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The Literate Mind and the Universal Human Mind

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In a chapter written in honor of Paul Bertelson, Dupoux and Mehler (1992) alerted psycholinguists that they "will have to include considerations about literacy in the interpretation of on-line studies. Indeed, literacy adds representations that make it possible for subjects to perform in tasks like phoneme-monitoring experiment which they would otherwise be unable to do. Given this observation, it is surprising that psycholinguists have neglected the potential effects of cultural representations" (p. 60). Eight years after these remarks were made, the impact of literacy on the human cognitive mind remains relatively ignored. In this chapter we question the implicit assumption of most cognitive psychology that the literate mind is an adequate model of the universal human mind.

We are the only animals that have acquired speech and literacy. Speech is ubiquitous in the human species after a necessary developmental period. It is only absent in a few pathological conditions, including extreme deprivation of linguistic input from the environment. Literacy, on the contrary, is not universal. If the universal mind exists, then the acquisition of literacy leads to two possible cases: either literacy represents an additional system of information processing, changing in no significant way the universal mind; or it modifies what are considered to be the universal properties. The latter hypothesis admits of many possibilities, depending on the number and nature of the properties of the mind that cease to be universal as a result of literacy acquisition. Concretely, one needs to ascertain whether the data, generalizations, and models derived from the study of literate people are or are not valid for illiterate people.

What Is Literacy?

Literacy is highly correlated with education. However, the two notions are distinct and can be separated empirically. We define *literacy* as the ability to read and write, and education as the whole corpus of knowledge acquired, for a large part, through the exercise of literacy.

Literacy is also associated with schooling, both contributing to the formation of the educated mind. However, one can isolate the specific effects of literacy either by comparing illiterate adults to "ex-illiterate" adults, that is, people who never attended school in childhood but became literate later on in special classes, or by comparing people who learned to read and write in different literacy systems.

We used the first method to demonstrate that awareness of phonemes does not develop spontaneously. Illiterates and ex-illiterates were compared on the ability to manipulate phonemes intentionally (Morais et al., 1979). Contrary to ex-illiterates, illiterates were unable to either delete the initial consonant of a verbal item or add one at the onset.

Read et al. (1986) used the second method to demonstrate that what entails phoneme awareness is not literacy in general but alphabetic literacy. Using tests adapted from ours, they compared alphabetized to nonalphabetized literate Chinese adults. The scores of the nonalphabetized Chinese readers were similar to those of illiterates, whereas the scores of the alphabetized ones were similar to those of ex-illiterates.

In this chapter, we focus mainly on the first method. A specific effect of literacy is demonstrated whenever, all other things being equivalent (especially social and cultural level), illiterates display lower performance than ex-illiterates do. These populations are rarely examined. Due to practical reasons but also to the belief that the investigated capacities are literacy-independent, the portrait of the literate mind is in most cases the portrait of the educated mind.

Literacy as a Biological or a Cultural Function

As said above, literacy is not universal. This indisputable fact leaves open, however, the question of whether literacy is mainly a biological (in the strong sense of genetically determined) or a cultural function. Indeed, exactly as the universality of a function does not mean that is biological, its lack of universality does not mean that it is cultural. The few examples below may illustrate these two claims.

Cross-cultural studies have shown that all young children share, in their conception of the earth, two presuppositions, namely that the ground where they live is flat and that physical objects need some kind of support (Vosniadou, 1994). However, there is no compelling evidence that these presuppositions are coded in the genes. Beliefs in ground flatness and up-down gravity may be derived from early experience. Infants living from birth in an interplanetary station where space would be round and imponderable would probably develop different beliefs about their habitat. Thus, universality does not imply genetic determination. More crucial to the present question, lack of universality does not imply a cultural origin, either. It is well-known that blue eyes are not universal; however, they are genetically coded. The cognitive profile associated with Down syndrome is, fortunately, not universal, but it has a genetic origin. And it is possible, although it will never be demonstrated, that the exceedingly high abilities of Leonardo da Vinci, which have not been shared by many other humans, were due in part to his "biological" capacities.

This term "biological" is often used in the context of the debate on genetically vs. environmentally determined capacities. Of course, this term must cover capacities that do not emerge spontaneously from the genes. The genes probably specify nothing but the overall structure of the mind. The infant's mind develops mainly under the action of epigenetic processes, that is, interactions of genetic and environmental information. The establishment of the phonetic boundaries that are typical of the native language provides an example of the combined influence of a biological predisposition to categorical perception and a cultural setting. Indeed, the categorical perceiving mode is part of the innate structure of the mind, and the different boundary in the voiced/unvoiced distinction for stops in English and French is a cultural phenomenon. Most learning is thus both biological and cultural.

However, a characteristic of epigenetic regulations is that they occur within some critical period that corresponds, according to Newport, Bavelier, and Neville (chapter 27), to a "peak period of plasticity, occurring at some maturationally defined time in development, followed by reduced plasticity later in life." For this reason, whatever the amount of reductionism involved, we propose to take the critical period contingency as a criterion for distinguishing biological from cultural learning. Cultural learning is open-ended learning. An example of cultural learning is the acquisition of phoneme awareness: it can occur at any age (Morais et al., 1988). Cultural learning may be cumulative as, for example, the learning of new words throughout life. It may also include the learning of procedures and involve a change from controlled to automatic operations as, for example, in writing.

An important question concerns how much of the adult mind is due to biological learning and how much is due to cultural learning. Developmental psychologists tend to embrace one of two opposite lines of thought about this question. According to the "biopsychological" approach, the structures of the mind are a product of biological evolution and epigenesis (Pinker, 1998). According to the "sociocultural" approach, the mind is a product of sociocultural history (Vygotsky, 1978). Probably, neither does full justice to both biological and cultural contributions.

Cultural learning is erroneously believed to involve only general processes (cf. Cossu, 1999). This idea stems from a regrettable confusion between biological and modular capacities. An important lesson from the study of literacy is that one has to distinguish between biological modules, like the system for processing speech, and cultural modules. Reading, in particular, presents many important modular characteristics. It involves fast, mandatory processes. Moreover, it is supported by a precise network of brain areas (e.g., see Allison et al., 1994; Cohen et al., 2000; Peterson, et al., 1990). One knows less well, unfortunately, what are the functions of these areas in the illiterate adult; and one totally ignores whether ex-illiterates use the same brain system for literacy as adults who became literate in childhood. Interestingly, the learning of abnormal auditory-visual associations in the adult barn owl is magnified by previous juvenile learning (Knudsen, 1998). If priming effects were also found for the acquisition of literacy, this would appear to be more dependent on biological learning than is usually assumed.

It should be clear anyway that brain data, at least at a microanalytic level, do not provide an argument for biology and against cultural learning. Cummins and Cummins (1999) present as uncontroversial the following logical argument: ". . . the mind is what the brain does; the brain was shaped by evolution; the mind was shaped by evolution." It would be no less logical (and materialist) to rephrase it using "learning," or even "cultural learning," in place of "evolution." The two arguments are not mutually exclusive. Both evolution and culture shape the brain, even though culture can only occupy the small space of freedom allowed by evolutionary constraints. Indeed, neurogenesis and the establishment of new synapses occur throughout life, to a much smaller extent, indeed, in adulthood than in childhood. Cultural learning, including learning literacy, must modify brain structures to some extent. Besides, the consistency of these modifications across individuals is not surprising. Cultural learning of phoneme-grapheme representations may be expected to develop in brain areas close or connected to those dedicated to basic phonological representations and to abstract visual representations. Different areas will be activated in the learning of a distinct cultural module, namely musical reading (see Peretz, chapter 24, for a discussion of the biological vs. cultural nature of music), which involves other types of representations, so that dissociation can occur in case of brain damage.

Although the lack of universality of literacy does not imply that literacy mainly results from cultural learning, there is no evidence that the literate people are those who were born with the literacy gene or who benefited from the appropriate epigenetic regulations. Nevertheless, the idea that literacy results from cultural learning has been disputed. For instance, Cossu (1999) believes that "specific biological components are responsible for the acquisition of reading," in particular "a core component may have emerged in phylogeny which later became refined as a cross-modal device for the (automatic) connection between phonology and other perceptual domains" (p. 226). This conception deserves some critical remarks.

The development of a new functional system may take advantage of components of previously existing systems. These "exaptation" processes (Gould and Vrba, 1982) are at work in alphabetic literacy: the phoneme representations involved in speech perception become useful for the written representation of language, provided that conscious awareness and recoding (two further biologically based capacities) are available to operate on them. However, the idea that "the metaphonological parser may have emerged as an outcome of a general trend for intersensory integration" (Cossu, 1999, p. 232) is dismissed by the fact that conscious phoneme segmentation does not emerge spontaneously but is elicited by alphabetic teaching, so that it can appear at five years of age, at sixty, or never. Moreover, the notion of a "general trend for intersensory connection" is paradoxically reminiscent of the notion of a general-purpose device. General trends are not selected in evolution; what is selected is a specific organ or mechanism. While a specific cross-modal device involving phonology has probably been developed in the human species to take advantage of the correlation between heard and visual speech (lipreading), there is no evidence that a similar specific device was developed to match phonology to symbols, hand movements, or stones.

A great deal of evidence now indicates that most dyslexics suffer from highly specific phonological deficits, which result from some anomaly in their biologically determined system of speech perception (see discussion in, e.g., Galaburda, chapter 25; Morais, in press). Indeed, cultural learning may be hampered by developmental injury to the brain areas underlying the basic capacities to be recruited. It must be emphasized that to recognize the biological foundations of alphabetic literacy is not to say that this is a biological achievement. To depend on and to be an instance of are not the same notion. The literate mind is a product of cultural learning capitalizing on biological capacities.

What Illiterates Tell Us about the Literate Mind

We summarize below the main findings on the cognitive effects of literacy. The absence of a literacy effect can be demonstrated by comparing literate and illiterate people. By contrast, the presence of a selective effect of literacy requires the comparison of illiterates and ex-illiterates. Obviously, some of the mentioned effects, such as phoneme awareness, are specific to alphabetic literacy, whereas others, such as lexical growth, may concern all types of literacy.

Language

Cerebral specialization for language is innate (Bertoncini et al., 1989) and consequently is present in illiterate people (Castro and Morais, 1987).

The automatic extraction of phonetic information is unaffected by literacy. Similar patterns of results in literate and illiterate people were obtained for categorical perception (Castro, 1993), the McGurk effect (Morais, Castro, and Kolinsky, 1991), feature blendings (Morais et al., 1987), and migration errors (i.e., illusory conjunctions: Morais & Kolinsky, 1994; Kolinsky and Morais, 1996).

Specific literacy effects concern the use of a phonemic attentional recognition strategy under difficult listening conditions (Morais et al., 1987) and the susceptibility of phoneme integration to orthographic knowledge, as observed with the phonological fusion paradigm (Morais et al., 1991).

Both word and pseudoword repetition are poorer in illiterate than in literate people (Castro-Caldas et al., 1998), the effect being stronger for pseudowords. The illiterate, but not the literate people, failed to activate the anterior cingulate cortex and basal ganglia during pseudoword repetition. These regions have a role in language and attention. According to Frith (1998), "illiterates have not developed their capacity for phonological processing, and hence they rely more on lexical-semantic systems" (p. 1011). According to Castro-Caldas et al. (1998), "the absence of knowledge of orthography limits the ability of illiterate subjects to repeat pseudowords correctly" (p. 1060). These two explanations are not exclusive of each other. Yet, since illiterates are not poorer than ex-illiterates in repeating words or pseudowords (Morais and Mousty, 1992), it seems that automatic activation of orthographic representations requires a degree of literacy ability above that of ex-illiterates.

Among metaphonological abilities, phoneme awareness shows a huge effect of alphabetic literacy (Morais et al., 1979; Read et al., 1986). By contrast, awareness of syllables (Morais et al., 1986), rhyme (Morais et al., 1986), and phonological length (Kolinsky, Cary, and Morais, 1987) was observed in at least some of the illiterate people tested. Morais et al. (1989) found that, like literate people, illiterates detect syllabic targets better than nonsyllabic targets.

Lexical knowledge increases during the first years of schooling, mostly as a consequence of literacy. Reading activities would account for about half of the 3000 new words that a schoolchild acquires each year (Nagy, Anderson, and Herman, 1987). By fifth grade, the best 10 percent readers would read 200 more texts outside school than the 10 percent poorest readers (Anderson, Wilson, and Fielding, 1988).

Concerning the notion of word, the results obtained depended on task. In illiterates, the command to repeat, one word at a time, an orally presented sentence elicits a segmentation into main syntactic constituents (e.g., "the car / stands / in front of the door"; Cary, 1988). According to Cary and Verhaeghe (1991), illiterates only produced 4 percent word segmentations, whereas ex-illiterates produced 48 percent and literates 86 percent. However, illiterates scored 72 percent word responses in the repetition of the last "bit" of an interrupted sentence (Cary and Verhaeghe, 1991). Unfortunately, they were not compared with ex-illiterates. When tested subsequently in the segmentation task, the same illiterates still produced 80 percent subject-verb-complement segmentations. Illiterates may thus consciously access the word unit, but they are usually biased to process meaning.

Semantic Knowledge

Comparing semantic knowledge in illiterate people, collective-farm activists, and young people with one to two years of schooling, Luria (1976) claimed that illiterates, contrary to the other groups, have no taxonomic knowledge. However, Scribner and Cole (1981), studying Vai people in Liberia, found results that "discourage conclusions about a strong influence of literacy on categorization and abstraction" (p. 124). It also seems that, in free recall, illiterates can use category organization of the items when the categories are explicitly indicated to them or simply suggested by having them sort the items into piles (Cole et al., 1971; Scribner, 1974). This would not be possible if the illiterates had no preexistent semantic organization.

Moreover, the categorization capacity appears very early in development. Three-year-olds can understand the logic of class inclusion, for instance, that "car" and "bike" belong to the superordinate "vehicle" (Markman, 1984). Matching in terms of taxonomic category is almost perfect at four years of age. Presented with fish, car, and boat, the last two are put together, in spite of the fact that fish and boat are found in water (Rosch et al., 1976). In five-year-olds, categorical relationships led to more false recognitions of a probe in a sentence than the part-whole relationship (Mansfield, 1977). Testing six-year-olds, Radeau (1983) found an auditory semantic priming effect. About 80 percent of the pairs used were taxonomically organized (coordinate: "arm-leg"; or superordinate: fruit-apple). All these findings reflect the taxonomic organization of semantic memory in preliterate children.

The apparent discrepancy between these data and Luria's (1976) can be accounted for in two ways: either people who are not stimulated to think categorically lose this knowledge, or they keep taxonomic knowledge but develop a strong preference for practical schemes.

Recent work we carried out in Brazil, in collaboration with Scliar-Cabral, Monteiro, and Penido, supports the second interpretation. Both illiterates and ex-illiterates could make semantic as well as perceptual classifications and shift from one type of dimension to the other. In a classification test requiring the subjects to match a target with either a taxonomically related or an unrelated item, illiterates made as much taxonomic choices (93 percent and 82 percent for images and words, respectively) as poorly literate people did (these are adults who completed only four school grades in childhood). In another test requiring the subjects to group twelve drawings taken from four categories, the illiterates grouped the items correctly, and the majority of their justifications were of a taxonomic kind. Finally, in fluency tests, the illiterates produced, on average, 12.9 words per category and the poorly literate adults, 11.9. The ratio of subcategory repetitions (Bousfield, 1953), indicating taxonomic clustering, was similar in the two groups. Thus, illiterates display both categorical knowledge and a hierarchical organization of categories.

However, when presented with a choice between a taxonomic and a functional relationship, both illiterate and poorly literate participants chose less frequently than more educated people the taxonomic relationship. In some of the classification tests, they also offered functional justifications for most of their choices (e.g., arm and leg were matched "because if I don't have my arm, I can't scratch my leg"), consistent with Luria's (1976) observations. Categorical thinking is thus strongly stimulated by schooling. Unschooled people tend to develop stories or narrative imagining and, in this sense, even illiterates exhibit what Turner (1996) called a "literary mind."

Obviously, contents knowledge is influenced by both literacy (since much information is acquired through reading) and schooling.

Memory

Illiterates use phonological codes in short-term memory (Morais et al., 1986). However, the illiterates' and ex-illiterates' short-term memory span is far smaller than the span displayed by literate adults. The superior capacity demonstrated by the schooled people may be linked to experience and organizational processes obtained through schooling or through literacy activities or both. It is also possible that the ex-illiterates' low reading ability does not allow the automatic activation of orthographic representations in verbal memory tasks.

Comparing forward digit and Corsi's block spans, we found an interaction between schooling and material (work in progress in collaboration with Grimm-Cabral, Penido, and dos Passos): only unschooled subjects were better for the visuospatial than for the verbal span. Lack of automatic activation of orthographic representations provides a potential explanation of their verbal span inferiority. Besides, ex-illiterates did not exhibit the length effect displayed by literate participants in verbal span. Thus, there seems to be a schooling effect, but not a specific effect of literacy, on either verbal rehearsal or mapping of phonological representations to output plans (cf. recent data on the development of the word length effect in children in Henry et al., 2000).

In the running digit span task, involving two mechanisms, the phonological loop (necessary for sequential storage and rehearsal) and the central executive (concerned with information updating), illiterates and ex-illiterates obtained similar scores. Thus, the executive component of working memory would not be selectively affected by literacy.

Illiterates were compared to Qur'anic literates for recall of studied lists of words (Scribner and Cole, 1981). There was no literacy effect for recall in any order, but the literates, possibly influenced by the incremental method of learning the Qur'an, were better for ordered recall.

Finally, immediate sentence recall is as good in illiterate as in university people (Ardila, Rosselli, and Rosas, 1989).

Executive Functions

The ability to inhibit irrelevant information and to selectively attend to one dimension of the stimulus is affected by schooling. In visual speeded classification (cf. Garner, 1974), illiterate unschooled subjects showed some difficulty at selectively attending to the form dimension when color varied orthogonally (e.g., green or red squares vs. green or red circles) (Kolinsky, 1988). Given that most illiterates can identify digit symbols, we also used a digit Stroop test. Literate participants were significantly faster than illiterate and ex-illiterate ones, but the size of the interference effect observed in the incongruent condition (e.g., to respond "three" when presented with "222") and of the facilitation observed in the congruent condition (e.g., "22") did not vary between the groups.

Planning ability was evaluated with the Tower of London test (cf. Shallice, 1982). In this test, a start state, consisting of a set of three differently colored disks placed on pegs, has to be reconfigured into a goal state in the fewest moves possible. The main constraint is that participants can only move one disk at a time. Thus, a sequence of moves must be planned, monitored, and possibly revised. In some trials, an incorrect move suggested by a local resemblance with the goal state has to be inhibited. The results showed no significant difference between illiterate and ex-illiterate participants in either number of movements or time of execution. However, in number of movements, though not in time of execution, literate participants performed better than unschooled ones.

Reasoning

Goody (1968) considered literacy to be a precondition for syllogism. Luria (1976) reported that illiterates could not perceive the logical relation between the parts of the syllogism. According to Scribner and Cole (1981), logic problems demonstrated the strongest effects of schooling, but neither Vai nor Arabic literacy had an effect on the number of correct responses or on theoretical justifications. However, examining illiterates in Brazil, Tfouni (1988) noticed that some of them could understand and explain syllogisms after displaying the behavior described by Luria.

A clear case of schooling influence concerns "intelligence" tests, among which are the Raven Progressive Matrices. As indicated by Neisser

(1998), some Matrices items may require "a special form of visual analysis . . . : each entry must be dissected into the simple line segments of which it is composed before the process of abstraction can operate" (p. 10). As indicated below, this kind of visual analysis is strongly influenced by schooling so that the sources of the unschooled people's inferiority in intelligence tests may be multiple. More important, we did not obtain significant differences between illiterates and ex-illiterates in these tests. (Cary, 1988; Verhaeghe, 1999).

Visual Cognition

According to Luria (1976), in unschooled people "neither the processing of elementary visual information nor the analysis of visual objects conforms to the traditional laws of psychology" (p. 22).

The first part of this claim is clearly unmotivated. Examining low-level feature extraction in an indirect way (i.e., through the occurrence of illusory conjunctions), we observed a clear developmental effect (Kolinsky, 1989), but no difference at all between illiterate and literate adults (Kolinsky, Morais, and Verhaeghe, 1994).

The second part of Luria's claim deserves more extensive comments. When conscious analysis of the figure or selective attention to one of its parts is required by the task, differences between unschooled and schooled, literate, people are observed. This was the case for recognition of incomplete figures (Luria, 1976; Verhaeghe, 1999), identification of hierarchical figures (identified more frequently at the local than at the global level; Verhaeghe, 1999), and part verification, in which unschooled adults displayed poorer scores than second-graders (e.g., see Kolinsky et al., 1987). Recognition of superimposed figures seems far better succeeded: especially in a detection task on geometric material, the unschooled subjects' performance was almost perfect (Verhaeghe, 1999).

However, the reported differences between schooled and unschooled people on "visual cognition," that is, explicit visual analysis (Kolinsky and Morais, 1999), should not be interpreted as resulting from literacy, since illiterates and ex-illiterates were equally poor. There was one exception: ex-illiterates displayed better mirror-image discrimination skills than illiterates (Verhaeghe and Kolinsky, 1992). However, this literacy effect seems related to the fact that our writing system includes mirror-image letters like "b" vs. "d" (see Gibson, 1969, for a similar suggestion). Readers of a written system that does not incorporate mirror-image signs (the Tamil syllabary) are as poor as illiterates in discriminating mirror-images (Danziger and Pederson, 1999). More important, other activities (e.g., lace-making) drawing the observer's attention to the left-right orientation of the stimuli may promote mirror-image discrimination as well (Verhaeghe and Kolinsky, 1992). Thus, no genuine, specific effect of literacy is observed in visual cognition.

The Literate Mind and the Modular Organization of the Mental Capacities

Coltheart's (1999) view of the organization of the input cognitive systems includes separate modules for spoken language, written language, and image processing. Within each of these modules there are interlevel interactions, but the modules are encapsulated from each other.

Among other relevant findings, those reviewed here on specific literacy effects and on schooling effects cast doubt both on the autonomy of the three mentioned modules, especially between spoken and written language, and on absolute internal interactions. It seems more appropriate to consider, on the one hand, autonomous processes for spoken and for written language at the early perceptual level, and, on the other hand, interactions between spoken and written language at higher (postperceptual) levels of processing. The postperceptual processes include recognition strategies and intentional analyses. Spoken language postperceptual processes are affected by literacy. Nonlinguistic visual postperceptual processes may be influenced by schooling and other special training, but do not depend in a specific way on literacy.

Conclusion

The empirical evidence reviewed above, albeit fragmentary, should contribute to drawing the portrait of three distinct cognitive concepts, namely, of the literate mind, the educated mind, and the universal mind. The finding of significant differences in ex-illiterate people compared to illiterate people points to specific characteristics of the literate mind. The observation of significant differences in people who completed a high degree of schooling compared to unschooled people (who include both ex-illiterates and illiterates) demonstrates specific characteristics of the educated mind. Finally, similar data from all these populations argue for universal characteristics of the human mind.

It is only for metaphonological knowledge, especially phoneme awareness, as well as for some processes involved in speech recognition (and, obviously, for literacy abilities), that the illiterates differed clearly from the ex-illiterates. Thus, the specific characteristics of the literate mind seem to be restricted to only a few aspects of the language capacity. However, one should not forget that these aspects of language are of overwhelming importance. Moreover, literacy is a main avenue to education: according to present cultural standards, illiterate people can hardly be cultivated people. Most domains of expertise are out of reach of illiterates. We thus strongly invite cognitive psychologists to take the study of literacy effects into high consideration.

Schooling effects also deserve systematic investigation. As a matter of fact, dramatic differences were obtained in either performance or processing strategies comparing both illiterate and ex-illiterate people to "literate" ones, actually to people who have reached a high level of schooling. The superior abilities of the educated mind involved lexical knowledge, verbal repetition (the results mentioned may, however, be due to the insufficient literacy level of the ex-illiterate participants), categorical thinking, verbal memory (possibly organizational processes and rehearsal), resolution of logical problems, explicit analysis of visual features and dimensions, and some planning components of executive processes.

Finally, the present findings support the hypothesis of universality of a significant array of capacities. These include the early processes of speech and visual perception, as well as the organization of semantic information in terms of hierarchical taxonomic categories, and the inhibition of information that is incongruent with the one relevant to the task.

Given that our present aim was mainly to examine the literate mind, the set of studies mentioned here did not address the characteristics of either the educated or the universal mind in an exhaustive way. It is worth recalling here that Mehler and Dupoux (1994) offered a rather comprehensive account of the universal characteristics of the human mind. In particular, Mehler's own experimental work has shown how the study of neonate cognition is crucial to assessing these universal characteristics. Of course, evidence on the final, adult state is important as well. But we believe that the evidence reviewed here shows that future cognitive work on human adults should distinguish more carefully than has been done in the past between the literate, the educated, and the universal mind.

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