA with EMR; Task Fourteen, comparing AA with TMR, and Task Seventeen, comparing AA with EMR, and comparing AA with TMR.

The null hypothesis of no statistically significant difference between the AA, the EMR and the TMR groups on the spontaneous use of the precision grip on individual tasks was rejected.

No significant differences were found between the mean ages of the three groups.

No significant differences were found between the total group scores of the EMR and the TMR.

A significant difference at the .001 level of confidence was found between the total group scores of the AA and TMR groups.

A significant difference at the .001 level of confidence was found between the total group scores of the AA and EMR groups.

The null hypothesis of no statistically significant differences between the AA, the EMR or the TMR groups on the spontaneous use of the precision grip was rejected.

Tables 3 and 4 summarize statistically the differences between the AA, the EMR and the TMR groups of children.

TABLE 3

MEAN, STANDARD DEVIATION FOR AA, EMR AND TMR GROUPS ON PRECISION GRIP TASKS AND TOTAL GROUP SCORES

Tasks	AA		EMR		TMR	
	M	S	M	S	M	S
1	1.00	.00	.93	.26	1.00	.00
2	3.53	.64	3.13	1.13	3.33	.90
3	3.53	.92	3.13	1.41	3.33	.90
4	.80	.41	.33	.49	.53	.52
5	1.00	.00	.87	.35	.87	.35
6	.93	.26	.87	.35	.87	.35
7	1.00	.00	.87	.35	1.00	.00
8	.47	.52	.27	.46	.47	.52
9	1.00	.00	.93	.26	.93	.26
10	1.00	.00	.93	.26	.80	.41
11	7.46	1.81	7.46	1.85	6.80	2.57
12	.80	.41	.93	.26	.87	.35
13	6.93	1.91	1.93	2.37	4.06	2.60
14	.87	.35	.53	.52	.27	.46
15	.93	.26	.87	.35	.87	.35
16	1.00	.00	.80	.41	.87	.35
17	.93	.26	.13	.35	.20	.41
18	2.93	.26	2.20	.86	2.47	1.06
19	1.00	.00	1.00	.00	.87	.35
20	1.00	.00	.67	.49	.87	.35
21	.87	.35	.80	.41	.67	.49
22	1.00	.00	.87	.35	.67	.49
23	3.00	.00	2.87	.52	2.80	.56
24	1.00	.00	1.00	.00	1.00	.00
25	1.00	.00	.93	.26	.87	.35
Total Score	45.00	2.88	37.27	5.68	35.27	4.59

TABLE 4

RESULTS OF t-TEST ON PRECISION GRIP TASKS AND TOTAL GROUP SCORES

Tasks	AA-EMR t	AA-TMR t	EMR-TMR t
1	1.000	1.000	1.000
2	1.197	.702	.538
3	.923	.603	.464
4	2.824**	1.560	1.090
5	1.468	1.468	.000
6	.592	.592	.000
7	1.468	1.000	1.468
8	1.122	.000	1.122
9	1.000	1.000	.000
10	1.000	1.871	-1.058
11	.000	.822	- .816
12	-1.058	- .475	- .592
13	6.358***	3.440**	2.345*
14	2.066*	4.025***	-1.497
15	.592	.592	.000
16	1.871	1.468	- .475
17	7.099***	5.821***	- .475
18	3.157**	1.657	- .756
19	1.000	1.468	1.468
20	2.646*	1.468	-1.288
21	.475	1.288	.807
22	1.468	2.646*	1.288
23	1.000	1.382	.339
24	1.000	1.000	1.000
25	1.000	1.468	.592
Total Score	4.707	6.958	1.061

* Significant at .05 level of confidence.
** Significant at .01 level of confidence.
*** Significant at .001 level of confidence.

CHAPTER IV

DISCUSSION

The results of the study showed that there were significant differences at the .001 level of confidence between the AA and EMR total group scores and between the AA and TMR total group scores on their spontaneous use of the precision grip. The AA group was significantly higher than either the EMR or the TMR group.

The null hypothesis of no statistically significant difference between the spontaneous use of the precision grip by the AA, the EMR or the TMR groups was rejected.

The results of the study showed further that the TMR and the EMR groups had less spontaneous use of the precision grip on individual tasks than did the AA group. The EMR group had significantly lower scores than the AA group on seven separate tasks. The TMR group had significantly lower scores than the AA group on four separate tasks. The EMR group had a significantly lower score than the TMR group on one task.

The null hypothesis which stated that there was no statistically significant difference between the AA, the EMR and the TMR groups on the spontaneous use of the precision grip on individual tasks was rejected.

The difference in performance on Task Four was significant at the .01 level of confidence when comparing AA with EMR groups. Opening the watch case required the use of the

precision grip with a slight diversion of thumb and forefinger pressure away from one another and on to the plastic snaps on the box.

The difference in performance on Task Thirteen (turning page of a book) was significant at the .001 level of confidence when comparing the AA and EMR groups. The difference in performance on this task was significant at the .01 level of confidence when comparing the AA with the TMR group. The difference in performance on this task was significant at the .05 level of confidence when comparing the EMR with the TMR group.

This task showed significant differences between all three groups. The AA group most generally used the precision grip initially on each page, releasing the thumb to complete turning the page with the forefinger or the forefinger and second finger. The EMR and the TMR groups often turned pages using the thumb and second finger initially on each page, omitting the forefinger, and releasing the thumb to complete turning the page with second finger alone.

The difference in performance on Task Fourteen was significant at the .05 level of confidence comparing the AA and the EMR groups. Replacing the movable feather in a horizontal position on the book was accomplished by using the side of the hand in many cases.

The difference in performance on Task Seventeen was significant at the .001 level of confidence when comparing the AA with the EMR group, and when comparing the AA with the TMR group. Although the rubber baseball was held in a throwing position by the demonstrator, both the EMR and the TMR groups were eager to show how far they could throw the ball rather than how they would get ready to throw it.

The difference in performance on Task Eighteen was significant at the .01 level of confidence when comparing the AA with the EMR group. When picking up three coins of varying sizes several children did not perform the task as demonstrated, rather, they slid the coins to the edge of the table where they could be scooped from the table with one hand and caught by the other.

The difference in performance on Task Twenty was significant at the .05 level of confidence when comparing the AA with the EMR group. Marking with a pencil on a blank piece of paper was an engrossing task for the majority of the children in all groups. Some persisted in using the pencil far beyond the estimated time necessary for performance of the task. Since there was no time limit on any task they were allowed to use the pencil as long as it held interest for them.

The difference in performance on Task Twenty-two was significant at the .05 level of confidence when comparing the AA with the TMR group. When holding the paper (while cutting with the scissors) there was a tendency for the TMR children to stiffen the forefinger of the paper-holding hand and thus to remove any possibility of using the precision grip.

Implications for Education

On the basis of this study several implications for education warrant consideration.

Teaching methods should be modified to include training in precision grip skills for retarded school children since they are lacking these skills to a greater degree than are

their average counterparts. There must be more than a cursory glance given to a child's difficulties or a quick label for him as a child with a visual-motor handicap.

Any instruction given in the use of the manual precision grip should be structured individually according to the peculiar needs of each student.

CHAPTER V

CONCLUSIONS AND SUMMARY

Under the conditions of this study the following can be concluded:

There is a difference in the spontaneous use of the precision grip between institutionalized children classified as EMR or TMR and average achieving elementary school children of the same age. Classification of the EMR or TMR in the institution from which these samples were drawn was based exclusively on I.Q.

Though this study was based on a limited sample, the results suggest that the EMR and the TMR groups did have difficulty with the performance of simple manipulative tasks when compared with the AA group. In many instances awkwardness of manipulation characterized the omission of the use of the precision grip.

Since there is a difference in the spontaneous use of the precision grip between institutionalized EMR and TMR children and the AA elementary school children, the institutionalized EMR and TMR children need specific training in the precision grip skills if they are to cope with their environment at least as efficiently as their AA counterparts.

This study was a comparative investigation of the spontaneous use of the precision grip by AA, EMR and TMR children who were matched by sex and age and who were categorized as AA by the elementary school which they attended

and as EMR or TMR on the basis of institutional files at the state institution where they resided.

Data was obtained from forty-five children (nine boys and six girls in each of the three groups) who ranged in age from 91 to 154 months. The EMR and TMR groups were from a state institution and the AA group were from an elementary school. Spontaneous use of the precision grip was scored by means of the Precision Grip Checklist which had been constructed for use in this study. Arithmetic means, standard deviations, variances and standard errors were computed. The significance of differences between means was computed by use of the t-test.

There was a significant difference at the .001 level of confidence between the total group scores of the AA and EMR and between the total group scores of the AA and the TMR children. No significant differences were found between the total group scores of the EMR and the TMR children. Significant differences were found between the groups on seven of the twenty-five tasks presented.

There is a significant difference in the spontaneous use of the precision grip between AA, EMR and TMR children as compared in this study. Institutionalized EMR and TMR children need specific training in the use of the precision grip skills if they are to perform at least as efficiently as their AA counterparts.

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APPENDIX A

APPENDIX A

PRECISION GRIP CHECKLIST

1. picking up cord ☐
   holding cord ☐☐☐☐
   holding beads ☐☐☐☐
   (9)

2. opening case ☐
   taking out watch ☐
   turning watch hands ☐
   putting watch in case ☐
   snapping lid closed ☐
   (5)

3. winding toy ☐
   setting down toy ☐
   (2)

4. putting pegs ☐☐☐☐
   in holes ☐☐☐☐☐
   (9)

5. moving feather ☐
   turning pages ☐☐☐☐
   ☐☐☐☐
   hiding feather ☐
   (10)

6. picking up plane ☐
   poising plane ☐
   (2)

7. holding ball in throwing position ☐
   (1)

8. picking up coins ☐☐☐
   (3)

9. holding eraser ☐
   holding pencil ☐
   cutting with scissors ☐
   while holding paper ☐
   putting pencil, eraser and scissors into case ☐☐☐
   zipping case closed ☐
   (8)

10. unscrewing lid ☐
    (1)

TOTAL (50) ☐

Directions for recording: Indicate use of precision grip by tally mark in box each time task is performed. If forefinger is omitted in performance do not mark box.

Directions for scoring: Add tally marks and record in box for total.

NAME_____ DATE___/___/_____ AGE_____

b.d. / / M F

SCHOOL_____ TMR EMR AA

APPENDIX B

APPENDIX B

ADMINISTRATION OF PRECISION GRIP CHECKLIST

Ten cards with tasks to be performed by subject when using equipment as described on each card.

One separate scoring sheet of checklist should be used for each subject - tally marks are totaled.

PGC - 1

EQUIPMENT: 2 twelve-inch plastic cords 1/16" in thickness
5 plastic pieces or beads

PREPARATION: 1 cord and 4 beads are placed on table in front of child. 1 cord and 1 bead are used by examiner as he demonstrates.

EXAMINER: "Pick up the cord (1). Put the beads on the cord." (4) for holding cord, (4) for holding beads.

9 points possible

PGC - 2

EQUIPMENT: 2 play wristwatches in plastic snap-lid cases

PREPARATION: 1 watch in case on table in front of child. 1 watch in case by examiner.

EXAMINER: "Open the case (1), take out the watch (1), move the hands to any time (1), put the watch back into the case (1), close the case (1)."

5 points possible

PGC - 3

EQUIPMENT: 1 wind-up toy

PREPARATION: Toy is on table.

EXAMINER: "Wind this about two or three times (1), set it down (1) so that it can move."

2 points possible

PGC - 4 EQUIPMENT: 1 plastic tic-tac-toe board, 9 pegs.

PREPARATION: Board is on table in front of child. Pegs are lying on table near board.

EXAMINER: "Put the pegs in the holes."

9 points possible

PGC - 5 EQUIPMENT: Golden Counting Book. The upper part of the back cover is shaped like an Indian with a movable cardboard feather on the Indian's head.

PREPARATION: The book is held in front of the child by the examiner in a vertical position with the feather in a horizontal position.

EXAMINER: "Here is the Indian's feather (moving the feather up and then down). We are going to count the Indians in this book."
"Make the feather stand up (1), turn the pages as we count (8), hide the feather (1)."

10 points possible

PGC - 6 EQUIPMENT: 1 plastic airplane

PREPARATION: Plane is on table.

EXAMINER: "Make the plane fly and land."
Picking up plane (1), poising plane (1).

2 points possible

PGC - 7

EQUIPMENT: 2 rubber baseballs, one is two inches and the other is 2½ inches in diameter.

PREPARATION: Both balls are placed on table. (Note which ball will fit hand of child best.)

EXAMINER: "Get ready to throw the baseball." (Assign point only if fourth and fifth fingers are excluded in grip.)

1 point possible

PGC - 8

EQUIPMENT: 4 coins - a quarter, a dime, a nickel, and a penny, in small plastic cup.

PREPARATION: Coins are placed on table in front of child. Plastic cup is just behind coins.

EXAMINER: (Picking up the quarter) "This is a quarter." (Put the quarter into the cup.) (Point to the nickel.) "Put the nickel in the cup (1), put the penny in the cup (1), put the dime in the cup (1)."

3 points possible

PGC - 9

EQUIPMENT: 1 zippered pencil case containing 1 pencil, 1 eraser, 1 scissors; 1 piece of unlined paper at least 6X8 inches.

PREPARATION: Paper and zippered case (zipped) are lying on table in front of child.

EXAMINER: "This case has a pencil (zip case open and take out items as they are named), an eraser, and a scissors." (Zip case closed before laying it down) (Place things across the table from the child as you lay them on the table.)

"Make a mark on the paper with the pencil (1),
Erase this mark" (indicate some small mark on paper so that child will pick up the eraser and us it) (1),
"Cut the paper" (1) (Start the cut if it is too difficult for him),
"Zip the case open" (1),
"Put the scissors (1), the pencil (1), and the eraser (1) into the case." (Hold the case for the child.)
"Zip the case closed." (1)

8 points possible

PGC - 10 EQUIPMENT: 1 plastic opaque bottle with screw-top. Wrapped candies or small prizes that fit into the bottle and slide out easily.

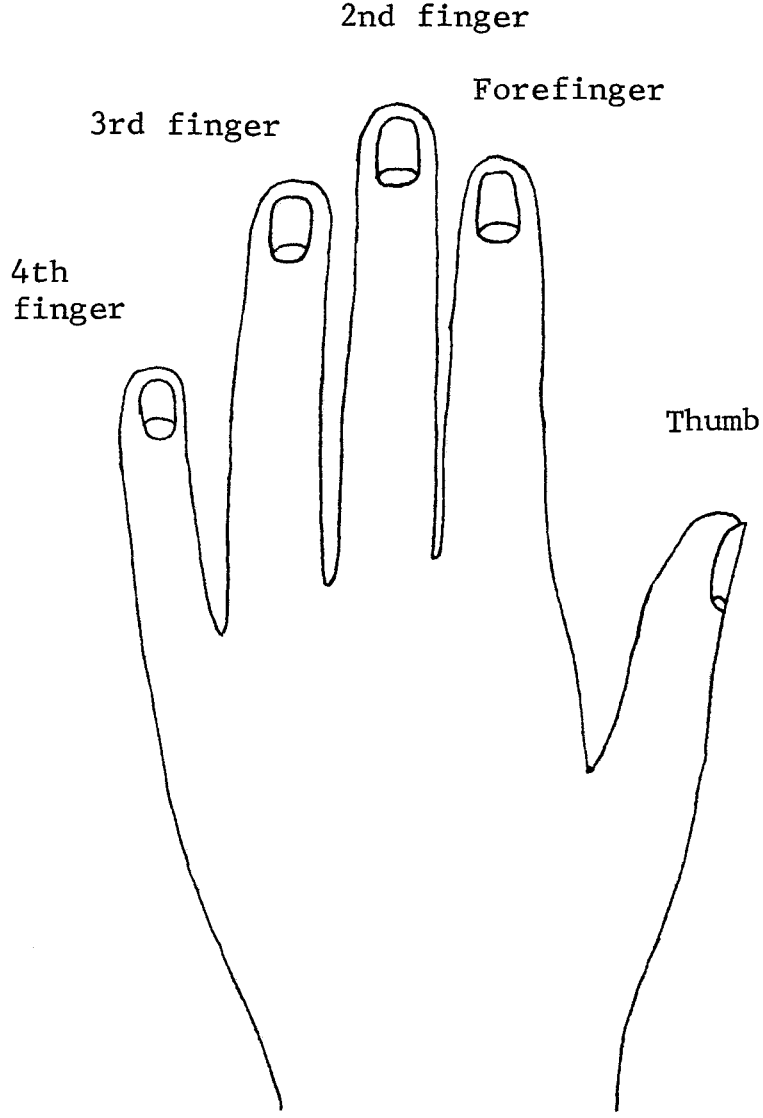
PREPARATION: Wrapped candy (or prize) in bottle. Top is screwed on lightly so that minimal power is needed for unscrewing it.

EXAMINER: "Unscrew the top and see what is inside for you." (1)

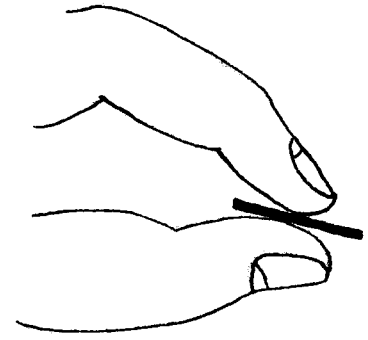
1 point possible

Note: Every grip for which a point may be assigned must be demonstrated by examiner as he speaks and before child is asked to perform each task. There is no time limit nor "correct" way of performing tasks. Observation is made of times when thumb and forefinger are gripping simultaneously. Precision grips are recorded on Checklist.

APPENDIX C



Human hand



Precision grip