

Cross-Cultural Perspectives on Early Development

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Most American psychologists believe in the hardness of habit and the premise that experience etches an indelible mark on the mind not easily erased by time or trauma. The application of that assumption to the first era of development leads to the popular view that psychological growth during the early years is under the strong influence of the variety and patterning of external events and that the psychological structures shaped by those initial encounters have a continuity that stretches at least into early adolescence. The first part of that hypothesis, which owes much of its popularity to Freud, Harlow, and Skinner, has strong empirical support. The continuity part of the assumption, which is more equivocal, is summarized in the American adage, "Well begun is half done."

Many developmental psychologists, certain of the long-lasting effects of early experience, set out to find the form of those initial stabilities and the earliest time they might obtain a preview of the child's future. Although several decades of research have uncovered fragile lines that seem to travel both backward and forward in time, the breadth and magnitude of intraindividual continu-

ities have not been overwhelming, and each seems to be easily lost or shattered (Kagan & Moss, 1962; Kessen, Haith, & Salapatek, 1970). A recent exhaustive review of research on human infancy led to the conclusion that "only short term stable individual variation has been demonstrated; . . . and demonstrations of continuity in process—genotype continuity—have been rare indeed [Kessen et al., 1970, p. 297]." Since that evaluation violates popular beliefs, the authors noted a few pages later:

In spite of slight evidence of stability, our inability to make predictions of later personality from observations in the first three years of life is so much against good sense and common observation, to say nothing of the implication of all developmental theories, that the pursuit of predictively effective categories of early behavior will surely continue unabated [p. 309].

The modest empirical support for long-term continuity is occasionally rationalized by arguing that although behaviors similar in manifest form might not be stable over long time periods, the underlying structures might be much firmer (Kagan, 1971). Hence, if the operational manifestations of those hidden forms were discerned, continuity of cognitive, motivational, and affective structures would be affirmed. However, we recently observed some children living in an isolated Indian village on Lake Atitlan in the highlands of northwest Guatemala. We saw listless, silent, apathetic infants; passive, quiet, timid 3-year-olds; but active, gay, intellectually competent 11-year-olds. Since there is no reason to believe that living conditions in this village have changed during the last century, it is likely that the alert 11-year-olds were, a decade earlier, listless, vacant-staring infants. That observation has forced us to ques-

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tion the strong form of the continuity assumption in a serious way.

The data to be presented imply absence of a predictive relationship between level of cognitive development at 12–18 months of age and quality of intellectual functioning at 11 years. This conclusion is not seriously different from the repeated demonstrations of no relation between infant intelligence quotient (IQ) or developmental quotient (DQ) scores during the first year of life and Binet or Wechsler IQ scores obtained during later childhood (Kessen et al., 1970; Pease, Wolins, & Stockdale, 1973). The significance of the current data, however, derives from the fact that the infants seemed to be more seriously retarded than those observed in earlier studies, their environments markedly less varied, and the assessment of later cognitive functioning based on culture-fair tests of specific cognitive abilities rather than culturally biased IQ tests.

Moreover, these observations suggest that it is misleading to talk about continuity of any psychological characteristic—be it cognitive, motivational, or behavioral—without specifying simultaneously the context of development. Consider the long-term stability of passivity as an example. The vast majority of the infants in the Indian village were homogeneously passive and retained this characteristic until they were five or six years old. A preschool child rarely forced a submissive posture on another. However, by eight years of age, some of the children became dominant over others because the structure of the peer group required that role to be filled. Factors other than early infant passivity were critical in determining that differentiation, and physical size, strength, and competence at valued skills seemed to be more important than the infant's disposition. In modern American society, where there is much greater variation among young children in degree of passivity and dominance, a passive four-year-old will always encounter a large group of dominant peers who enforce a continuing role of submissiveness on him. As a result, there should be firmer stability of behavioral passivity during the early years in an American city than in the Indian village. But the stability of that behavior seems to be more dependent on the presence of dominant members in the immediate vicinity than on some inherent force within the child.

Continuity of a psychological disposition is not solely the product of an inherited or early acquired structure that transcends a variety of contexts. The small group of scientists who champion that view of stability—we have been among them—envision a small box of different-colored gems tucked deep in the brain, with names like intelligent, passive, irritable, or withdrawn engraved on them. These material entities guarantee that, despite behavioral disguises, an inherent set of psychological qualities, independent of the local neighborhood and knowable under the proper conditions, belongs to each individual. This belief in a distinct and unchanging mosaic of core traits—an identity—is fundamental to Western thought and is reflected in the psychological writings of Erik Erikson and the novels of popular Western writers. Only Herman Hesse, who borrowed the philosophy of the East, fails to make a brief for personal identity. *Siddartha*, *Magister Ludi*, and *Narcissus and Goldmund* are not trying to discover “who they are” but are seeking serenity, and each appreciates the relevance of setting in that journey.

A secondary theme concerns the interaction of maturation and environment, an issue that has seized academic conversation because of the renewed debate surrounding the inheritance of intelligence. But there is a broader issue to probe. The majority of American psychologists remain fundamentally Lockean in attitude, believing that thought and action owe primary allegiance to experience and that reinforcements and observations of models set the major course of change. Despite Piaget's extraordinary popularity, the majority of American psychologists do not believe that maturation supplies the major impetus for psychological growth during the childhood years. We have forgotten that many years ago Myrtle McGraw (1935) allowed one twin to climb some stairs and prevented his co-twin from practicing that skill. This homely experiment occurred only a few years after Carmichael (1926) anesthetized some *Amblystoma* embryos to prevent them from swimming. The twin not allowed to climb was behind his partner in learning this skill, but he eventually mastered it. Carmichael's embryos swam perfectly when the anesthetic was pumped out of the tank. In both instances, the organisms could not be prevented from displaying species-specific properties.

Our observations in these Indian villages have led us to reorder the hierarchy of complementary influence that biology and environmental forces exert on the development of intellectual functions that are natural to man. Separate maturational factors seem to set the time of emergence of those basic abilities. Experience can slow down or speed up that emergence by several months or several years, but nature will win in the end. The capacity for perceptual analysis, imitation, language, inference, deduction, symbolism, and memory will eventually appear in sturdy form in any natural environment, for each is an inherent competence in the human program. But these competences, which we assume to be universal, are to be distinguished from culturally specific talents that will not appear unless the child is exposed to or taught them directly. Reading, arithmetic, and understanding of specific words and concepts fall into this latter category.

This distinction between universal and culturally specific competences implies a parallel distinction between absolute and relative retardation. Consider physical growth as an illustration of this idea. There is sufficient cross-cultural information on age of onset of walking to warrant the statement that most children should be walking unaided before their second birthday. A three-year-old unable to walk is physically retarded in the absolute sense, for he has failed to attain a natural competence at the normative time. However, there is neither an empirical nor a logical basis for expecting that most children, no matter where they live, will develop the ability to hunt with a spear, ride a horse, or play football. Hence, it is not reasonable to speak of absolute retardation on these skills. In those cultures where these talents are taught, encouraged, or modeled, children will differ in the age at which they attain varied levels of mastery. But we can only classify a child as precocious or retarded relative to another in his community. The data to be reported suggest that absolute retardation in the attainment of specific cognitive competences during infancy has no predictive validity with respect to level of competence on a selected set of natural cognitive skills at age 11. *The data do not imply that a similar level of retardation among American infants has no future implication for relative retardation on culture-specific skills.*

The Guatemalan Settings

The infant observations to be reported here were made in two settings in Guatemala. One set of data came from four subsistence farming Ladino villages in eastern Guatemala. The villages are moderately isolated, Spanish speaking, and contain between 800 and 1,200 inhabitants. The families live in small thatched huts of cane or adobe with dirt floors and no sanitary facilities. Books, pencils, paper, and pictures are typically absent from the experience of children prior to school entrance, and, even in school, the average child has no more than a thin lined notebook and a stub of a pencil.

A second location was a more isolated Indian village of 850 people located on the shores of Lake Atitlan in the northwest mountainous region of the country. Unlike the Spanish-speaking villages, the Indians of San Marcos la Laguna have no easy access to a city and are psychologically more detached. The isolation is due not only to geographical location but also to the fact that few of the women and no more than half of the men speak reasonable Spanish. Few adults and no children can engage the culture of the larger nation, and the Indians of San Marcos regard themselves as an alien and exploited group.

THE INFANT IN SAN MARCOS

During the first 10–12 months, the San Marcos infant spends most of his life in the small, dark interior of his windowless hut. Since women do not work in the field, the mother usually stays close to the home and spends most of her day preparing food, typically tortillas, beans, and coffee, and perhaps doing some weaving. If she travels to a market to buy or sell, she typically leaves her infant with an older child or a relative. The infant is usually close to the mother, either on her lap or enclosed on her back in a colored cloth, sitting on a mat, or sleeping in a hammock. The mother rarely allows the infant to crawl on the dirt floor of the hut and feels that the outside sun, air, and dust are harmful.

The infant is rarely spoken to or played with, and the only available objects for play, besides his own clothing or his mother's body, are oranges, ears of corn, and pieces of wood or clay. These infants are distinguished from American infants of the same age by their extreme motoric passivity,

fearfulness, minimal smiling, and, above all, extraordinary quietness. A few with pale cheeks and vacant stares had the quality of tiny ghosts and resembled the description of the institutionalized infants that Spitz called marasmic. Many would not orient to a taped source of speech, not smile or babble to vocal overtures, and hesitated over a minute before reaching for an attractive toy.

An American woman who lived in the village made five separate 30-minute observations in the homes of 12 infants 8–16 months of age. If a particular behavioral variable occurred during a five-second period, it was recorded once for that interval. The infants were spoken to or played with 6% of the time, with a maximum of 12%. The comparable averages for American middle-class homes are 25%, with a maximum of 40% (Lewis & Freedle, 1972). It should be noted that the infant's vocalizations, which occurred about 6% of the time, were typically grunts lasting less than a second, rather than the prolonged babbling typical of middle-class American children. The infants cried very little because the slightest irritability led the mother to nurse her child at once. Nursing was the single, universal therapeutic treatment for all infant distress, be it caused by fear, cold, hunger, or cramps. Home observations in the eastern villages are consonant with those gathered in San Marcos and reveal infrequent infant vocalization and little verbal interaction or play with adults or older siblings. The mothers in these settings seem to regard their infants the way an American parent views an expensive cashmere sweater: Keep it nearby and protect it but do not engage it reciprocally.

One reason why these mothers might behave this way is that it is abundantly clear to every parent that all children begin to walk by 18 months, to talk by age 3, and to perform some adult chores by age 10, despite the listless, silent quality of infancy. The mother's lack of active manipulation, stimulation, or interactive play with her infant is not indicative of indifference or rejection, but is a reasonable posture, given her knowledge of child development.

Comparative Study of Infant Cognitive Development

Although it was not possible to create a formal laboratory setting for testing infants in San Marcos,

it was possible to do so in the eastern Ladino villages, and we shall summarize data derived from identical procedures administered to rural Guatemalan and American infants. Although the infants in the Ladino villages were more alert than the Indian children of San Marcos, the similarities in living conditions and rearing practices are such that we shall assume that the San Marcos infants would have behaved like the Ladino children or, what is more likely, at a less mature level. In these experiments, the Guatemalan mother and child came to a special laboratory equipped with a chair and a stage that simulated the setting in the Harvard laboratories where episodes were administered to cross-sectional groups of infants, 84 American and 80 Guatemalan, at 5½, 7½, 9½, and 11½ months of age, with 10–24 infants from each culture at each age level.

Before describing the procedures and results, it will be helpful to summarize the theoretical assumptions that govern interpretation of the infant's reactions to these episodes. There appear to be two important maturationally controlled processes which emerge between 2 and 12 months that influence the child's reactions to transformations of an habituated event (Kagan, 1971, 1972). During the first six weeks of life, the duration of the child's attention to a visual event is controlled by the amount of physical change or contrast in the event. During the third month, the infant shows prolonged attention to events that are moderate discrepancies from habituated standards. Maintenance of attention is controlled by the relation of the event to the child's schema for the class to which that event belongs. The typical reactions to discrepancy include increased fixation time, increased vocalization, and either cardiac deceleration or decreased variability of heart rate during the stimulus presentation. These conclusions are based on many independent studies and we shall not document them here (Cohen, Gelber, & Lazar, 1971; Kagan, 1971; Lewis, Goldberg, & Campbell, 1970).

However, at approximately eight–nine months, a second process emerges. The infant now begins to activate cognitive structures, called hypotheses, in the service of interpreting discrepant events. A hypothesis is viewed as a representation of a relation between two schemata. Stated in different language, the infant not only notes and processes a discrepancy, he also attempts to transform it to his

prior schemata for that class of event and activates hypotheses to serve this advanced cognitive function. It is not a coincidence that postulation of this new competence coincides with the time when the infant displays object permanence and separation anxiety, phenomena that require the child to activate an idea of an absent object or person.

There are two sources of support for this notion. The first is based on age changes in attention to the same set of events. Regardless of whether the stimulus is a set of human masks, a simple black and white design, or a dynamic sequence in which a moving orange rod turns on a bank of three light bulbs upon contact, there is a U-shaped relation between age and duration of attention across the period 3–36 months, with the trough typically occurring between 7 and 12 months of age (Kagan, 1972).

The curvilinear relation between age and attention to human masks has been replicated among American, rural Guatemalan, and Kahlahari desert Bushman children (Kagan, 1971; Konnor, 1973; Sellers, Klein, Kagan, & Minton, 1972). If discrepancy were the only factor controlling fixation time, a child's attention should decrease with age, for the stimulus events become less discrepant as he grows older. The increase in attention toward the end of the first year is interpreted as a sign of a new cognitive competence, which we have called the *activation of hypotheses*.

A second source of support for this idea is that the probability of a cardiac acceleration to a particular discrepancy increases toward the end of the first year, whereas cardiac deceleration is the modal reaction during the earlier months (Kagan, 1972). Because studies of adults and young children indicate that cardiac acceleration accompanies mental work, while deceleration accompanies attention to an interesting event (Lacey, 1967; Van Hover, 1971), the appearance of acceleration toward the end of the first year implies that the infants are performing active mental work, or activating hypotheses.

Since increased attention to a particular discrepancy toward the end of the first year is one diagnostic sign of the emergence of this stage of cognitive development, cultural differences in attention to fixed discrepancies during the first year might provide information on the developmental maturity of the infants in each cultural group.

Method

BLOCK EPISODE

Each child was shown a 2-inch wooden orange block for six or eight successive trials (six for the two older ages, and eight for the two younger ages) followed by three or five transformation trials in which a 1½-inch orange block was presented. These transformations were followed by three representations of the original 2-inch block.

LIGHT EPISODE

The child was shown 8 or 10 repetitions of a sequence in which a hand moved an orange rod in a semicircle until it touched a bank of three light bulbs which were lighted upon contact between the rod and the bulbs. In the five transformation trials that followed, the hand appeared but the rod did not move and the lights lit after a four-second interval. Following the transformations, the original event was presented for three additional trials.

During each of the episodes, two observers coded (a) how long the infant attended to the event, (b) whether the infant vocalized or smiled, and (c) fretting or crying. Intercoder reliability for these variables was over .90.

Results

The Guatemalan infants were significantly less attentive than the Americans on both episodes, and the cultural differences were greater at the two older than at the two younger ages. Figures 1 and 2 illustrate the mean total fixation time to four successive trial blocks for the two episodes. The four trial blocks were the first three standard trials, the last three standards, the first three transformations, and the three return trials.

The American infants of all ages had longer fixation times to the block during every trial block (F ranged from 30.8 to 67.3, $df = 1/154$, $p < .001$). The American infants also displayed longer fixations to the light during every trial block (F ranged from 9.8 to 18.4, $df = 1/141$, $p < .01$). However, it is important to note that at 11½ months, the American children maintained more sustained attention to the return of the standard than the Guatemalans, who showed a drop in fixation time toward the end of the episode. These data suggest that more of the American than of the Guatemalan infants had entered the stage of activation of hypotheses. Since the Ladino infants appeared more mature than the San Marcos children, it is possible that the American one-year-olds were approximately three months advanced over the San Marcos children in this cognitive function.

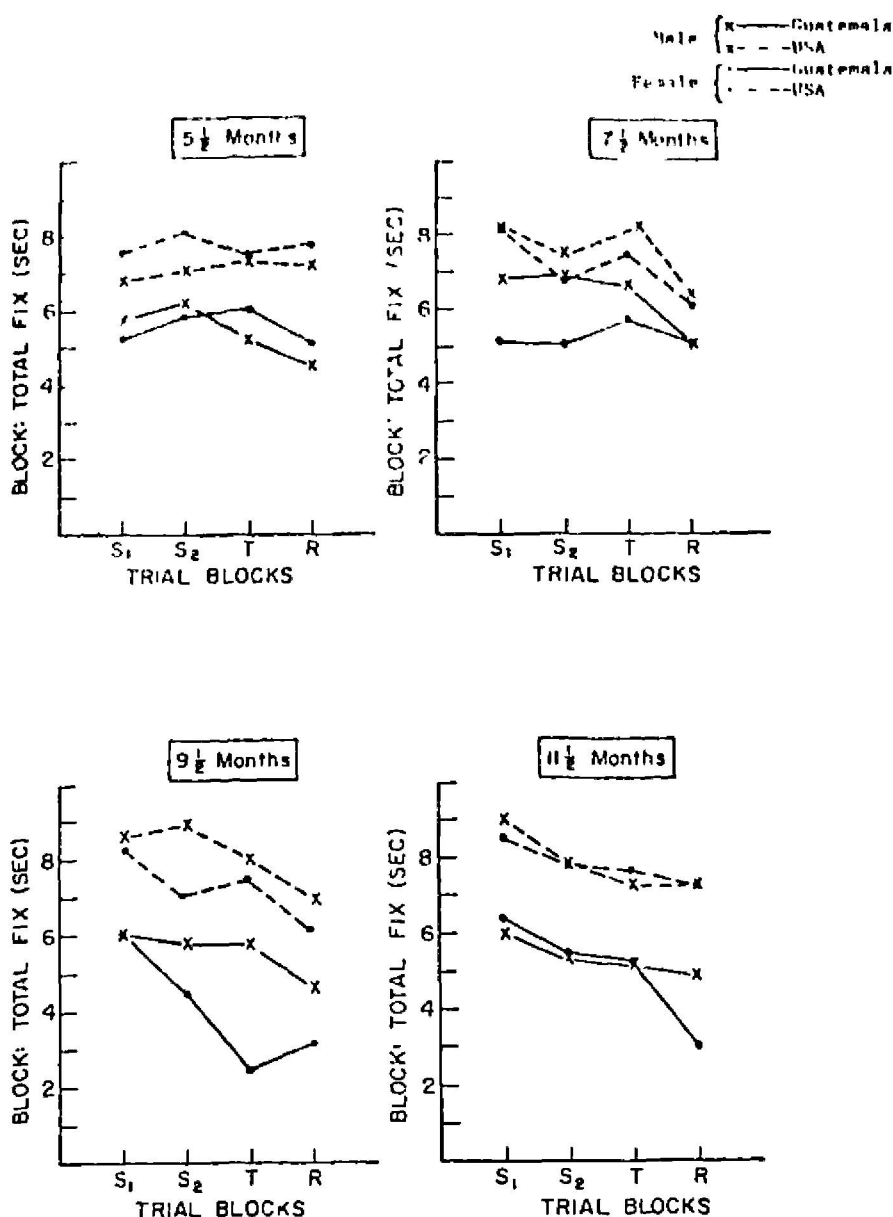


Figure 1. Average total fixation time to the block episode by age and culture.

Additional Assessments of Developmental Status

We collected, under less formal conditions in the home, additional information on the developmental status of the San Marcos infant. Not one of the 12 infants between 8 and 16 months reached for an attractive object they watched being hidden, although many would, with considerable hesitation, reach for a visible object placed close to their hands. Furthermore, none of these 12 infants revealed facial surprise following a sequence in which they watched an object being hidden under a cloth but saw no object when that cloth was removed. These observations suggest an absolute retardation of four months in the display of behavioral signs diagnostic of the attainment of object permanence.

A third source of data is based on observations of stranger anxiety. Each of 16 infants between 8 and 20 months was observed following the first exposure to a strange male (the senior author). The first age at which obvious apprehension and/or

crying occurred was 13 months, suggesting a five-month lag between San Marcos and American infants. Finally, the information on nonmorphemic babbling and the onset of meaningful speech supports a diagnosis of absolute retardation. There was no marked increase in frequency of babbling or vocalization between 8 and 16 months among the 12 San Marcos infants observed at home, while comparable observations in American homes revealed a significant increase in babbling and the appearance of morphemic vocalizations for some children. Furthermore, many parents remarked that meaningful speech typically appears first at 2½ years of age, about one year later than the average display of first words in American children.

These data, together with the extremely depressed, withdrawn appearance of the San Marcos infants, suggest retardations of three or more months for various psychological competences that typically emerge during the first two years of life. With the exception of one 16-month-old boy, whose alert appearance resembled that of an American infant, there was little variability among the re-

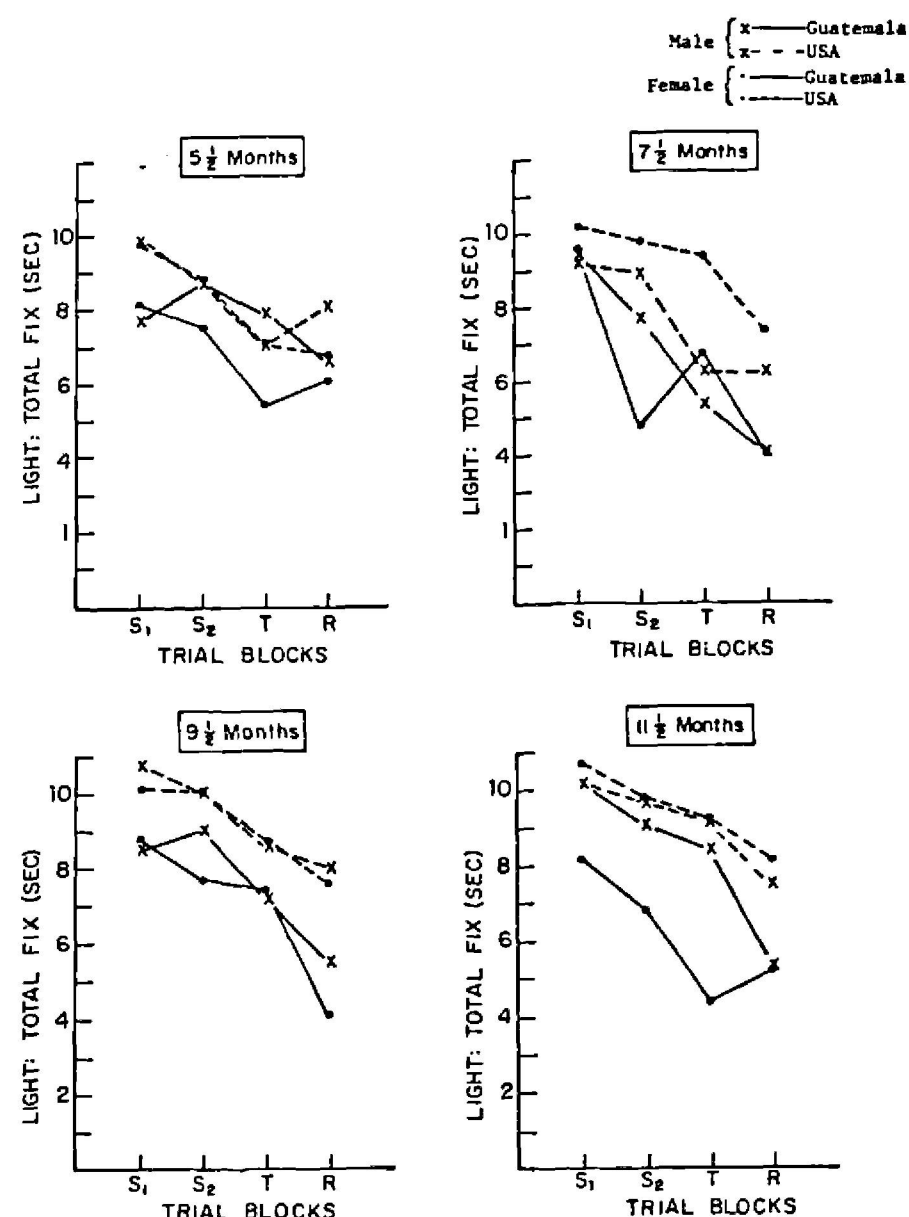


Figure 2. Average total fixation time to the light episode by age and culture.

maining children. Since over 90% were homogeneously passive, nonalert, and quiet, it is unlikely that the recovery of intellectual functioning to be reported later was a result of the selective mortality of a small group of severely retarded infants.

Resilience of Cognitive Development

The major theme of this article is the potential for recovery of cognitive functions despite early infant retardation. When the San Marcos child becomes mobile at around 15 months he leaves the dark hut, begins to play with other children, and provides himself with cognitive challenges that demand accommodations. Since all children experience this marked discontinuity in variety of experience and opportunity for exploration between the first and second birthday, it is instructive to compare the cognitive competence of older Guatemalan and American children to determine if differences in level of functioning are still present.

The tests administered were designed to assess cognitive processes that are believed to be part of the natural competence of growing children, rather than the culturally arbitrary segments of knowledge contained in a standard IQ test. We tried to create tests that were culturally fair, recognizing that this goal is, in the extreme, unattainable. Hence, the tests were not standardized instruments with psychometric profiles of test-retest reliabilities and criterion validity studies. This investigation should be viewed as a natural experiment in which the independent variable was degree of retardation in infancy and the dependent variables were performances on selected cognitive instruments during childhood. We assume, along with many psychologists, that perceptual analysis, recall and recognition memory, and inference are among the basic cognitive functions of children (even though they do not exhaust that set), and our tests were designed to evaluate those processes.

Tests of recall and recognition memory, perceptual analysis, and perceptual and conceptual inference were given to children in San Marcos, the Ladino villages, an Indian village close to Guatemala City and more modern than San Marcos, Cambridge, Massachusetts, and to two different groups of children living in Guatemala City. One of the Guatemala City settings, the "guarderia,"

was a day care center for very poor children. The second group, middle-class children attending nursery school, resembled a middle-class American sample in both family background and opportunity. Not all tests were administered to all children. The discussion is organized according to the cognitive function assessed, rather than the sample studied. The sample sizes ranged from 12 to 40 children at any one age.

RECALL MEMORY FOR FAMILIAR OBJECTS

The ability to organize experience for commitment to long-term memory and to retrieve that information on demand is a basic cognitive skill. It is generally believed that the form of the organization contains diagnostic information regarding cognitive maturity for, among Western samples, both number of independent units of information and the conceptual clustering of that information increase with age.

A 12-object recall task was administered to two samples of Guatemalan children. One group lived in a Ladino village 17 kilometers from Guatemala City; the second group was composed of San Marcos children. The 80 subjects from the Ladino village were 5 and 7 years old, equally balanced for age and sex. The 55 subjects from San Marcos were between 5 and 12 years of age (26 boys and 29 girls).

The 12 miniature objects to be recalled were common to village life and belonged to three conceptual categories: animals (pig, dog, horse, cow), kitchen utensils (knife, spoon, fork, glass), and clothing (pants, dress, underpants, hat). Each child was first required to name the objects, and if the child was unable to he was given the name. The child was then told that after the objects had been randomly arranged on a board he would have 10 seconds to inspect them, after which they would be covered with a cloth, and he would be required to say all the objects he could remember.

Table 1 contains the average number of objects recalled and the number of pairs of conceptually similar words recalled—an index of clustering—for the first two trials. A pair was defined as the temporally contiguous recall of two or more items of the same category. A child received one point for reporting a pair of contiguous items, two points for three contiguous items, and three points for contiguous recall of four items. Hence, the maxi-

TABLE 1
Mean Number of Objects and Pairs Recalled

Age	Trial 1		Trial 2	
	Recall	Pairs	Recall	Pairs
Ladino village				
5	5.2	2.1	5.4	2.1
7	6.7	3.3	7.8	3.7
Indian village				
5-6	7.1	3.4	7.8	3.8
7-8	8.6	3.4	8.3	3.6
9-10	10.3	4.9	10.3	4.3
11-12	9.6	3.4	10.1	3.6

mum clustering score for a single trial was nine points. As Table 1 reveals, the children showed a level of clustering beyond chance expectation (which is between 1.5 and 2.0 pairs for recall scores of seven to eight words). Moreover, recall scores increased with age on both trials for children in both villages (F ranged from 11.2 to 27.7, $p < .05$), while clustering increased with age in the Ladino village ($F = 26.8$, $p < .001$ for Trial 1; $F = 3.48$, $p < .05$ for Trial 2).

No five- or six-year-old in either village and only 12 of the 40 seven-year-olds in the Ladino village were attending school. School for the others consisted of little more than semiorganized games. Moreover, none of the children in San Marcos had ever left the village, and the five- and six-year-olds typically spent most of the day within a 500-yard radius of their homes. Hence, school attendance and contact with books and a written language do

TABLE 2
Mean Percentage of Correct Responses

Delay	Americans			Guatemalans		
	Age					
	5	8	11	5	8	11
0 hours	92.8	96.7	98.3	58.4	74.6	85.2
24 hours	86.7	95.6	96.7	55.8	71.0	87.0
48 hours	87.5	90.3	93.9	61.4	75.8	86.2

Note. Percent signs are omitted.

not seem to be prerequisites for clustering in young children.

The recall and cluster scores obtained in Guatemala were remarkably comparable to those reported for middle-class American children. Appel, Cooper, McCarrell, Knight, Yussen, and Flavell (1971) presented 12 pictures to Minneapolis children in Grade 1 (approximately age 7) and 15 pictures to children in Grade 5 (approximately age 11) in a single-trial recall task similar to the one described here. The recall scores were 66% for the 7-year-olds and 80% for the 11-year-olds. These values are almost identical to those obtained in both Guatemalan villages. The cluster indices were also comparable. The American 7-year-olds had a cluster ratio of .25; the San Marcos 5- and 6-year-olds had a ratio of .39.²

RECOGNITION MEMORY

The cultural similarity in recall also holds for recognition memory. In a separate study, 5-, 8-, and 11-year-old children from Ladino villages in the East and from Cambridge, Massachusetts, were shown 60 pictures of objects—all of which were familiar to the Americans but some of which were unfamiliar to the Guatemalans. After 0-, 24-, or 48-hours delay, each child was shown 60 pairs of pictures, one of which was old and the other new, and was asked to decide which one he had seen. Although the 5- and 8-year-old Americans performed significantly better than the Guatemalans, there was no statistically significant cultural difference for the 11-year-olds, whose scores ranged from 85% to 98% after 0-, 24-, or 48-hours delay (Kagan et al., 1973). (See Table 2.) The remarkably high scores of the American 5-year-olds have also been reported by Scott (1973).

A similar result was found on a recognition memory task for 32 photos of faces, balanced for sex, child versus adult, and Indian versus Caucasian, administered to 35 American and 38 San Marcos children 8-11 years of age. Each child initially inspected 32 chromatic photographs of faces, one at a time, in a self-paced procedure. Each child's recognition memory was tested by showing him 32 pairs of photographs (each pair

² The cluster index is the ratio of the number of pairs recalled to the product of the number of categories in the list times one less than the number of words in each category.

was of the same sex, age, and ethnicity), one of which was old and the other new. The child had to state which photograph he had seen during the inspection phase. Although the American 8- and 9-year-olds performed slightly better than the Guatemalans (82% versus 70%), there was no significant cultural difference among the 10- and 11-year-olds (91% versus 87%). Moreover, there was no cultural difference at any age for the highest performance attained by a single child.³ The favored interpretation of the poorer performance of the younger children in both recognition memory studies is that some of them did not completely understand the task and others did not activate the proper problem-solving strategies during the registration and retrieval phases of the task.

It appears that recall and recognition memory are basic cognitive functions that seem to mature in a regular way in a natural environment. The cognitive retardation observed during the first year does not have any serious predictive validity for these two important aspects of cognitive functioning for children 10–11 years of age.

PERCEPTUAL ANALYSIS

The Guatemalan children were also capable of solving difficult Embedded Figures Test items. The test consisted of 12 color drawings of familiar objects in which a triangle had been embedded as part of the object. The child had to locate the hidden triangle and place a black paper triangle so that it was congruent with the design of the drawing. The test was administered to rural Indian children from San Marcos, as well as to rural Indians living close to Guatemala City (labeled Indian₁ in Figure 3), the Ladino villages, and two groups from Guatemala City. (See Figure 3.)

The Guatemala City middle-class children had the highest scores and, except for San Marcos, the rural children, the poorest. The surprisingly competent performance of the San Marcos children is due, we believe, to the more friendly conditions of testing. This suggestion is affirmed by an inde-

pendent study in which a special attempt was made to maximize rapport and comprehension of instructions with a group of rural isolated children before administering a large battery of tests. Although all test performances were not facilitated by this rapport-raising procedure, performance on the Embedded Figures Test was improved considerably. It is important to note that no five- or six-year-old was completely incapable of solving some of these problems. The village differences in mean score reflect the fact that the rural children had difficulty with three or four of the harder items. This was the first time that many rural children had ever seen a two-dimensional drawing, and most of the five-, six-, and seven-year-olds in San Marcos had had no opportunity to play with books, paper, pictures, or crayons. Nonetheless, these children solved seven or eight of the test items. Investigators who have suggested that prior experience with pictures is necessary for efficient analysis of two-dimensional information may have incorrectly misinterpreted failure to understand the requirements of the problem with a deficiency in cognitive competence. This competence seems to develop in the world of moving leaves, chickens,

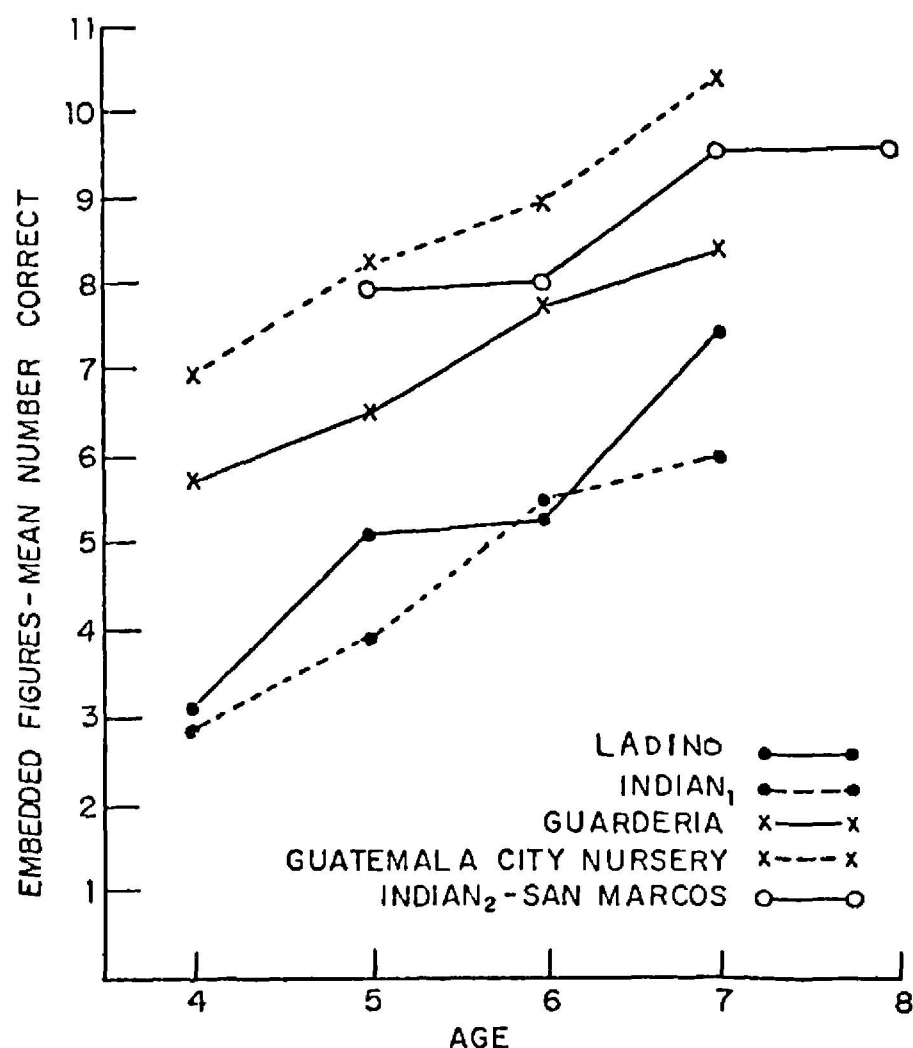


Figure 3. Mean number correct on the Embedded Figures Test.

³ These photographs were also used in an identical procedure with 12 Kipsigis-speaking 10- and 11-year-olds from a rural village in eastern Kenya. Despite the absence of any black faces in the set, the percentage of items recognized correctly was 82 for this group of African children.

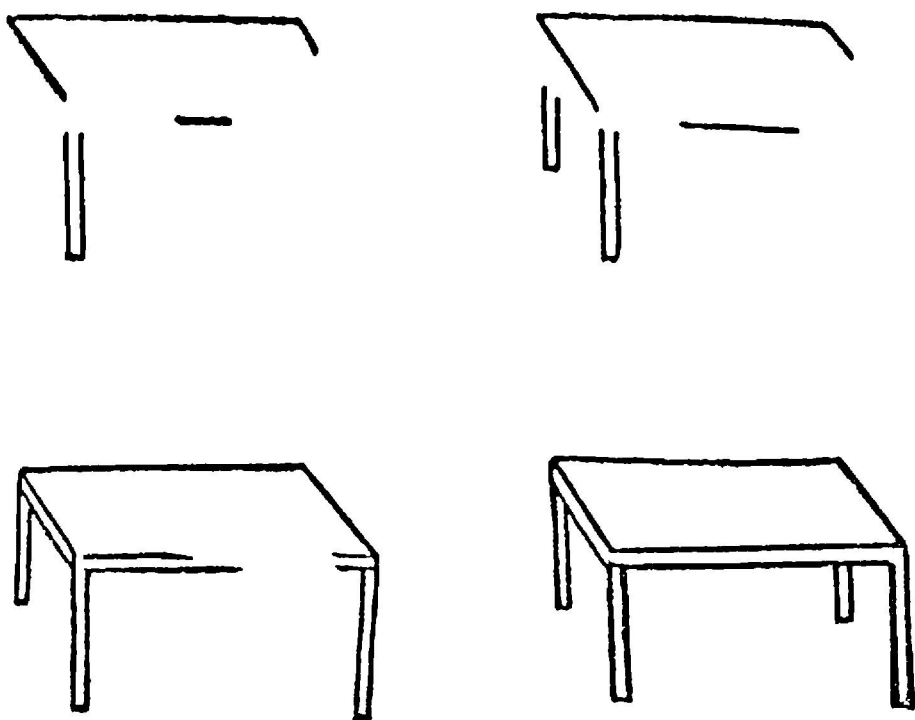


Figure 4. Sample item from the Perceptual Inference Test.

and water.⁴ As with recall and recognition memory, the performance of the San Marcos child was comparable to that of his age peer in a modern urban setting.

PERCEPTUAL INFERENCE

The competence of the San Marcos children on the Embedded Figures Test is affirmed by their performance on a test administered only in San Marcos and Cambridge and called Perceptual Inference. The children (60 American and 55 Guatemalan, 5-12 years of age) were shown a schematic drawing of an object and asked to guess what that object might be if the drawing were completed. The child was given a total of four clues for each of 13 items, where each clue added more information. The child had to guess an object from an incomplete illustration, to make an inference from minimal information (see Figures 4 and 5).

There was no significant cultural difference for the children 7-12 years of age, although the American 5- and 6-year-olds did perform significantly better than the Indian children. In San Marcos, performance improved from 62% correct on one of the first two clues for the 5- and 6-year-olds to 77% correct for the 9-12-year-olds. The comparable changes for the American children were from 77% to 84%. (See Figure 6.)

⁴ This conclusion holds for Embedded Figures Test performance, and not necessarily for the ability to detect three-dimensional perspective in two-dimensional drawings.

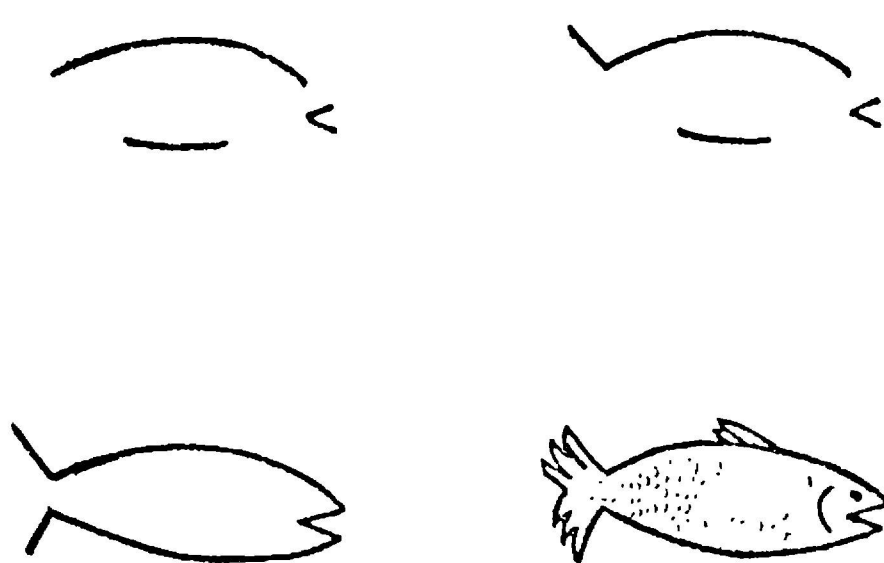


Figure 5. Sample item from the Perceptual Inference Test.

Familiarity with the test objects was critical for success. All of the San Marcos children had seen hats, fish, and corn, and these items were rarely missed. By contrast, many American children failed these items. No San Marcos child not attending school, and therefore unfamiliar with books, correctly guessed the book item, whereas most of those in school guessed it correctly. As with memory and perceptual analysis, the retardation seen during infancy did not predict comparison

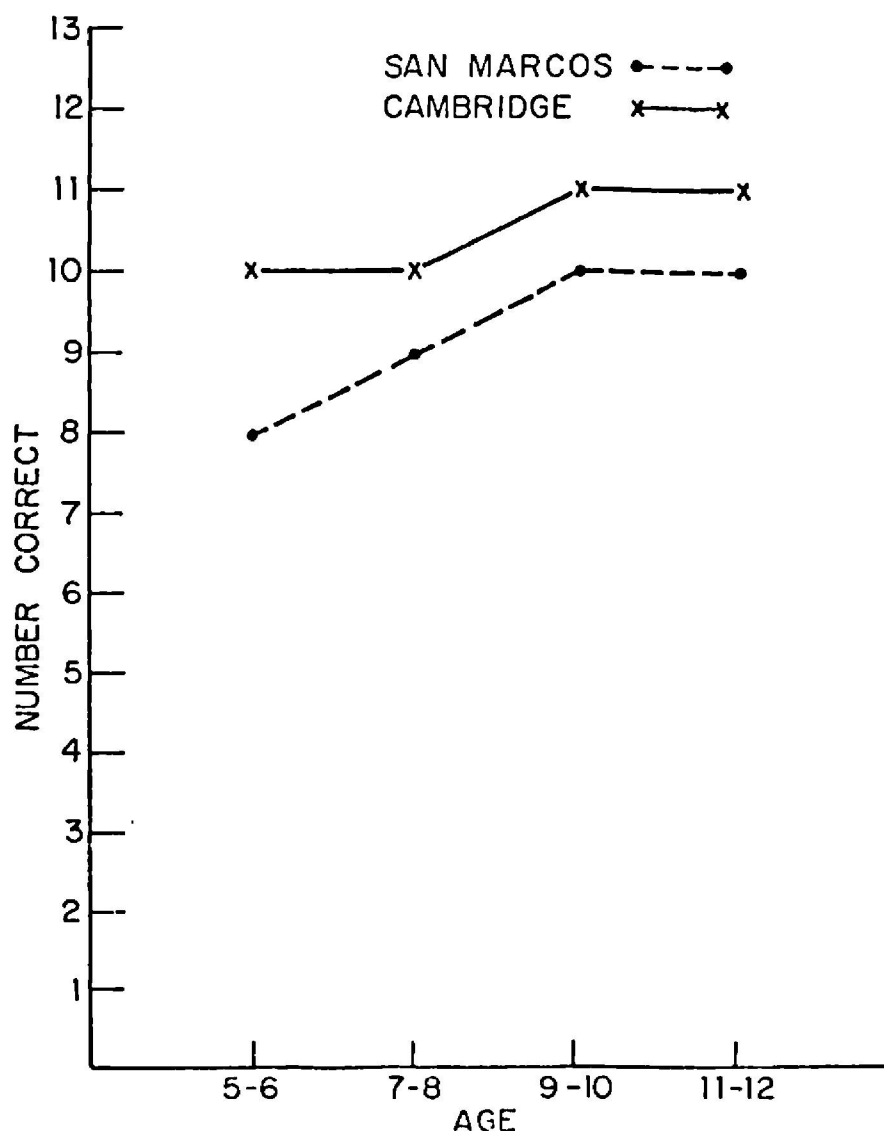


Figure 6. Number correct on the Perceptual Inference Test.

ble retardation in the ability of the 11-year-old to make difficult perceptual inferences.

CONCEPTUAL INFERENCE

The San Marcos child also performed well on questions requiring conceptual inference. In this test, the child was told verbally three characteristics of an object and was required to guess the object. Some of the examples included: What has wings, eats chickens, and lives in a tree? What moves trees, cannot be seen, and makes one cold? What is made of wood, is used to carry things, and allows one to make journeys? There was improved performance with age; the 5- and 6-year-olds obtained an average of 9 out of 14 correct, and the 11- and 12-year-olds obtained 12 out of 14 correct. The San Marcos child was capable of making moderately difficult inferences from both visual and verbal information.

Discussion

This corpus of data implies that absolute retardation in the time of emergence of universal cognitive competences during infancy is not predictive of comparable deficits for memory, perceptual analysis, and inference during preadolescence. Although the rural Guatemalan infants were retarded with respect to activation of hypotheses, alertness, and onset of stranger anxiety and object permanence, the preadolescents' performance on the tests of perceptual analysis, perceptual inference, and recall and recognition memory were comparable to American middle-class norms. Infant retardation seems to be partially reversible and cognitive development during the early years more resilient than had been supposed.

One potential objection to this conclusion is that the tests were too easy for the Guatemalan 11-year-olds and that is why cultural differences were absent. There are two comments that can be addressed to that issue. First, it is not intuitively reasonable to argue that the ability to remember 60 photographs of objects, classify an object from a few sketchy lines, or detect the triangle hidden in a two-dimensional drawing is "easy" for children who rarely see photographs, pencils, crayons, or books. Second, we deliberately assessed cognitive functions that we believe all children should master by the time they are preadolescents. The fact that

many 11-year-olds approached the ceiling on some tests is support for the basic premise of this article, namely, that infant retardation does not prevent a child from eventually developing basic cognitive competences.

This result is surprising if one believes that each child is born with a certain level of general intellectual competence that is stable from infancy through adulthood. If, on the contrary, one assumes that each stage of development is characterized by a different profile of specific competences and there is no necessary relation between early emergence of the capacities of infancy and level of attainment of the quite different abilities characteristic of childhood, then these results are more reasonable. There is no reason to assume that the caterpillar who metamorphoses a bit earlier than his kin is a better adapted or more efficient butterfly.

Consideration of why the rural Guatemalan children lagged behind the urban children on some tests during the period five through nine years of age comprises a second implication of these data. It will be recalled that on the embedded figures and recognition memory tests the performance of rural children was several years behind both the American and Guatemala City middle-class children. The differences were minimal for the object recall and perceptual inference tests. The approximately three-year lag in performance is paralleled by comparable differences between lower- and middle-class children in urban Western cities. For example, Bosco (1972) found that middle-class first and third graders were able to tolerate smaller interstimulus intervals in a backward masking procedure than lower-class children, but this difference had vanished among sixth-grade children. Similarly, Bakker (1971) compared good and poor readers from urban centers in Holland on a task that required operating simultaneously on two items of information in a temporal integration task. The poor readers performed less well than the good readers at ages six to eight, but were comparable to the good readers during the preadolescent years.

We interpret these results as indicating that the urban lower-class children, like the younger, rural Guatemalans, were not able to mobilize proper problem-solving strategies necessary for task solution, but achieved that level of competence by 11 years of age. Some of these strategies include

focused attention, rehearsal of task information and instructions, awareness of and understanding the problem to be solved, maintenance of problem set, and the ability to remember critical information elements in the problem and to operate on that information. It is believed that these functions may emerge a little later in some groups of children than in others, but that they are operative in all children by 11–12 years of age. In a recently completed study with Patricia Engle, we found that among rural Guatemalan children, 5 through 11 years of age, the rate of improvement in performance on three memory tasks (memory for numbers, memory for sentences, and auditory blending) was greatest between 9 and 11 years of age, whereas White (1970), using comparable data from American children, found that the greatest rate of improvement was between 5 and 7 years of age—a lag of about three years.

These data have implications for America's educational problems. There is a tendency to regard the poor test performances of economically impoverished, minority group 6-year-olds in the United States as indicative of a permanent and, perhaps, irreversible defect in intellectual ability—as a difference in quality of function rather than slower maturational rate. The Guatemalan data, together with those of Bosco and Bakker, suggest that children differ in the age at which basic cognitive competences emerge and that experiential factors influence the time of emergence. Economically disadvantaged American children and isolated rural Guatemalan children appear to be from one to three years behind middle-class children in demonstrating some of the problem-solving skills characteristic of Piaget's stage of concrete operations. But these competences eventually appear in sturdy form by age 10 or 11. The common practice of arbitrarily setting 7 years—the usual time of school entrance—as the age when children are to be classified as competent or incompetent confuses differences in maturational rate with permanent, qualitative differences in intellectual ability. This practice is as logical as classifying children as reproductively fertile or sterile depending on whether or not they have reached physiological puberty by their thirteenth birthday.

When educators note correctly that poor children tend to remain permanently behind middle-class children on intellectual and academic performance, they are referring to the relative retardation on the

culturally specific skills of reading, mathematics, and language achievement described earlier. That relative retardation is the product of the rank ordering of scores on achievement and IQ tests. The fact that relative retardation on these abilities is stable from age five on does not mean that the relatively retarded children are not growing intellectually (when compared with themselves), often at the same rate as economically advantaged youngsters.

The suggestion that basic cognitive competences, in contrast to culturally specific ones, emerge at different times and that the child retains the capacity for actualization of his competence until a late age is not substantially different from the earlier conclusions of Dennis and Najarian (1957). Although the 49 infants 2–12 months of age living in poorly staffed Lebanese institutions were seriously retarded on the Cattell developmental scale (mean developmental quotient of 68 compared with a quotient of 102 for a comparison group), the 4½–6-year-olds who had resided in the same institution all their lives performed at a level comparable to American norms on a memory test (Knox Cubes) as well as on Porteus mazes and the Good-enough Draw-a-Man Test.

Of more direct relevance is Dennis's (1973) recent follow-up study of 16 children who were adopted out of the same Lebanese institution between 12 and 24 months of age—the period during which the San Marcos infant leaves the unstimulating environment of the dark hut—with an average developmental quotient of 50 on the Cattell Infant Scale. Even though the assessment of later intellectual ability was based on the culturally biased Stanford-Binet IQ test, the average IQ, obtained when the children were between 4 and 12 years of age, was 101, and 13 of the 16 children had IQ scores of 90 or above.

Additional support for the inherent resiliency in human development comes from longitudinal information on two sisters who spent most of their infancy in a crib in a small bedroom with no toys.⁵ The mother, who felt unable to care for her fourth child, restricted her to the room soon after birth and instructed her eight-year-old daughter to care for the child. One year later, another daughter

⁵ The authors thank Meinhard Robinow for information on these girls.

was born, and she, too, was placed in a crib with the older sister. These two children only left the room to be fed and, according to the caretaking sister who is now a married woman in her twenties, the two infants spent about 23 hours of each day together in a barren crib. When the authorities were notified of this arrangement, the children were removed from the home and taken to a hospital when the younger was 2½ and the older 3½ years old. Medical records reveal that both children were malnourished, severely retarded in weight and height, and seriously retarded psychologically. After a month in the hospital, following considerable physical recovery, both sisters were placed in the care of a middle-class family who had several young children. The sisters have remained with that family for the last 12 years and regard the husband and wife as their parents. One of us (J. K.) tested the sisters five times when they were between 4 and 9 years of age, and recently interviewed and tested both of them over a two-day period when they were 14½ and 15½ years old.

The younger sister has performed consistently better than the older one over the last 10 years. The IQ scores of the younger girl have risen steadily from a Stanford-Binet IQ of 74 at age 4½ (after two years in the foster home) to a Wechsler Full Scale IQ of 88 at age 14. The older girl's scores have also improved, but less dramatically, from a Stanford-Binet IQ of 59 at age 5 to a Wechsler IQ of 72 at age 15. The author also administered a lengthy battery of tests, some of which were discussed earlier. On the Perceptual Inference Test, the percentage correct was 85 for the younger sister and 61 for the older sister. On the Recognition Memory for Photographs, the percentages were 94 for both. On the Embedded Figures Test, the percentages were 92 and 100, and on the recall memory for objects, the percentages were 92 and 83 for the younger and older sister, respectively. Moreover, the interpersonal behavior of both girls was in no way different from that of the average rural Ohio adolescent—a group the author came to know well after seven years of work in the area. Although there is some ambiguity surrounding the competence of the older girl, the younger one performs at an average level on a wide range of tests of cognitive functioning, despite 2½ years of serious isolation.

These data, together with the poor predictive relation between scores on infant developmental

tests and later assessments of intellectual functioning, strengthen the conclusion that environmentally produced retardation during the first year or two of life appears to be reversible. The importance of the Guatemalan data derives from the fact that the San Marcos 11-year-olds performed so well, considering the homogeneity and isolation of their childhood environment. Additionally, there is a stronger feeling now than there was in 1957 that environmentally produced retardation during the first two years may be irreversible, even though the empirical basis for that belief is no firmer in 1972 than it was in 1957.

More dramatic support for the notion that psychological development is malleable comes from recent experimental studies with animals. Several years ago Harlow's group demonstrated that although monkeys reared in isolation for the first six months displayed abnormal and often bizarre social behaviors, they could, if the experimenter were patient, solve the complex learning problems normally administered to feral-born monkeys. The prolonged isolation did not destroy their cognitive competence (Harlow, Schiltz, & Harlow, 1969). More recently, Suomi and Harlow (1972) have shown that even the stereotyped and bizarre social behavior shown by six-month-old isolates can be altered by placing them with female monkeys three months younger than themselves over a 26-week therapeutic period. "By the end of the therapy period the behavioral levels were virtually indistinguishable from those of the socially competent therapist monkeys [Suomi & Harlow, 1972, p. 491]."

This resiliency has also been demonstrated for infant mice (Cairns & Nakelski, 1971) who experienced an initial 10 weeks of isolation from other animals. Compared with group-reared mice of the same strain, the isolated subjects were hyperreactive to other mice, displaying both extreme withdrawal and extreme aggressiveness. These investigators also attempted rehabilitation of the isolates by placing them with groups of mice for an additional 10 weeks, however, after which their behavior was indistinguishable from animals that had never been isolated.

By the seventieth day after interchange, the effects of group therapy were complete, and animals that had been isolated for one hundred days following weaning were indistinguishable from animals that had never been isolated [Cairns & Nakelski, 1971, p. 363].

These dramatic alterations in molar behavior are in accord with replicated reports of recovery of visual function in monkeys and cats deprived of patterned light soon after birth (Baxter, 1966; Chow & Stewart, 1972; Wilson & Riesen, 1966). Kittens deprived of light for one year recovered basic visual functions after only 10 days in the experimenter's home (Baxter, 1966); kittens who had one or both eyes sutured for close to two years were able to learn pattern discriminations with the deprived eye only after moderate training (Chow & Stewart, 1972).

If the extreme behavioral and perceptual sequelae of isolation in monkeys, cats, and mice can be altered by such brief periods of rehabilitative experience, it is not difficult to believe that the San Marcos infant is capable of as dramatic a recovery over a period of nine years. These data do not indicate the impotence of early environments, but rather the potency of the environment in which the organism is functioning. There is no question that early experience seriously affects kittens, monkeys, and children. If the first environment does not permit the full actualization of psychological competences, the child will function below his ability as long as he remains in that context. But if he is transferred to an environment that presents greater variety and requires more accommodations, he seems more capable of exploiting that experience and repairing the damage wrought by the first environment than some theorists have implied.

These conclusions do not imply that intervention or rehabilitation efforts with poor American or minority group preschool children are of no value. Unlike San Marcos, where children are assigned adult responsibilities when they are strong and alert enough to assume them, rather than at a fixed age, American children live in a severely age graded system, in which children are continually rank ordered. Hence, if a poor four-year-old falls behind a middle-class four-year-old on a culturally significant skill, like knowledge of letters or numbers, he may never catch up with the child who was advanced and is likely to be placed in a special educational category. Hence, American parents must be concerned with the early psychological growth of their children. We live in a society in which the relative retardation of a four-year-old seriously influences his future opportunities because we have made relative retardation functionally synonymous

with absolute retardation. This is not true in subsistence farming communities like San Marcos.

These data suggest that exploration of the new and the construction of objects or ideas from some prior schematic blueprint must be inherent properties of the mind. The idea that the child carries with him at all times the essential mental competence to understand the new in some terms and to make a personal contribution to each new encounter is only original in our time. Despite the current popularity of Kant and Piaget, the overwhelming prejudice of Western psychologists is that higher order cognitive competences and personality factors are molded completely by the environment. Locke's image of an unmarked tablet on which sensation played its patterned melody has a parallel in Darwin's failure to realize, until late in his life, that the organism made a contribution to his own evolution. Darwin was troubled by the fact that the same climate on different islands in the Galapagos produced different forms of the same species. Since he believed that climatic variation was the dynamic agent in evolution he was baffled. He did not appreciate that the gene was the organism's contribution to his own alteration. Western psychologists have been blocked by the same prejudice that prevented young Darwin from solving his riddle. From Locke to Skinner we have viewed the perfectibility of man as vulnerable to the vicissitudes of the objects and people who block, praise, or push him, and resisted giving the child any compass of his own. The mind, like the nucleus of a cell, has a plan for growth and can transduce a new flower, an odd pain, or a stranger's unexpected smile into a form that is comprehensible. This process is accomplished through wedding cognitive structures to selective attention, activation of hypotheses, assimilation, and accommodation. The purpose of these processes is to convert an alerting unfamiliar event, incompletely understood, to a recognized variation on an existing familiar structure. This is accomplished through the detection of the dimensions of the event that bear a relation to existing schemata and the subsequent incorporation of the total event into the older structure.

We need not speak of joy in this psychological mastery, for neither walking nor breathing is performed in order to experience happiness. These properties of the motor or autonomic systems occur

because each physiological system or organ naturally exercises its primary function. The child explores the unfamiliar and attempts to match his ideas and actions to some previously acquired representation because these are basic properties of the mind. The child has no choice.

The San Marcos child knows much less than the American about planes, computers, cars, and the many hundreds of other phenomena that are familiar to the Western youngster, and he is a little slower in developing some of the basic cognitive competences of our species. But neither appreciation of these events nor the earlier cognitive maturation is necessary for a successful journey to adulthood in San Marcos. The American child knows far less about how to make canoes, rope, tortillas, or how to burn an old milpa in preparation for June planting. Each knows what is necessary, each assimilates the cognitive conflicts that are presented to him, and each seems to have the potential to display more talent than his environment demands of him. There are few dumb children in the world if one classifies them from the perspective of the community of adaptation, but millions of dumb children if one classifies them from the perspective of another society.

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