DEVELOPMENTAL DIFFERENCES IN THE QUESTION ASKING BEHAVIOR OF INDIAN AND WHITE BOYS

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ABSTRACT

Groups of Indian and white boys ages 7-8 years, 9-10 years, and 11-12 years from rural and urban residential areas were studied to test associations between question-asking performance and age, and ethnic, and residential characteristics.

Subjects (n=271) were required to ask questions which would permit them to locate a preselected "target" picture from a stimulus array of 3" by 5" line drawn picture cards. The proportion of constraint questions used and the number of problems solved were assumed to reflect the overall efficiency of the information seeking strategy.

Association between the number of constraint questions and each of age groups and ethnic groups were found. There was no significant association, as tested by chi-square tests, between number of constraint questions and place of residence. Differences in the number of problems solved by the three age levels and by the ethnic groups reached a statistically significant level in analysis of variance. Differences in the number of problems solved by rural and urban groups were of little consequence.

It was concluded that cultural background may have a significant bearing on the information seeking behavior of children.

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CHAPTER 1

Related to our conception of cognitive growth is the means by which human beings represent their experience of the world and how they organize for future use what they have encountered. Throughout this developmental process there are striking changes in emphasis that occur with the development of representation (Bruner, 1966). At first the child's world is known to him principally by habitual action used for coping with it. In time there is added a technique of representation through imagery that is relatively free of action. Gradually there is added a new and powerful method of translating action and image into symbols including language, providing a third system of representation in the cognitive developmental process. Each of these three modes of representation--enactive, ikonic, and symbolic--has its unique way of representing events. Each makes a powerful impression on the mental life of human beings at different ages, and their interplay continues as one of the major features of adult intellectual life.

The maturational theory of Bruner (1966) outlined above does not negate the impact of culture in nurturing and shaping growth. It does not assume that the three modes of representation are universal in terms of forms in which they develop. On the contrary, Bruner explicitly describes one culture in which it seems that the symbolic mode never develops. Bruner (1966) wrote:

> . . . that different cultures provide different amplifiers at different times in a child's life. One need not expect the course of cognitive growth to run parallel in different

> cultures, for there is bound to be different emphasis, different deformations (p. 2).

This statement illustrates the important place assigned to cultural environment with regards to the determination of cognitive processes and structures. If the culture does not in some sense require the emergence of some of the forms of a mode of representation, especially in the case of the symbolic mode, those forms are not likely to develop. That is to say, if certain conceptual tools are not made available by the culture, conceptual thought patterns are not likely to be acquired.

TO NOTES

More specifically, a modern industrial world demands abstractions while, on the other hand, what is demanded in a less technical society is more concrete in nature. The implication in this regard is that an urban culture leads to the production of categories whose structure and content are characterized by symbolic thought patterns while in a rural culture this is not likely the case. The difference between urban and rural cultures could be most compactly described as a difference between abstractness and concreteness. One investigator (Greenfield, 1966) concluded that, "rural life it appears, is somewhat less conducive to the development of abstraction (p. 315)."

An investigation of research related to changes characterizing cognitive development has been described by earlier studies such as the work of (Bruner, 1964, 1965; Mosher, 1962; Mosher & Hornsby, 1966; Olver & Hornsby, 1966). They have suggested that information-seeking reflects the way a child organizes his thoughts, and for this reason we can expect drastic changes to occur in the way children of different

ages go about putting questions and organizing answers. The use of general questions for example, presupposes an ability to equate things in a superordinate category in which all subjects in the class share one or more common attribute (e.g., banana, peach, and potato are "all food" or "all have skins") and should be out of reach of the younger child. Each emerging form of cognitive organization and representation should be reflected in the questions a child asks and the manner in which the answers are used in the process of growing up. The less mature child, thus, adjusts to his environment on the basis of concrete perceptual (ikonic) cues while the more mature child is able to represent and deal with his world on an abstract symbolic level. This transformation is considered to be achieved via the verbal-symbolic training provided along the way. An environment that stresses the verbal-symbolic processes forces the child from concrete immediate representation of his world to one that is abstract and functional. Consistent with this point of view are findings that children reared in indigenous cultures where training is not oriented toward abstract representation continue as adolescents to equate on the basis of perceptual attributes (Greenfield, et al., 1966).

The work of Mosher (1962) and Mosher & Hornsby (1966) revealed two different strategies used as plans for choosing steps in solving problems calling for the selection of the correct alternative from many possibilities. The two strategies, "constraint seeking" and "hypothesis scanning" differ in grouping skills employed. Questions

linking or grouping at least two items are classed as constraint questions. Constraint seeking is based on the principle that alternative possibilities are equal, and as a consequence the child tries to eliminate half the alternatives with each question. His later questions tend to reduce the number of alternatives considered over the series of tasks. An example of an idealized statement of the strategy would be the child who begins with a general question grouping a large number of specific possibilities into domains, in one of which the correct answer must lie. This grouping ensures usable information from the answer to each question, since in theory, both a positive or negative response is equally useful to a child. He uses the information gained from each question to narrow in on the answer by successively constraining the remaining domain until he can almost determine the correct answer without asking about it directly. Constraint seeking offers success in a reasonable time, but requires a plan of strategy in building the conceptual structure necessary.

The very opposite to constraint seeking is "hypothesis scanning." A child simply asks a series of questions each of which names one alternative. He asks unrelated questions that have no relation to what has gone before. Hypothesis scanning is presumably less of a strain. It is an approach that depends entirely on positive answers. A "no" answer is practically useless, and in time the scanner who only obtains negative answers gives up.

Constraint seeking is considered to presuppose skills that are required for its use. To use it a child must first be able to organize things hierarchially in order to narrow down from general to specific questions that help keep track of the ground already covered. The use of symbolic mode is considered to facilitate constraint type strategy by encouraging abstract grouping. If the demands of the environment and the opportunities it offers push toward the development of a symbolic mode of representation, there will be a greater tendency in the use of constraint type questions.

It is possible, then, from a researcher's point of view, to conceptualize development as leading to changes in modes of representation by relatively abrupt changes. The development of a new mode of representation will permit a child to perform in a way that is markedly different from what he could have done previously on the same tasks. The information seeking strategy, or more specifically the question-asking performance, appears to be one index of determining modes of representation. Children who are able to deal not only with one item at a time but rather with the properties or features of two or more items simultaneously would be expected to make use of constraint type questions. Question-asking performance development towards constraint seeking questions calls for symbolic representation and hierarchial organization.

This present study investigates that aspect of cognitive functioning which is reflected in seeking information. It compares the cognitive functioning of boys of different ages, from different

cultural backgrounds and having different environmental experiences in terms of the questions generated and the manner in which the answers are used. More specifically, the study evaluates the level of difference in the question-asking performance of Indian boys when compared to the performance of white boys of similar ages. Environmental effects are further investigated by considering associations between question-asking performance and place of residence (rural vs. urban).

CHAPTER 2

REVIEW OF LITERATURE

On Cognitive Growth

In the approach of Bruner (1966), a general theory of cognitive development is advanced in which cognition is explicitly viewed as a means of interacting with an environment. Stages are described--enactive, ikonic, symbolic representations of experience--that are seen as partly produced by that environment and adaptive in it. An illustrative experiment was performed by Bruner & Kenny (1966), who confronted 160 children with a simple problem of determining which of the two beakers is the fuller one, and then which is the emptier one. The experiment, consisting of 11 pairs of beakers filled to varying degrees with ordinary water, presented one pair at a time. Forty children in each of the age groups of 5, 6, and 7; and 20 children in each of the age groups of 9 and 11 were used. Bruner & Kenny concluded that the child begins with a discrete idea of the meaning of empty and full and that he does so by use of highly enactive definitions of empty and full. At the next stage (ikonic stage) there is a movement toward a perceptual definition of the two terms. Full is interpreted as much water; empty as meaning little water. As the child gets older he moves toward the symbolic stage where the child achieves a new bit of cognitive technology (now fuller means much water and empty means much empty space) and a different system for computing relationships than the younger child. To do this, he must master what it takes to hold several different things in mind at once. Bruner (1966) wrote, "learning to recognize the underlying

respect in which two quantities are alike (though they appear different) is the same task as learning how a bell and a horn are alike--or a man and an animal (p. 325)."

Bruner and his associates offer evidence to support the proposition that development proceeds from global and diffuse functioning through differentiation to hierarchic integration. Using children varying in age from about three upwards, they have been able to examine the three phases in the developmental process with various tasks. Olver & Hornsby (1966) studied 60 children from Boston ranging in age from 6 to 19. They were required to explain how sets of objects were alike. The initial set consisted of two items. A third was then added to the initial pair, and subjects were asked to indicate how all three were alike or different. The same procedure was continued until there were eight items. The sets became increasingly diverse as objects were added. A set of items consisted of: bananas, peach, potato, meat, milk, water, air, germs, and stones. The 6-year-olds grouped more often according to perceptible properties than did the older children. Their protocols were linked with colors, sizes, shapes, and places of things. From the age six on there was a steady increase in functionally based ideas. Two types of groupings, complexive and superordinate were found. Complexive groupings are inconsistent; all group members are not taken as belonging to the class on the same basis, for the same reason (i.e., common attributes). Superordinate groupings are characterized by members in the class sharing one or more common attributes (e.g., banana, peach, and

potato are "all food" or "all have skins"). At six, half of the groupings made by the children were complexive, half superordinate. By 19, the complexive grouping had virtually disappeared. As the subjects got older there was a progress path towards superordinate grouping.

The work on strategies of information seeking by Mosher & Hornsby (1966) has yielded age related developmental trends consistent with that of Olver & Hornsby (1966). Mosher & Hornsby presented 6- to 11-year-olds with a stimulus array consisting of colored pictures of familiar objects. Subjects were instructed to ask questions that could be answered by "yes" or "no" in an attempt to find the picture selected as the target. In the information seeking context of the Twenty Questions game, younger children emitted a discrete series of unconnected hypotheses. Older children asked questions derived from hierarchic structure. General constraint seeking questions proceeded toward more specific hypothesis testing in an orderly, efficient sequence among older children.

Comparable effects were observed by Potter (1966) in the domain of perceptual recognition which involved the presentation of a scene, initially out of focus and gradually moving into focus. The subject was allowed to view each step for 10 seconds. The younger children, in contrast to the older children and adults, took much longer to recognize the picture. The 4- and 5-year-olds, in addition repeated the same hypothesis frequently but rarely mentioned details in their description of the picture. Older children, on the other hand, were

more analytic in their descriptions and less likely to repeat hypotheses. The older children were also more continuous, often refusing to guess, indicating that they recognized and took account of the inadequacy of their hypotheses. In summary the younger children offered an unrelated series of hypotheses to the nature of the viewed picture. With increased age, subjects were better able to integrate the stimulus features in an efficient, hypothesis testing manner.

Of importance to the present study were the findings of Maccoby, Lander, & Modiano (1964). In their study, Mexican village and city children were compared on the Olver & Hornsby tasks. They were required to explain how sets of pictures were alike or different. At the youngest age levels (six to eight), there were few rural-urban differences. Children at that age were better able to discriminate differences accurately than to synthesize accurately. With age, the urban children made the leap toward adequate synthesizing ability, an advance not shown among the older village children. Synthesis, or the recognition of similarities in the Olver & Hornsby procedures, requires that the child go beyond the external, perceptual attributes of objects to a higher order of abstraction. According to Kagan & Kogan (1970) accurate discrimination of differences can be considered an index of differentiation; the accurate apprehension of similarities can be considered an index of hierarchial integration. Differentiation requires that the child reach the perceptual or "ikonic" stage of development; hierarchial integration is reached when the child has progressed to the conceptual or symbolic level.

Greenfield, Reich & Olver (1966) confirmed and extended the findings of Maccoby & Modiano in studies of Sengalese children. Two groups of children, urban and rural, from the first, third, and sixth grade levels and a group of nonschool-attenders (of comparable ages to the other two groups) from a remote Wolof village, were compared on a picture sorting task. Sorting reasons were solicited. It was found that the use of superordinate structures increased with age among the schooled groups but declined with age among the unschooled groups. Only the urban school group showed trends toward more functional and nominal grouping with age. The unschooled group, across age, showed a dramatic increase in the rise of color as a sorting attribute, but showed no form, function or naming criteria. The fixed perceptible attribute used by the unschooled child as a basis for sorting behavior is quite unlike the developmental shift from perceptible attributes to conceptual content apparent in the schooled childrens' sorting behavior. Most important, cognitive accomplishments that can be carried out only by symbolic means are considered to be dependent to having access to an appropriate teacher. And, as Greenfield, et al. (1966) concluded, an appropriate teacher must be available early in a child's experience to guard against what they termed "errors of growth," where a child becomes more mistaken about some matter as he grows older before he finally comes to understand it.

Cross-cultural investigation is conducted not merely with replicative intent of discovering universal sequences of cognitive development but more importantly in order to find environments

varying in their general adaptive demands and the particular conditions of childhood experience that affect the development from one stage of representing experience to another. Greenfield, Reich & Olver (1966) conducted a comparative study of white and Eskimo children having similar educational backgrounds, in terms of curriculum and standards of performance. The grade placement for each of the matched groups was roughly equivalent. The average age of the Eskimo children was greater for each group than for the white children. All the children were given the task of telling how various objects in a set were alike. The Eskimo child was found to be slower than the white child in making the transition from the perceptual to the conceptual level of performance. With age both groups of children decreased in their use of complexive groupings and increased in their use of superordinate constructions. White children at both the younger and older age levels, however, had a greater tendency to use superordinate or hierarchic structures than did the Eskimo counterparts. The findings of this study are consistent with Bruner's (1966) contention that one should not expect the course of cognitive growth to run parallel in different cultures. He stated that "cognitive growth . . . is inconceivable without participation in a culture and its linguistic community (p. 2)." The Greenfield, et al. (1966) studies with Wolof children from the bush and school as well as with French children indicated that cognitive accomplishments requiring symbolic means are dependent on a language with a lexicon of several levels to facilitate perceptual analysis

and synthesis into unified hierarchial structures. The Wolof language, according to the Greenfield group is at a single level of generality and hence adequate for differentiating objects; synthesis depends upon superordinate terms, however, and these cannot readily be generated within the structure of the Wolof lexicon. Wolof children showed considerable more hierarchic structures when employing French as opposed to their native tongue. The movement toward the symbolic stage, then, appears to be to a great extent dependent upon access to an appropriate language.

Pilot work in the present study attempted a comparative study of 6- 9- and 12-year-old children using an equal number of Indian and white children. It noted in the question-asking game played with each subject using an array of line drawn picture cards that with increase in age, both groups had a tendency to use a constraint strategy. However, white children used a greater proportion of constraint type questions than did the Indian children. Also, it was noted that there were a higher proportion of Indian children using a guessing strategy at all age levels than there were white children. In summary the white children had progressed to a greater extent toward a conceptual or symbolic level than had the Indian children.

Question-Asking Techniques and the Study of Cognitive Development

Considerable evidence has been gathered to support the contention that knowledge of cognitive processes comes from studies of the kinds of questions children ask. Yamamoto (1962) analyzed questions of 850 subjects (grades 1 to 12 as well as adult counsellors) who

underwent an "ask and guess test." Subjects were shown a picture illustrating a familiar nursery rhyme. In the first part of the test, the subject was instructed to ask as many questions as possible about what he saw in the picture. The number of questions tended to increase with age. Questions beginning with "why" were the most common of the questions asked by grades one to three, by grade four questions beginning with "what" increased. Yamamoto's general conclusions were that children advance from global questions (why?) to specific questions (what? when? where? who? which?) and finally to a definitive question (how?).

Faust (1958), Mosher (1962), Mosher & Hornsby (1966) have employed the Twenty Questions game to investigate children's problem solving behavior. Faust (1958) reported a number of characteristics of this game that makes it useful in research. The game is close to everyday life because it uses subject matter, language, and concepts with which the subjects are familiar. Few of the data needed for a solution of the problem are presented when the problem is stated. The achievement of the solution involves a certain series of steps. The game is enjoyable to most people. There are a number of problems available, while the same problem seems appropriate for children or adults. In the process of solving the problem the subject's task may be seen as having to conceive some set of possible alternatives in finding the domain to which an object belongs. Once the set of possible alternatives is known, according to Attneave (1959), an approach can be used which attempts to narrow the answer

with as few questions as possible by eliminating half of the remaining alternatives. In order to do this the subject has to find some way of grouping or categorizing the possibilities which will eliminate a large set of alternatives whether the answer is "yes" or "no." Faust (1958) concluded that if the subject does not think of eliminating a large number of alternatives at one time he can test each alternative one at a time. In other words he does not have to be efficient to get the answer. The game can be played with varying degrees of efficiency. Any approach has at least some chance of success.

Mosher (1962) was of the opinion that most people have some notion of the strategy which prescribes the use of questions in the Twenty Questions game. No matter what approach you use you must have some idea about the domain in order to phrase the question. The environment in the game merely negates or affirms the alternatives generated by the person playing it. The thoughts may vary from simple to complex, but in the game no question is asked without some expectation, and none or little information is gained unless there is some system of classifying the answers received.

Mosher (1962) contended that an important element in the study of human problem solving concerns the processes by which information is acquired and used. His opinion was that to study how subjects gain and use information, the information initially presented should be inadequate and the subjects should have to ask questions about the environment. The problem might require that the information be trans-

formed in some way before the next question is asked. It should be possible to estimate from succeeding questions whether or not such transformation has been made, and to make some judgements concerning this matter. In summary, Mosher concluded that the Twenty Questions game was quite an appropriate process for finding how people gather and use information in the course of problem solving.

Two variants of the Twenty Questions game were used by Mosher & Hornsby (1966) with children between the ages of 6 and 11 years. The most rational strategy for this kind of game is what the authors called constraint seeking, which means asking questions that progressively narrow the range of possibilities and which have an equal chance of being answered affirmatively or negatively. Theoretically, both positive and negative responses can be equally useful to the child. This guarantees usable information on each question. The child then uses the information gained on each question to narrow the domain (constraining the remaining domain) until the answer can be derived from the information known without asking about it directly. The opposite strategy, called hypothesis scanning, is presumably less of a strain in both formulation and use. "A child simply asks a series of questions, each of which tests a self-sufficient, specific hypothesis that bears no necessary relation to what has gone before (Mosher & Hornsby, 1966, p. 88)."

One form of the Mosher task involved a display of common objects; the child had to find out which one of the pictures the experimenter had in mind. Almost all the questions asked by the

6-year-old subjects were the hypothesis scanning type. Constraint seeking questions increased slightly by the age of eight, and comprised approximately 80% of the questions asked by 11-year-olds. When the 8-year-old children asked a constraint type of question, it was usually followed by a series of specific hypothesis questions rather than by further constraint seeking. On the other hand 11-year-olds generally avoided voicing specific hypotheses until they felt ready to terminate the inquiry.

A second form of the task used a verbally described situation. In contrast to the first experiment where alternatives were restricted to a set of pictures displayed in front of the subjects, the possible solutions came from an unrestricted universe. As before, 11-year-olds used constraint seeking more than hypothesis scanning, but the 6- to 8-year-olds were more likely to use hypothesis scanning. When the children were offered a choice between a general and a specific question (e.g., Is it the apple? or Is it something to eat?) one-third of the 6-year-olds and nearly all of the 8-year-olds chose the general constraint seeking question, but as Mosher & Hornsby (1966) concluded, "they appeared able to recognize a better strategy in the verbal game, but seemed less able to mount the strategy on their own initiative (p. 99)."

A related investigation by Olson (1966) presented children with a board bearing a number of light bulbs arranged in a matrix pattern. Children of 3, 5, and 7 years of age were told that some of the bulbs, but not others, would light up when pressed. Two diagrams representing

alternative partitions of the matrix into on-off bulbs were shown to the subjects. Their circuit testing involved pressing individual bulbs on the board to see whether they would light or not. These bulb pressing responses were thus equivalent to asking questions. The 3-year-olds pressed bulbs independently of the diagram representing the alternate combinations. At five years of age a "circuit-pattern-matching strategy" was used. The subject tried out bulbs that, according to the diagram, should light up. Finally, at about age seven, the "information selection strategy" appeared. They selectively matched key bulbs to the diagrams. The child concentrated on informative bulbs that would light up according to one solution but not according to the other, and in this way could make a decision between the alternatives. Olson noted that locating and utilizing information changed with the growth of the child's powers of representation. He wrote, "such a step corresponds to the development in the Twenty Questions game when children are able to ask 'indirect' questions about constraints, rather than testing hypotheses directly (p. 152)." The transition from pure guessing, through estimated guessing to constraint guessing in perceptual tasks, as this study indicates, appears to change with age.

The Olson, Mosher & Hornsby studies suggest that question-asking techniques can be used to identify levels of representational experience. However, it is highly probable that information seeking strategies may be dependent on other variables such as the specific stimulus material being studied, the type of instruction used, and

the complexity of the stimulus array (Kagan & Kogan, 1970). At present, there is insufficient knowledge of the potential effects of these factors and consequently an inaccurate estimation of their influence limits the extent to which the findings by Olson, Mosher & Hornsby can be generalized.

Guided by the foregoing thoughts, the present study used question-asking tasks in an attempt to compare Indian and white boys of different ages from different environmental backgrounds.

Statement of Hypotheses

1. The older the child, the greater is his tendency to seek information with a constraint strategy, and the greater his success in the games played.

2. There is a higher proportion of white children at all age levels using a constraint strategy in solving problems than there are Indian children. Further, white children will solve more games than Indian children will.

3. Children living in or near urban centres have a greater tendency toward the use of constraint strategy in problem solving than children from rural areas. Further, urban children will solve more games than rural children will.

Statistical Hypotheses

1. For specific testing of the null form of hypothesis one, concerning age effects, it is hypothesized that no significant association exists between age and proportion of constraint type questions, and no significant differences exist between the number of games solved.

2. For a specific testing of the null form of hypothesis two, it was hypothesized that no significant association exists between ethnicity and proportion of constraint type questions used in problem solving, and no significant difference exists in the number of games solved by Indian and white children.

3. For a specific testing of a null form of hypothesis three, it is hypothesized that no significant association exists between location of residence and proportion of constraint type questions used in problem solving, and no significant difference exists in the number of games solved by urban and rural children.

CHAPTER 3

METHOD

Subjects

The sample included boys from Indian and caucasian ethnic groups and from rural and urban backgrounds on Vancouver Island. A total of 271 boys born in 1964-63 (7-8 years), 1962-61 (9-10 years), and 1960-59 (11-12 years) formed the sample. Reported sex differences in the development of question-asking ability (Taylor, 1962) were avoided by using only male subjects. The four sample groups (Table 1) consisted of students attending school on test administration day as follows:

> Group I (n=72) consisted of all the Indian boys born from 1959 to 1964 attending Christie and Ahousaht Indian Schools.
>
> Group II (n=73) consisted of white boys born from 1959 to 1964 attending Ucluelet and Tofino provincial schools randomly assigned from a population of 106 students.
>
> Group III (n=59) consisted of all the Indian boys born from 1959 to 1964 attending Queen of Angels and St. Joseph's parochial schools.
>
> Group IV (n=67) consisted of all the white boys born from 1959 to 1964, attending Queen of Angels parochial school plus an additional 13 white boys attending St. Joseph's parochial school randomly assigned from a population of 30 boys.

Group I subjects were Indian boys who were members of the native language group known as the Nootka whose homes and families lived on rural or isolated reserves on the shores and sheltered bays and inlets on the West Coast of Vancouver Island. Parental employment for the majority of the people was in some way connected with the fishing or

TABLE 1

Distribution of Subjects in Four Sample Groups

Group	Group Description	Number of Subjects and Mean Age-Grade Level								
		7-8			9-10			11-12		
		N	Mean Age	Mean Grade	N	Mean Age	Mean Grade	N	Mean Age	Mean Grade
I	Indian-Rural	31	7-7	1.52	20	9-7	2.50	21	11-5	4.43
II	White-Rural	26	7-5	1.54	24	9-4	3.46	23	11-5	5.25
III	Indian-Urban	17	7-4	1.53	23	9-4	3.09	19	11-7	4.95
IV	White-Urban	19	7-4	1.47	25	9-2	3.46	23	11-4	5.43

logging industry. Travel in the area was generally by water by means of fishing or speed boat. Bush planes flew into these isolated settlements daily, on scheduled or charter flights. Mail was brought in by air two to three times weekly.

Housing on the reserves was generally characterized by over-crowding because of large families (Table 2). Sometimes families doubled or tripled in the same house while waiting for houses to be built.

The subjects from these west coast reserves, generally, did not speak the native Indian language at home. There were instances when the parents or older adults on the reserves expressed concern to the researcher over the fact that so few of their young people spoke their native language. Davis (1970) noted while interviewing the Sliammons that the children on the reserve generally did not understand the language. In her study, Davis reported that it was not a matter of a native language being used at home and English at school, but rather the variety of English learned and used was "reserve English" which was probably quite different from that used by white classmates and teachers.

Group II subjects were non-Indian (white) pupils attending school at Ucluelet and Tofino elementary schools. Ucluelet and Tofino are rural settled areas along the Esowista Peninsula on the West Coast of Vancouver Island. Until 12 years ago, this area was isolated from other communities except by a passenger ferry and bush plane service. In 1959, the B.C. Government arranged for existing logging roads to

TABLE 2

Housing and Language Backgrounds of Subjects

Electricity (E.), Water & Plumbing (W.P.), Mean Rooms (M.R.), Mean Number Inhabitants (M.I.), Spoke Language Other than English (SLOE), Understood Language Other than English (ULOE), English spoken at home All the time (E.A.), English spoken at home Part time (E.P.).

Group	Housing Facilities				Size & # of Residents		Language			
	E. %	W.P. %	Radio %	Telev. %	M.R.	M.I.	SLOE %	ULOE %	E.A. %	E.P. %
I	79.2	56.9	84.7	51.4	4.00	9.08	11.1	43.1	58.3	41.1
II	100.0	100.0	97.0	96.0	5.43	5.38	12.3	13.7	86.0	13.7
III	98.0	67.8	96.0	93.0	3.78	8.52	35.5	64.4	23.7	76.2
IV	100.0	100.0	98.5	100.0	9.26	6.55	27.0	40.3	59.2	40.3

be extended and access was then available by road from Port Alberni. Twenty-five miles of this access mountainous road was rough, gravel, and narrow at the time of this study. Float planes operated charter flights into the area. A sea plane service was based at Tofino. A passenger ferry service operated three times a week between Port Alberni and Ucluelet. It arrived in Ucluelet on Monday, Wednesday, and Friday returning to Port Alberni the following day. Mail service was daily, except Sunday, from Port Alberni.

The estimated area population in 1971 was approximately 3,500. The school population was over 800 and about 200 of these were Indian girls and boys from local reserves. The British Columbia Centennial directory estimated that there were 315 commercial fishing vessels under the ten-ton class based in the area in 1964, and reported that this was the means of employment for about 400 men. The number of vessels and employees probably has increased proportionately with the population since then. In 1964 the population was estimated to be 2,000. The forest provided quite an active logging industry, and it was estimated that one-tenth of the area's population were employed as a result. Local residents were of the opinion that much of the area's future growth would be a result of the tourist trade potential, particularly since the Long Beach area was included in the newly formed Pacific Rim National Park.

All subjects in this group indicated that English was the language used to communicate with one another in their homes (Table 2). However, 10 subjects reported that another language was spoken part of the time.

Groups III and IV, considered to be from urbanized centres, were drawn from Duncan and Chemainus areas which are situated midway between Nanaimo and Victoria on Vancouver Island with an area population of over 24,000. The area provided a variety of recreational facilities including golf, curling, tennis, music, drama, recreational dancing, soccer, cricket, baseball, Canadian and English football, and horse riding. Rhodonite for rockhounds is found nearby. Private and public boat-launching facilities are available to residents and tourists for year round fishing. The local economy is based on products from the forest and mixed farming in the area. A large proportion of the residents found employment as a result of pulp operations, logging and sawmilling. A cement works south of Duncan was a productive industry and contributed to the local economy. When the study was undertaken the private and public school population was over 7,000. Some well-known private schools in the area were Shawnigan Lake Boys' School, Brentwood College for Boys, Strathcona Lodge for Girls, St. Margaret's School for Girls with students enrolled from various parts of the world. It was in this setting that the Queen of Angels and St. Joseph's parochial schools were located.

When the study was conducted the Queen of Angels School at Duncan taught students from grades one to seven. Slightly less than one-third of the students were Indian girls and boys from the local reserves. There were nine regular classrooms featuring a special grade one class, for 5-year-olds, which was considered the only one

of its kind in the District. There were 11 teachers, one a full-time remedial teacher, and another a teaching principal. Six of the teachers were Sisters of St. Ann. All of the teachers had B.C. Teacher Certificates, five had degrees. A cultural program, which was in its third year, was functioning. Indian people from the local reserves were employed to conduct two classes a week and taught native art, craft, and history.

St. Joseph's school at Chemainus also taught grades one to seven, with approximately one-third of the students being Indian and in this respect closely paralleled that of Queen of Angels. When the study was conducted there were six teachers. There were four Sisters of the Child Jesus Order and two lay teachers. All but one were certified teachers.

Group III subjects consisted of Indian students who lived on the local reserves within a 10 mile radius of urban centres and were members of one of the five local Indian bands. These were a part of the 19 bands that comprised the Coast Salish language group whose reserves extended south from Comox, generally along the coastal waters, to Victoria and Sooke on Vancouver Island.

The British Columbia Heritage Series (1965) reported that the Coast Salish Indians acquired a great variety of cultural traits, because of their wide dispersion throughout a diversified environment. Many of them were acquired from the highly developed Kwakiutl culture to the north, and some interchange with the Nootka on the westerly coast of the Island. The most profound influence seems to have been

the European invasion, as has been the case for all Vancouver Island Indian people, which in innumerable ways altered the uniqueness of the native way of life.

The close proximity of the reserves, on which the Indian children in the group lived, to the urban centres would seemingly contribute to a high degree of integration at all levels in this area. However, observation suggests little social mixing of people from the reserves with the whites in the area. Indians do their grocery shopping, visit the doctors, are admitted to the hospitals, attend the theatre, frequent the pubs, but for one reason or another barriers seem to exist on the part of both groups. Davis (1970) reported that it is common knowledge that prejudice and discrimination abounds in areas immediately adjacent to reservations. Discrimination and prejudice seemed quite evident in this area.

The forest industry, logging in particular, was the primary source of employment for the men living on the reserves. A number of camps were close enough so that workers could live at home and commute. A few worked at the pulp mill at Crofton and the sawmill at Chemainus.

Housing conditions on the reserves is generally one of overcrowding (Table 2). Families are often doubled up while waiting for houses to be built. Families of two generations living in two bedroom homes is not uncommon.

The majority of children from these reserves did not speak their native language. The researcher noted that on these reserves although

closely situated to urbanized centres, there was a greater proportion that reported they both spoke and understood their native language than there were in Group I, Indian children from the rural and more isolated areas (Table 2).

Group IV consisted of non-Indian subjects whose fathers had a greater variety of occupations than did the fathers of their Indian counterparts attending the same schools. However, since the local economy was based to a large extent on forestry a fairly high proportion of the parental occupations were directly connected with this industry.

The housing for families in this group seemed to provide ample room. All of the houses for this group were provided with electricity, water and plumbing, and television. One child reported no radio at home.

The language generally spoken at home was English, but about 40% reported that another language was spoken at home part of the time (Table 2).

Testing Procedure

In order to determine the question-asking strategy of boys from these culturally different backgrounds, stimulus arrays of 3" x 5" line drawn picture cards were shown and subjects were to determine which one of the cards the experimenter had preselected. In their attempt to solve the problem the subjects were expected to utilize the information gained from the experimenter's "yes" and "no" answers to their questions. As in the Mosher & Hornsby (1966) study, the

proportion of constraints and guesses used was expected to reflect the frequency of conceptually or perceptually based information seeking strategies. The total number of constraint questions used in the problem solving task, and the total number of games solved were assumed to reflect the overall efficiency of the information seeking strategy.

Questions asked by subjects were tape recorded for later classification according to type: Guesses, Hypotheses, Pseudoconstraints, or Constraints. Guess questions were those which referred to only one picture and did not show any particular relationship to previous questions asked. A constraint question was one that was general enough to refer to more than one picture. A hypothesis question was one that referred to only one picture, but showed some discernable relationship to a previous constraint question. Pseudoconstraint questions were those that were phrased like constraints, but referred only to one picture. Mosher & Hornsby (1966) stated that pseudoconstraints were "a form without substance, as though a child learned to make a question sound right without knowing how to use it properly (p. 90)." To test the reliability of scoring procedures, these criteria were applied to 10 randomly selected samples of subjects' question-asking games. Assignment of questions to scoring categories of the experimenter and one independent judge agreed 342 times out of 346 questions asked by the 10 subjects (Table 9). Interjudge agreement of 98.8% was obtained.

Stimuli were colored line drawings of real life objects. Pictures for the stimulus arrays were selected following pilot work with 60 boys of similar ages as those used in the present study from students attending Princess Royal and Departure Bay elementary schools at Nanaimo. At these two schools, pictures were presented to subjects prior to their playing the question-asking games. Thirty-six pictures that were easily recognized were selected by having the subjects name all the stimulus objects on the picture cards, and having them group items by indicating which were things to wear, to eat, made of metal, used in school, and with similar colors on them. The teachers of these boys were then asked their opinion whether or not all of their students would recognize the picture cards finally selected. They were also asked if their students would determine ways the various items could be grouped by such conceptual relationships as color, form and function. The teachers were of the opinion that the picture cards selected were appropriate for the tasks.

Two-thirds of the 36 pictures selected were used to form one stimulus array and used for tasks one and two. The remaining one-third of the pictures were added to extend the stimulus array and to form the display for tasks three and four. The stimulus arrays are illustrated in Appendix C. Each subject was shown and asked to identify the objects on the picture cards, to which he would be exposed during the problem solving tasks. The subjects were told that one of the pictures would be preselected as the target for each game. Subjects could have 10 questions to find the name of the preselected

picture, but were to try to find the answer in as few questions as possible. The subject watched the experimenter draw a slip of paper from a container which contained names for each of the pictures. The task was to try to find the picture named on the slip of paper from the array displayed on the table before them. The name written on the slip of paper was shown to each subject at the completion of each game. Four successive games were played with each subject at one sitting. The verbatum instructions presented to each subject in each of the four groups are given in the Appendix A.

The subjects were told during the preliminaries that their voices would be recorded. The tape recorder was left in plain view with the microphone on the table. Student anonymity was promised. Hence, a number was given to subjects in each group used in the study. A listing of students by number, giving the score classification of their response and other individual information about them is given in the Appendix E.

CHAPTER 4

RESULTS AND DISCUSSION

The major variable considered in the present study concerned the question-asking behavior of children from various backgrounds and different age levels. Data for each subject within each of the four groups of the study were added to give total scores for each of the three age levels. All subjects played four games with the exception of one, who played only three. This subject was included in the study since the total score for each was based on the number of questions asked and the number of games played (Appendix E). The total number of constraint questions asked was converted to proportion of the total number of questions. Distribution of subjects in each group are reported in Table 3. The mean number of games solved and the standard deviations are presented in Table 4.

An overall test of significance among the total number of groups in their use of constraint type questions was conducted by the multiple-classification chi-square procedure of Sutcliffe (1957). Categories of high and low proportions of constraint questions were established by dividing at the median (about .10) for the total group. As reported in Table 5, there was a significant total chi-square value, Indicating that statistically significant associations among the variables existed. The method permitted an analysis of the source of this association relative to each of the independent variables (ethnic group, place of residence, and age) considered in the study.

TABLE 3

Number of Subjects Categorized by Proportion of Constraint Type Questions

Group	Group Residence	Score Category	Age 7-8	Age 9-10	Age 11-12
I	Indian-Rural	High	0	0	5
		Low	31	20	16
		Total	31	20	21
II	White-Rural	High	4	13	15
		Low	22	11	8
		Total	26	24	23
III	Indian-Urban	High	0	3	10
		Low	17	20	9
		Total	17	23	19
IV	White-Urban	High	1	11	16
		Low	18	14	7
		Total	19	25	23
Across Four Groups		High	5	27	46
		Low	88	65	40
		Total	93	92	86

* High Category - proportion of .11 and above

Low Category - proportion of .00 to .10

TABLE 4

Means and Standard Deviations for the Number of Games Solved

Group Residence	Age									Across Three Age Levels Total		
	7-8			9-10			11-12					
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
I Indian-Rural	31	1.13	0.79	20	1.10	0.83	21	1.81	1.10	72	1.32	0.96
II White-Rural	26	1.77	0.97	24	1.88	1.09	23	1.74	1.29	73	1.80	1.12
III Indian-Urban	17	0.94	0.64	23	1.30	1.12	19	1.89	1.29	59	1.39	1.14
IV White-Urban	19	1.37	0.99	25	1.56	1.13	23	2.52	1.25	67	1.84	1.24
Four Group Total	93	1.32	0.92	92	1.48	1.10	86	2.00	1.28	271	1.59	1.14

TABLE 5

Partitioned Chi-Square Values for Proportion of Constraints

Source		χ^2	df	p
Ethnic	(AD)	29.704	1	.005
Residence	(BD)	1.285	1	> .100
Age	(CD)	48.480	2	.005
Ethnic x Residence	(ABD)	1.648	1	> .100
Ethnic x Age	(ACD)	2.606	2	> .100
Residence x Age	(BCD)	1.003	2	> .100
Ethnic x Residence x Age	(ABCD)	0.966	2	> .100
Total		85.692	11	.005

TABLE 6

Analysis of Variance for Number of Games Solved

Source		F	df	p
Ethnic	(A)	11.22	1, 266	0.0009
Residence	(B)	0.04	1, 266	0.8449
Age	(C)	8.82	2, 266	0.0002
Ethnic x Residence	(AB)	0.01	1, 261	1.0000
Ethnic x Age	(AC)	0.42	2, 261	0.6593
Residence x Age	(BC)	2.75	2, 261	0.0659
Ethnic x Residence x Age	(ABC)	1.82	2, 259	0.1646

An analysis of variance test on the number of games solved is shown in Table 6. There were significant main effects which are discussed below. None of the interaction effects was significant.

Age Effects

The initial hypothesis was concerned with age effects. It was hypothesized that the older child uses a greater proportion of constraint type questions and solves more games than would the younger child. As reported in Table 3, only 5 out of the 93 in the youngest group asked more than 10% constraint type questions. Most of the questions asked by children at age 7-8 years were in the form of specific hypothesis scanning (Appendix E). By age 9-10 years, 27 out of 92 used more than 10% constraint type questions and by 11-12 years over half, 46 out of 86 used constraint type questions in their attempt to solve the problem. By the chi-square test reported in Table 5, the association between age grouping and proportion of constraint type questions was statistically significant ($p < .01$). The findings support the contention that the older child has a greater tendency to seek information from a constraint strategy than does the younger child.

The hypothesis that the older child would solve more games than the younger child was tested by the age group effect in the analysis of variance test (Table 6). A comparison of the means indicated a difference significant at the .0002 level, thus rejecting the null hypothesis that no significant difference exists between the

number of games solved by the age groups. It can be concluded that the number of games solved by the older children is significantly greater than the number solved by younger children.

Ethnic Group

It was further hypothesized that white children would use a greater proportion of constraint type questions in the problem solving tasks and that they solve more problems than their Indian counterparts.

The results shown in Table 7 indicate that a greater number of white subjects than Indian subjects at all three age levels were categorized in the high proportion of constraint usage group. Chi-square comparison indicated that the association between ethnic group and constraint usage group, reported in Table 5, was statistically significant ($p < .01$). The greatest performance difference between the two ethnic groups seemed to occur at the 9-10 age level. At the 11-12 age level the difference does not appear to be as great as that of the 9-10 age level but the difference between the ethnic groups is still significant. Indian children in the two younger age levels seem to be similar in that relatively they tend to be hypothesis scanners, while the white children in the two older age levels seem to have similar tendencies towards using a strategy of constraint seeking. A comparison across age levels for each ethnic grouping indicated that only 13.74% Indian as compared to 42.85% whites were in the "high" category of constraint use (Table 5). The hypothesized greater use of constraint strategy in solving problems among white as

TABLE 7

Proportion of Constraints Used by Indian and White Subjects

Group	Score Category	Range	Age			Total Across Age Levels
			7-8	9-10	11-12	
Indian	High	.11 to 1.00	0	3	15	18
	Low	.00 to .10	48	40	25	113
	Total	.00 to 1.00	48	43	40	131
White	High	.11 to 1.00	5	24	31	60
	Low	.00 to .10	40	25	15	80
	Total	.00 to 1.00	45	49	46	140

compared to Indian children was supported.

The hypothesis that white children would solve more games than Indian children was tested by the ethnic group effect in the analysis of variance procedure. A comparison of means of the two ethnic groups indicated a difference significant at the .0009 level (Table 6). Therefore, the null hypothesis is rejected. Consequently, it can be concluded that the number of games solved by the two ethnic groups was significantly different. Findings of this study indicate that white children solved more problems than did Indian children. This difference gives indication that cultural background may have significant relationship with the way children process information.

Place of Residence

It was also hypothesized that children from urban areas would use a higher proportion of constraint seeking questions in problem solving than rural children and that they would likewise solve more problems. Consideration of place of residence (rural vs. urban) across the three age levels, shown in Table 8, indicated very little difference regarding the proportion of constraint type questions used. When the total scores were considered, slightly more urban children than rural children were placed in the "high" proportion of constraint usage category. The difference was only 6% and, thus, would appear insignificant. A test of the association between proportion of constraint type questions and place of residence by chi-square supports this lack of association (Table 5).

TABLE 8

Proportion of Constraints Used by Rural and Urban Subjects

Group	Score Category	Range	Age			
			7-8	9-10	11-12	Total
Rural	High	.11 to 1.00	4	13	20	37
	Low	.00 to .10	53	31	24	108
	Total	.00 to 1.00	57	44	44	145
Urban	High	.11 to 1.00	1	14	26	41
	Low	.00 to .10	35	34	16	85
	Total	.00 to 1.00	36	48	42	126

Analysis of variance was employed to test the hypothesis that urban children would be more successful in solving problems than rural children. A comparison of the means of the two groups (rural vs. urban) indicated that the difference was not statistically significant ($p > .10$). The null hypothesis that there is no significant difference in the number of games solved by urban and rural children was not rejected (Table 6). Consequently, there is no reason to believe that the two groups are different. The findings do not support the contention that urban children have a greater tendency to seek information from a constraint strategy, nor do the findings support the contention that urban children solve more games than rural children.

In addition to considering main effects the present study considered interaction effects. There was no apparent significance in any of the interactions involving ethnic group, place of residence, and age with regards to proportion of constraint type questions used (Table 5). Neither were any of the interactions involving number of games solved statistically significant (Table 6).

In summary, children aged 7-8 years seem to generally seek information from a guessing strategy, children aged 9-10 years seem to have a tendency toward the use of constraint questions, while children age 11-12 years use a constraint strategy to narrow down the possibilities to solve the problem.

The data support the findings of Mosher & Hornsby in their study using 90 boys (Bruner and others, 1966). Their conclusions

were similar in that they found the younger children had little awareness of the game requirements other than an answer to be guessed, and that the older children had a greater tendency to appreciate the requirements of the game, and also grasp the importance of narrowing successfully in ones approach to the answer.

The pattern that seems to emerge from this study when a comparison of question-asking strategies is made between Indian and white children is that the Indian child develops more slowly. Indian children do not seem to realize to the same extent as white children do that the use of general questions help achieve a solution. From this study it is suggested that more white children than Indian children use what is considered to be a more successful strategy of information seeking.

CHAPTER 5

CONCLUSIONS AND IMPLICATIONS

Conclusions

The significance of representational thought in the process of cognitive growth seems to be well documented (Piaget, 1951; Bruner, 1964). Acquisition of more complex conceptual thought as well as participation in the symbolic realm are presumed to be dependent on representational competence (Sigel & McBane, 1967).

Mosher & Hornsby (1966) wrote:

> . . . As the child increasingly relies on symbolic representation rather than on representation by action and image--and thus is able to construct groupings of objects and events on the basis of characteristics they have in common--he attains the structure necessary to follow through a constraint seeking strategy, to guide his inquiry by cycles of questioning that narrow from the general to the specific. In contrast, the child relying on enactive and ikonic representation . . . lacks the prerequisite structure for a constraint approach, and thus can do little more than use hypothesis scanning in seeking new information (p. 101).

A question-asking performance was studied with 271 Indian and white boys, who ranged in age from 6 years 5 months to 12 years 4 months (May, 1971). They were all enrolled in schools located on Vancouver Island. The children were stratified into four groups according to cultural background and place of residence (rural vs. urban). The Indian groups and urban white groups from which subjects were drawn for this study perhaps experienced more direct influence from the church, through the facilities of the school, than do most children elsewhere in B.C.

The stimulus items selected for the present study represented only a small portion of items that could have been used, thus limiting the environment from which questions could be initiated.

An important aspect of this study is the indication that Indian children do not develop at the same rate as white children in their use of constraint type questions in seeking new information. Indian boys at each of the three age levels considered in the study use fewer general questions and apparently fail to grasp the importance of narrowing successively in their approach to the answer more so than do their white counterparts. There is a greater tendency on the part of the Indian boys at all age levels to use a hypothesis scanning approach in seeking new information than is the case with the white boys.

Rural vs. urban differences for either of the ethnic groups with regards to choice of hypothesis scanning or constraint seeking is small.

Implications

In view of the results of this study, the possibility of instituting programs to increase the use of constraint type questions of Indian children should be considered. Several related studies have suggested that children's general cognitive processes can be facilitated by training procedures (Sigel & Olmsted, 1967; Rowher, 1970).

Such training procedures might involve practice in dealing with categorization type tasks which are assumed to facilitate the develop-

ment of classifying ability. Experience in dealing with likeness or differences in many sequential learning situations could provide a foundation for development of formal logical thought. The ability to recognize class identities and to use them in establishing logical relationships may be facilitated through programs involving the matching of identical elements, or categorization of similar elements (Vallet, 1967).

Specific practice in classifying may be gained through imitative learning. Driver (1969) suggested that children in all cultures learn partly by voluntary imitation of older children and adults. He also suggested that Indian children probably learn more by imitative learning and less by conscious instructions than do children in the modern western world. With this thought in mind, dramatic play is a medium that could be used with simple imitation of models that increase in complexity.

Activities integrating language and variations in representational presentations of familiar items (i.e., pictures and real objects varying in orientation and amount of detail) could be used. There the focus might be on color, form, and function increasing attention to the role of observable and inferred attributes. In effect, activities integrating language and various representations is training children to acquire knowledge of objects, and in this way evolving meaning in the face of varying modes of representation (Sigel & McBane, 1967).

Inquiry training such as the method developed by Suchman (1960) might be used. The students' task is to discover an explanation for some physical event that happened by asking questions in the form that the teacher can answer either "yes" or "no." Thus the teacher is a source of information but not a source of strategies for gaining information. At the end of each inquiry session, a period follows in which the teacher and children discuss the tactics and strategies of inquiry in order to improve the students' competence in the use of the method.

Such training procedures should contribute to our understanding of the conditions useful for Indian children to make the transition to symbolic representation. Research programs assessing the potency of the above procedures in increasing the use of constraint type questions by Indian children would add greatly to our knowledge of the more general area of cognitive growth.

Research efforts to test the proposition that Indian children classify three dimensional objects differently from the pictorial or verbal representations of these objects could be undertaken. Research matching Indian children's information search strategy with other children of comparable ages using three dimensional objects and pictures or other representations of these objects might be attempted.

A second set of implications concerns the need to modify school programs for Indian children to accommodate their demonstrated differences in seeking information. For example, a teacher might consider using materials that emphasize concrete referents rather than abstrac-

tive generalizations for young Indian learners.

The differences found in the present study suggest a need for specially trained teachers of Indian children, who have a knowledge of Indian psychology, of native cultures, and of language differences that exist between Indian children and the dominant elements of the non-Indian school population. An understanding of the cognitive developmental processes such as the grouping structures, and the category systems being used by young Indian children, would enable teachers to modify techniques to accommodate demonstrated differences in question-asking strategies of Indian children.

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APPENDIX A

1. Preliminaries and Verbatum Instructions Read to Each Subject.
2. Subjects Tape Recorded Questions and Score Category.

APPENDIX A

1. Preliminaries and Verbatum Instructions Read to Each Subject

Greeted and introduced myself to the boy as he came into the room. Inquired regarding his age, grade, teacher, parents occupation, and games he liked to play.

Told him that we were going to play some games with the pictures on the table, and had him name each picture as I pointed to them.

Showed him the tape recorder with the microphone on the table and told him that it would be turned on when we started to play the games.

Told him that I would read the instructions to him and he should listen carefully so that he would know how the games were played.

Asked him not to tell the other students in the school anything about the games we played because we wanted to keep it a surprise for them.

Instructions Read

The following prewritten instructions were read to each subject in each of the four groups. The same instructions were read to all age levels.

Game #1 (array of 24 pictures displayed on table in front of subject).

"We are going to play the game. The game is called a question and answer game. You ask me a question and I will answer.

There are 24 pictures here on the table in front of you and there are 24 slips of paper in this container. Each piece of paper has the name of one of these pictures on it. There is only one name on each piece of paper. I will take one of these pieces of paper out of this container, and your job is to try find out which picture is named on it. You ask me questions that I can answer by 'yes' or 'no.' Ask me questions that will help you get the picture that is named on this piece of paper. You can have 10 questions, but try to find out in less than that if you can.

Now, I have a piece of paper. You can ask me any question you like, but remember I can only answer 'yes' or 'no.' Try to find the picture card that is named on this piece of paper."

Game #2 (same 24 pictures as game #1).

"Now, we are going to play the game again. You can have 10 questions. You can ask me any question you like that I can answer by 'yes' or 'no.' Now, see if you can find the picture named on this piece of paper."

Game #3 (36 pictures - same pictures as games #1 and #2 with 12 more pictures added).

"Now, we will add a few more pictures and play the game again. This time I will take this container over here because it has the names of all of the pictures in front of you on the pieces of paper in it. You can have 10 questions. Ask any question that you like that I can answer by 'yes' or 'no.' Now, see if you can find the picture on this piece of paper."

Game #4 (same 36 pictures as game #3).

"Now, we will play the game again. This is the last game we are going to play. Remember, you can have 10 questions. Ask any questions you like that I can answer by 'yes' or 'no.' Try to find the picture that is on this piece of paper."

After completing the fourth or last game, I asked each subject the following questions:

1. "How did you think-up the questions you asked?"
2. "If we were just starting to play the games again, which do you think would be a better question to ask?"

   a. "Is it something to play with?"

   or

   b. "Is it the balls?"

If the child made a choice between 2 (a and b), I then asked, "Why do you think that is the better question?"

APPENDIX A

2. Subjects Tape Recorded Questions and Score Category

Subject (S), Experimenter (E)

Game #1, played with 24 items	Score Category
(S): Is it a fruit?	Pseudoconstraint
(E): Is it a fruit? No.	
(S): Is it a--a working tool?	Constraint
(E): A working tool? No.	
(S): Is it a--something you drink out of?	Pseudoconstraint
(E): Something you drink out of? No.	
(S): Is it a--something you play with?	Constraint
(E): Is it something you play with? Yes.	
(S): Blocks?	Hypothesis
(E): Blocks? No.	
(S): Ah--balls?	Hypothesis
(E): Balls? Yes.	
Game #2, played with 24 items	
(S): Is it a--something you drink out of?	Pseudoconstraint
(E): Something you drink out of? No.	
(S): Is it something you wear on your feet?	Pseudoconstraint
(E): Something you wear on your feet? No.	
(S): Is it something you eat?	Constraint
(E): Something you eat? No.	
(S): Is it a--something you read?	Pseudoconstraint
(E): Something you read? No.	

(S): Is it a--something you work in school with?	Pseudoconstraint
(E): Something you work in school with? No.	
(S): Is it something you brush your teeth with?	Pseudoconstraint
(E): Something you brush your teeth with? No.	
(S): Is it a--is it something you wash yourself with?	Constraint
(E): Something you wash yourself with? Yes.	
(S): Soap?	Hypothesis
(E): No, not the soap.	
(S): Toothbrush?	Hypothesis
(E): Toothbrush? No.	
(S): Towels?	Hypothesis
(E): Towels? Yes.	

Game #3, played with 36 items

(S): Is it--is it a fruit?	Constraint
(E): Is it a fruit? No.	
(S): Is it a vegetable?	Pseudoconstraint
(E): Is it a vegetable? No.	
(S): Is it a--is it a marble, a marble pack?	Guess
(E): Is it a marble pack? No.	
(S): Is it something you eat?	Constraint
(E): Is it something you eat? No.	
(S): Is it a too--is it a tool?	Constraint
(E): Is it a tool? No.	

(S):	Is it something to play with?	Constraint
(E):	Is it something to play with? No.	
(S):	Is it something you wear?	Constraint
(E):	Is it something you wear? No.	
(S):	Is it a thread?	Guess
(E):	Is it a thread? No.	
(S):	Is it something you work with in school?	Constraint
(E):	Yes, you use it in school.	
(S):	Eraser?	Hypothesis
(E):	Eraser? No.	

Game #4, played with 36 items

(S):	Is it a fruit?	Constraint
(E):	Is it a fruit? No.	
(S):	Is it a vegetable?	Pseudoconstraint
(E):	Is it a vegetable? No.	
(S):	Is it something you eat with?	Constraint
(E):	Is it something you eat with? No.	
(S):	Is it something you wear?	Constraint
(E):	Is it something you wear? No.	
(S):	Is it like--is it a tool?	Constraint
(E):	Is it tools? No.	
(S):	Is it something you eat?	Constraint
(E):	Is it something you eat? Yes.	
(S):	Loaf of bread?	Hypothesis
(E):	Loaf of bread? Yes.	

APPENDIX B

Table 9 (Interjudge Assignment of Questions to Scoring Categories)

TABLE 9

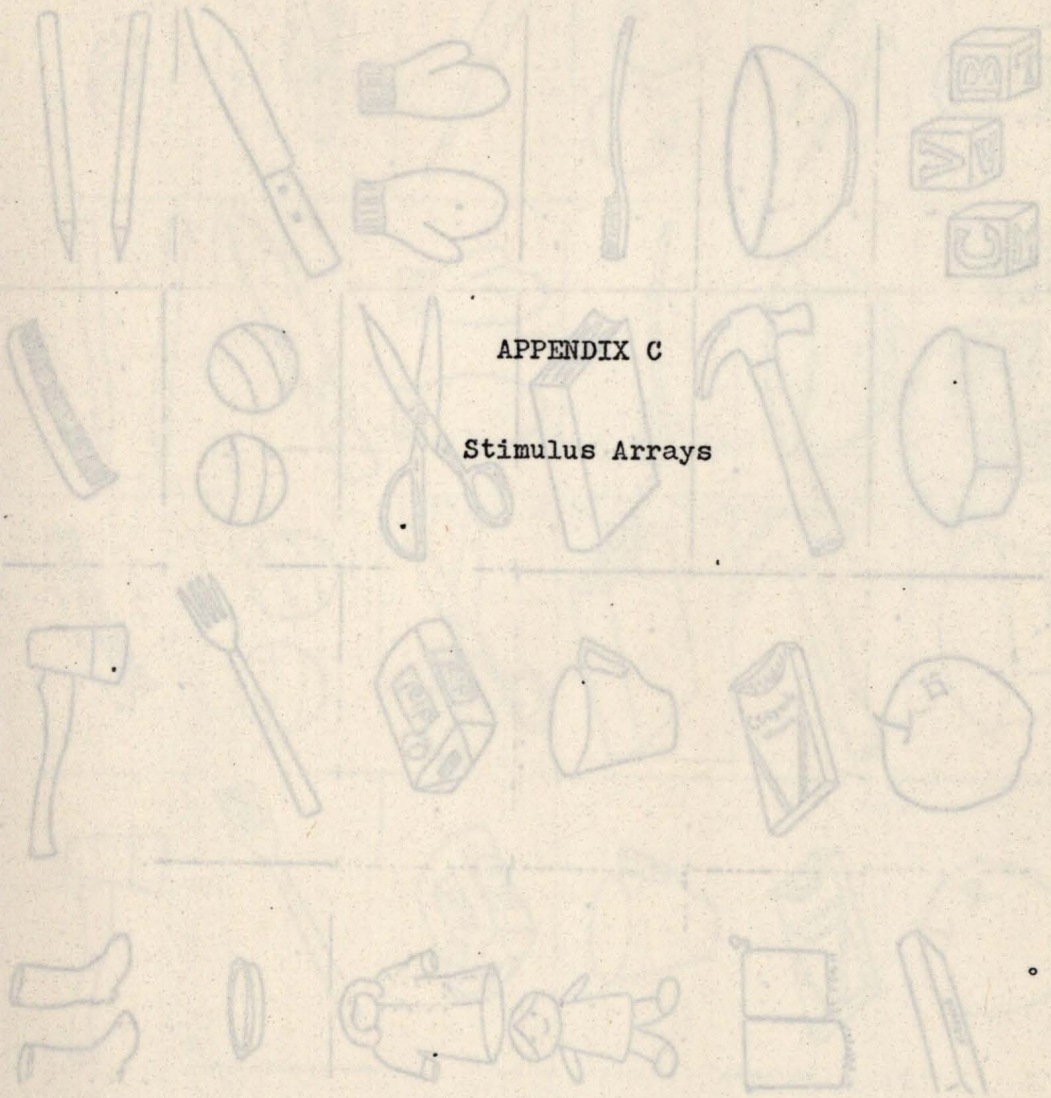
Interjudge Assignment of Questions to Scoring Categories

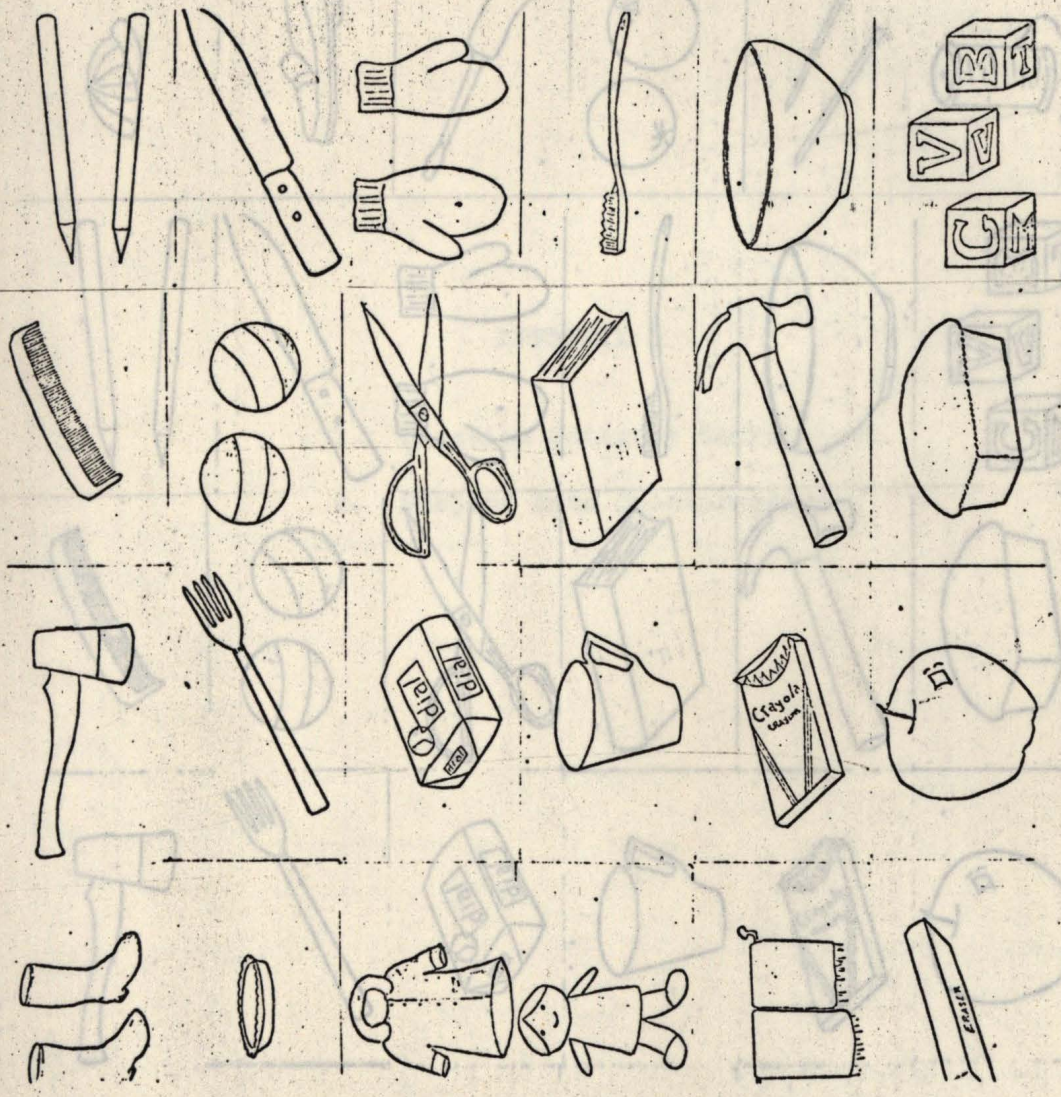
Guess (G), Hypothesis (H), Pseudo-Constraint (PC), Constraint (C).

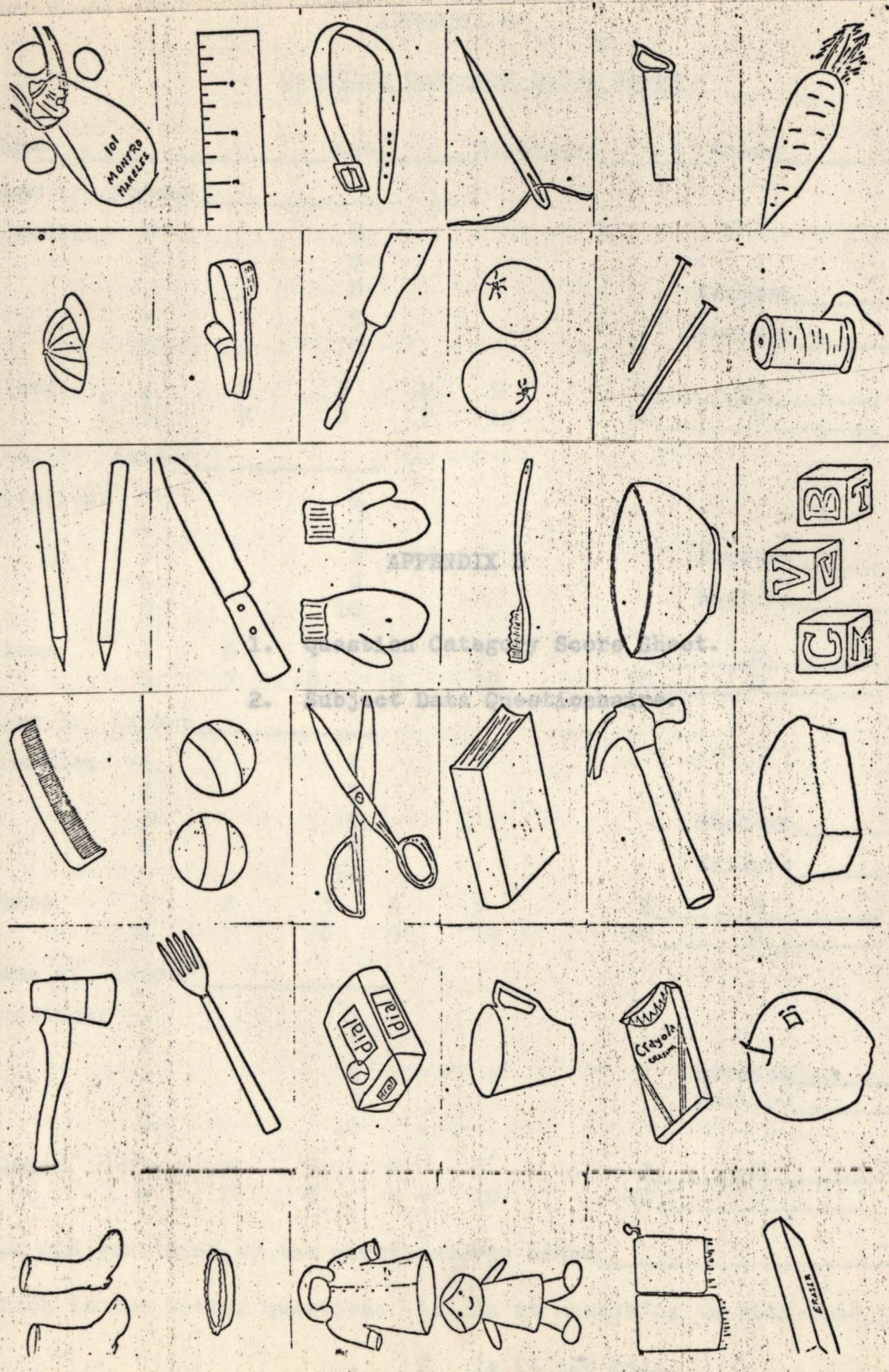
		Judge 1				Judge 2			
Protocol Number	Total Questions	(G)	(H)	(PC)	(C)	(G)	(H)	(PC)	(C)
1	40	40				40			
2	35	35				35			
3	30		4	10	16		4	10	16
4	33	3	6	8	16	2	7	8	16
5	34	34				34			
6	40	40				40			
7	40	40				40			
8	37	37				37			
9	23	1	9		13	1	8		14
10	34		2	9	23		2	9	23
Total	346	230	21	27	68	229	21	27	69

APPENDIX C

Stimulus Arrays




Crayola
crayons


lol
MONTRO
MARBLES
Crayola
ERASER

APPENDIX D

1. Question Category Score Sheet.
2. Subject Data Questionnaire.

APPENDIX D

1. Question Category Score Sheet

Name_____ Age_____ Birthdate_____ Grade_____ Grade I II

Game 1: Answer_____

Question:										
	1				6					
	2				7					
	3				8				Success_____	
	4				9					
	5				10				Failure_____	
Class:	1	2	3	4	5				G_____	H_____
	6	7	8	9	10				PC_____	C_____

Game 2: Answer_____

Question:										
	1				6					
	2				7					
	3				8				Success_____	
	4				9					
	5				10				Failure_____	
Class:	1	2	3	4	5				G_____	H_____
	6	7	8	9	10				PC_____	C_____

Game 3: Answer_____

Question:										
	1				6					
	2				7					
	3				8				Success_____	
	4				9					
	5				10				Failure_____	
Class	1	2	3	4	5				G_____	H_____
	6	7	8	9	10				PC_____	C_____

Game 4: Answer_____

Question:										
	1				6					
	2				7					
	3				8				Success_____	
	4				9					
	5				10				Failure_____	
Class:	1	2	3	4	5				G_____	H_____
	6	7	8	9	10				PC_____	C_____

How did you think up the questions you asked_____

Which is the better question: 1. Is it something to play with_____

2. Is it the ball_____

2. Subject Data Questionnaire

Name_____Age_____Birth Date_____

School_____Grade_____ I W

1. Which of these items do you have in your home:
   Electricity_____ Radio_____ Television_____ Waterworks____

2. How old were you when you started school?_____years.

3. Did you repeat a grade? Yes_____ No_____

4. How many rooms in your house?_____

5. How many people live in your house?_____ Adults_____
   Children_____

6. Do you speak another language other than English? Yes_____
   No_____

7. Do you speak Indian? Yes_____ No_____

8. Do you understand Indian? Yes_____ No_____

9. Is English spoken in your home: All of the time_____ Most of the time_____ Some of the time_____ None of the time_____

10. What type of work does your father do?_____

11. Does he have a job now?_____

12. Which of the following activities do you take part in:
    Basketball_____ Volleyball_____ Soccer_____ Music_____
    Singing_____ Fishing_____Reading_____Go to Movies_____
    Others_____

13. Did you ever attend a Kindergarten class? Yes_____ No_____

14. School achievement (teachers opinion) Above average_____
    Average_____ Below_____

APPENDIX E

Raw Data

APPENDIX E

Raw Data

Subject Number (S#), Grade (gr.); Chronological Age (C.A.); Games Played: Success (S.), Failure (F.); No. of Questions Asked (Q.); Qualitative Class of Questions: Guess (G.), Constraint (C.), Pseudoconstraint (PC), Hypothesis (H.); Post Test Choice: Constraint (c.), Hypothesis (h.).

111 RURAL INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	1	6.6	0	4	40	40					x
2	1	6.9	1	3	38	38					x
3	1	6.8	2	2	24	24					x
4	1	6.10	2	2	33	33					x
5	1	7.0	1	3	32	32					x
6	2	7.1	0	4	40	40					x
7	1	7.2	0	4	40	40					x
8	1	7.2	1	3	36	36					x
9	1	7.2	1	3	31	31					x
10	1	7.2	2	2	31	31					x
11	1	7.3	1	3	31	31					x
12	1	7.3	1	3	32	32					x
13	1	7.4	1	3	39	39				x	
14	1	7.4	2	2	31	31				x	
15	1	7.5	1	3	33	33					x
16	2	7.6	1	3	35	35					x
17	2	7.6	3	1	28	28				x	
18	1	7.7	1	3	31	31					x

112 RURAL INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	2	8.5	0	4	40	40					x
2	2	8.9	1	3	40	40					x
3	3	8.11	1	3	40	40				x	
4	2	8.11	2	2	25	25				x	
5	3	8.11	1	3	34	34				x	
6	2	9.3	2	2	29	29					x
7	2	9.4	1	3	38	38					x
8	3	9.4	1	3	40	40				x	
9	3	9.4	1	3	35	35					x
10	2	9.5	1	3	37	37					x
11	2	9.6	0	4	40	40					x
12	2	9.6	2	2	37	37				x	
13	4	9.7	0	4	40	40				x	
14	3	9.8	2	2	32	32					x
15	2	9.8	1	3	36	36					x
16	3	9.9	1	3	33	33					x
17	2	9.10	0	4	40	40					x
18	3	10.0	3	1	33	33					x

111 RURAL INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
19	2	8.0	0	4	40	40					x
20	2	8.0	1	3	35	35					x
21	2	8.0	3	1	23	23					x
22	2	8.1	1	3	33	33				x	
23	2	8.1	2	2	28	28					x
24	2	8.1	0	4	40	40					x
25	2	8.2	1	3	37	37				x	
26	2	8.4	2	2	27	27					x
27	2	8.4	1	3	33	33					x
28	2	8.4	1	3	31	31					x
29	2	8.4	0	4	40	40				x	
30	2	8.5	1	3	39	39					x
31	2	8.4	1	3	36	36				x	

112 RURAL INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
19	2	10.1	0	4	40	40					x
20	3	10.4	2	2	35	35					x

Raw Data

113 RURAL INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	4	10.5	2	2	35		18	6	11	x	
2	4	10.7	1	3	35	35					x
3	5	10.7	3	1	33	20	4		9		x
4	4	10.8	3	1	30	30				x	
5	5	10.10	2	2	33	33					x
6	3	10.11	1	3	37	37					x
7	5	11.2	2	2	31	31				x	
8	3	11.2	1	3	40	40					x
9	5	11.4	1	3	34	34				x	
10	4	11.5	4	0	11		5		6	x	
11	2	11.6	0	4	40	40					x
12	5	11.7	0	4	40	40					x
13	4	11.7	1	3	32	32				x	
14	5	11.7	1	3	35	35				x	
15	5	11.8	3	1	30	30				x	
16	4	11.9	2	2	38	38					x
17	5	11.9	1	3	38	38					x
18	5	11.9	1	3	34	34				x	
19	6	11.11	3	1	32		20		12	x	
20	6	12.0	3	1	27	27				x	
21	5	12.2	3	1	27	1	7	16	3		x

121 URBAN INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	1	6.5	2	2	31	31					x
2	1	6.7	1	3	38	38					x
3	1	6.8	1	3	32	32					x
4	1	6.8	1	3	37	37					x
5	1	6.10	1	3	38	38					x
6	1	6.11	0	4	40	40					x
7	1	7.0	0	4	40	40					x
8	1	7.0	1	3	35	35					x
9	1	7.3	1	3	40	40					x
10	1	7.4	1	3	33	33				x	
11	2	7.8	2	2	28	28					x
12	3	7.8	1	3	34	34					x
13	2	7.10	0	4	40	40				x	
14	2	8.1	0	4	40	40					x
15	2	8.1	1	3	36	36				x	
16	2	8.3	2	2	31	31				x	
17	3	8.3	1	3	35	35				x	

Raw Data

122 URBAN INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	3	8.4	2	2	34	34					x
2	1	8.4	2	2	29	29					x
3	3	8.5	1	3	40	40					x
4	2	8.8	1	3	32	32					x
5	2	8.9	0	4	40	40				x	
6	3	9.10	1	3	39	39					x
7	3	8.11	2	2	34	34				x	
8	4	9.0	0	4	39	39					x
9	2	9.2	2	2	38	38					x
10	2	9.2	2	2	34	34				x	
11	3	9.3	0	4	40	40					x
12	3	9.4	1	3	39	39					x
13	3	9.4	0	4	40	40				x	
14	4	9.6	0	4	40	40					x
15	3	9.6	0	4	40	40					x
16	3	9.6	1	3	38	38					x
17	3	9.7	2	2	30		16	10	4		x
18	4	9.8	2	2	38		29	7	2	x	
19	4	9.11	0	4	40	40				x	
20	4	10.2	1	3	40	40					x
21	4	10.2	4	0	24	6	12		6	x	
22	4	10.4	3	1	32	32					x
23	4	10.4	3	1	31	31					x

123 URBAN INDIAN

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	4	10.6	1	3	34	34				x	
2	4	10.8	3	1	23	1	7	2	13	x	
3	3	10.9	4	0	28		15	3	10		x
4	5	10.11	4	0	31	1	13	9	8	x	
5	3	10.11	0	4	40	40				x	x
6	5	11.3	2	2	27	27				x	
7	4	11.6	2	2	38	38				x	
8	5	11.6	1	3	36	36				x	
9	5	11.8	4	0	21		14	1	6	x	
10	5	11.8	0	4	40	40				x	
11	5	11.9	2	2	33	33				x	
12	6	11.10	3	1	32	3	22	4	3	x	
13	6	11.11	0	4	39		39			x	
14	6	12.1	2	2	30	30				x	
15	6	12.2	1	3	38		22	13	3	x	
16	6	12.2	1	3	37	37				x	
17	6	12.3	3	1	24		16	5	3	x	
18	6	12.3	2	2	30		20	5	5	x	
19	4	12.4	1	3	37	37				x	

211 RURAL WHITE

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	1	6.5	1	3	31	31					x
2	1	6.5	1	3	32	32					x
3	1	6.6	1	3	40	40				x	
4	1	6.7	1	3	33	33					x
5	1	6.7	2	2	28	28				x	
6	1	6.9	2	2	34	34				x	
7	1	6.11	3	1	29	29					x
8	1	7.0	2	2	35	35					x
9	1	7.0	1	3	31	31					x
10	1	7.2	1	3	32	32					x
11	1	7.3	1	3	40	40				x	
12	1	7.4	1	3	35	35				x	
13	1	7.4	1	3	32	32					x
14	2	7.8	2	2	28	28					x
15	2	7.8	3	1	33	5	12	7	9		x
16	2	7.8	4	0	26	26				x	
17	2	7.9	2	2	33	2	10	2	19	x	
18	2	7.11	1	2	22	22				x	
19	2	7.11	3	1	35	35					x
20	2	8.0	1	3	33	33					x
21	2	8.1	3	1	33	33					x
22	2	8.3	1	3	36	36				x	
23	2	8.3	3	1	40	2	22	9	7		x
24	2	8.4	0	4	40	40				x	
25	3	8.4	3	1	27		11		16	x	
26	2	8.4	2	2	23	23					x

212 RURAL WHITE

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	3	8.5	0	4	40	40				x	
2	3	8.5	2	2	33		13	15	5		x
3	3	8.6	3	1	26	26					x
4	3	8.6	3	1	32	32					x
5	3	8.7	3	1	30	1	18	1	10	x	
6	3	8.9	4	0	26	10	7		9	x	
7	3	8.10	1	3	39	39				x	
8	3	8.11	2	2	33	33				x	
9	3	9.0	2	2	26		13	1	12		x
10	3	9.1	1	3	32	6	10	15	1	x	
11	3	9.1	0	4	40	40				x	
12	3	9.4	3	1	25		15	1	9	x	
13	4	9.7	2	2	35	1	25	2	7	x	
14	4	9.8	1	3	36		13	4	19	x	
15	4	9.8	2	2	29	29					x
16	4	9.9	1	3	36		18	17	1	x	
17	3	9.9	1	3	33	33					x
18	4	9.10	1	3	33	33				x	
19	4	10.0	1	3	39		18	15	6	x	
20	4	10.0	3	1	29		7	1	21	x	
21	4	10.0	1	3	31						x
22	4	10.0	2	2	34		23	9	2		x
23	4	10.2	4	0	20		12	2	6	x	
24	4	10.3	2	2	36	36				x	

Raw Data

213 RURAL WHITE

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	5	10.8	2	2	33	9	10		14	x	
2	4	10.10	1	3	36	36				x	
3	5	10.10	1	3	40	4	20	15	1	x	
4	5	10.10	3	1	21		8	9	5	x	
5	5	10.10	1	3	38	2	14	20	2		x
6	5	10.11	1	3	33	16	11		6	x	
7	5	10.11	4	0	23	1	13		9	x	
8	5	11.0	1	3	33	33					x
9	5	11.0	2	2	33	24	6	1	2	x	
10	5	11.0	0	4	40	37	3			x	
11	4	11.3	2	2	29	29				x	
12	5	11.4	3	1	25		21	1	3	x	
13	6	11.5	0	4	40	40				x	
14	6	11.8	3	1	31	4	21	2	4	x	
15	5	11.8	3	1	25	5	11	4	5	x	
16	6	11.8	0	4	40	40					x
17	6	11.8	2	2	35		17	12	6		x
18	5	11.8	4	0	18	2	7	1	8	x	
19	6	11.10	1	3	37	37				x	
20	6	12.0	1	3	39	1	27	5	6	x	
21	6	12.2	4	0	28	2	15	1	10	x	
22	5	12.3	1	3	38	32	3	3		x	
23	6	12.3	0	4	38	6	15	12	5	x	

221 URBAN WHITE

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	1	6.5	2	2	31	31					x
2	1	6.5	0	4	40	40					x
3	1	6.6	2	2	31	31					x
4	1	6.8	0	4	40	40					x
5	1	6.9	2	2	32	32				x	
6	1	7.0	2	2	26	26					x
7	1	7.2	1	3	33	33					x
8	1	7.2	1	3	38	38				x	
9	1	7.3	3	1	27	27					x
10	1	7.4	3	1	33	33				x	
11	2	7.5	2	2	29	29				x	
12	2	7.7	1	3	38	38					x
13	2	7.8	1	3	36	36					x
14	2	7.10	0	4	40	39	1				x
15	2	8.0	1	3	34	34					x
16	2	8.1	3	1	31	31					x
17	2	8.1	1	3	37	37					x
18	1	8.3	1	3	33	33				x	
19	3	8.4	0	4	40	1	23	16			x

Raw Data

222 URBAN WHITE

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	2	8.4	3	1	29	29				x	
2	3	8.5	1	3	38	11	12	2	13	x	
3	3	8.5	2	2	32	32				x	
4	3	8.6	2	2	31	27	1	3		x	
5	3	8.6	1	3	33	33				x	
6	3	8.6	1	3	35		22	12	1		x
7	3	8.6	3	1	33		18	2	13	x	
8	3	8.7	0	4	40	40					x
9	2	8.9	2	2	39	39				x	
10	2	8.9	2	2	28	28					x
11	3	8.9	3	1	33	33				x	
12	3	9.0	2	2	37	37					x
13	3	9.1	3	1	23		9	5	9		x
14	3	9.1	0	3	30	30					x
15	4	9.3	1	3	40	7	24	4	5	x	
16	4	9.4	0	4	40	40				x	
17	4	9.5	1	3	34		13	20	1	x	
18	4	9.6	0	4	40	40				x	
19	4	9.6	2	2	38		30	5	3	x	
20	4	9.9	1	3	37	14	11		12	x	
21	4	10.1	3	1	33	3	16	8	6	x	
22	4	10.1	0	4	40	40					x
23	5	10.2	4	0	24		11		13	x	
24	4	10.3	1	3	34		20	12	2	x	
25	4	10.3	1	3	34	34				x	

223 URBAN WHITE

S#	gr.	C.A.	S.	F.	Q.	G.	C.	PC.	H.	c.	h.
1	5	10.6	1	3	39	39				x	
2	5	10.6	0	4	40	40				x	
3	5	10.6	3	1	26	1	13	1	11	x	
4	5	10.7	1	3	36	36				x	
5	5	10.8	3	1	33	17	5		11	x	
6	4	10.8	2	2	31		15	12	4	x	
7	5	10.11	2	2	29	28		1		x	
8	5	10.11	3	1	32		20	6	6	x	
9	7	11.1	4	0	18		9		9	x	
10	5	11.2	4	0	27		16	2	9	x	
11	4	11.3	3	1	37	37				x	
12	6	11.5	4	0	24	2	16	1	5	x	
13	5	11.6	4	0	28	1	15	1	11	x	
14	6	11.7	3	1	28	10	9	2	7	x	
15	6	11.8	1	3	37		27	9	1		x
16	6	11.8	3	1	31		24	4	3	x	
17	6	11.10	2	2	28	2	15	9	2	x	
18	6	12.0	4	0	27		15	6	6	x	
19	6	12.0	4	0	22		17		5	x	
20	5	12.1	2	2	31	8	14	2	7	x	
21	6	12.1	0	4	40	40				x	
22	6	12.2	3	1	28	28				x	
23	6	12.2	2	2	31	4	16	8	3	x	

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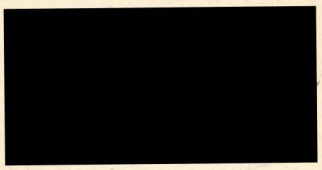

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