

Extension of Luria's Psycholinguistic Studies in Poland

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One of Luria's basic interests was the organization of human cognitive processes, and thinking in particular. He believed that language and thought are closely related, and hence the manner in which we speak reflects the way we think. To verify this assumption, he and his collaborators performed a number of interesting psycholinguistic experiments with subjects of various ages and cultural backgrounds. The tasks used made the evaluation of both receptive and expressive language possible. The Narrative Ability Test described here stems from Luna's observations to a considerable degree. The test was administered to preschool children (N = 106), schoolchildren (N = 143), adolescents (N = 89), adults (n=126), and older persons (N = 175). Findings of the 20-year studies with normal and deviant populations indicate close relationships among thought, language, and self-control. It was found that difficulty in developing narratives corresponds with a disability to process complex information. Correlations between narrative skills and age, sex, and social background were also noted.

INTRODUCTION

During my 1974 visit to Professor Luria's laboratory, some of us were asked by our host to read manuscripts of his two latest books (Luria, 1975, 1979) and to give our comments. Unfortunately, I was too young and too shy at that time to express any criticism, even though I did not share the professor's fascination with Chomsky's (1965) model of transformational generative grammar. Besides, I ascertained that this fascination was not deeply rooted and sometimes meant simply the replacement of the old terms. For example, the term *deep structure* was used in place of inner speech, yet its sense remained the same as in older books by Luria (1966, 1970).

At the same time, I found Luria's considerations on relationships among language, thought, and behavior discussed in the text *Language and Cognition* (1979) extremely interesting. The book revealed to me other facets of Aleksandr Romanovitch's broad research, namely, his interest in developmental as well as cultural psychology. The studies, performed in Central Asia with another prominent Soviet psychologist, L. S. Vygotsky, showed that a number of logical problems, with which most of us struggled at school, had little to do with the way people process information in natural circumstances (Luria, 1976, 1979). Accordingly, peasants who were not taught to accomplish such tasks simply refuse to solve them. This finding was further confirmed in the experiments carried out in Poland by Tlokinski (1995), who used techniques elaborated by Zeigarnik (1962), a close collaborator of Luria's and Vygotsky "s. Tlokiriski

examined schoolchildren, manual workers, and college students, giving them varied linguistic tasks that included statements expressing spatial and time relations, double negation, conversion of time, formal similarity of subject and object, comparison, and possession. Other tasks required evaluation of figurative phrases as well as assessment of relations occurring among words presented to the subjects. It was found that all the preceding tasks were difficult for the uneducated persons.

These findings are of great importance in connection with another significant aspect of Luria's studies: his investigation of the role of language in the regulation of human behavior (Luria, 1961,1979). He performed a number of experiments with both normal populations of children and populations of children who were developmentally retarded to verify the assumption that language is responsible for our ability to plan and to control our actions. This conjecture was further pursued in a series of studies on patients with brain damage, with special emphasis on the frontal lobes (cf. Luria, 1966)

One word of comment may be needed here. It is well known that Luria devoted much of his research to the investigation of aphasic disorders (Luria, 1970,1975). This was closely connected with his belief that we may learn about the nature of psychological processes only when they are disrupted. Otherwise, their course is so smooth and fluent that we are not able to see that they constitute a complex chain of interconnected functions. It might be worth mentioning that Luria stressed the need to revise his classification of aphasia, pointing to its neurophysiological basis, because he believed that linguistic factors should be taken into account first.

I had a chance to present my own views on the subject in question and was warmly supported by him to conduct a further study in that direction. The neurolinguistic dichotomy of aphasic impairments, which I finally arrived at, has been presented elsewhere in Polish (Kaczmarek, 1995a). I decided not to discuss it in the present article because, first, it would require too much space, and, second, we are focusing on psycholinguistic aspects here. Furthermore, those matters will be discussed in some detail in the book *The Communicative Brain*, which I am currently writing. Hence, we shall concentrate on relations among language, thought, and behavior in this article.

LANGUAGE AND THOUGHT

It is commonly assumed that the way we think is reflected in the manner in which we speak. This assumption seems to be confirmed by observations of people who do have problems with formulating their ideas. They often create awkward and odd constructions, such as "I had to activate my pocket," meaning "I had to pay it," or "It made me direct my thinking toward those matters" instead of "I have thought it over."

Numerous examples of this kind of language can be found in the formal speeches of former party secretaries. Thus, one of them complained, "Accuracy of our words is missing," while trying to say that people did not want to listen to them any longer. The other described the audience's lack of interest with the words "They were conspicuously absent in debate." There are also examples of words losing their true meaning, as in the following utterance: 'The

situation is good but not hopeless," which is a reflection of the official optimism (see Magicrowa and Kroh, 1995).

Obstacles in the proper use of language are largely due to the fact that most of our utterances are figurative in their nature (cf. Lakoff and Johnson, 1980). Hence, to communicate efficiently, we need some general knowledge besides good linguistic skills. Accordingly, children, who lack such experience, tend to interpret a number of statements literally, to the surprise of adults, who do not consider their utterances to be metaphoric. This may lead to some awkward situations, as in the case of 4-year-old Ola, who stated, "Mummy, you said that uncle was on aunt's neck and he is seating on the chair" (Chukovsky, 1962, p.152).

To investigate the matter further, I and my colleagues undertook a study that was to show how children come to understand proverbial structures. The preliminary results (unpublished data) indicate that even 6-year-olds are not able to go beyond the literary meaning of a particular proverb, and some of them give unexpected interpretations. Following are some examples of the most common comments:

1. *Make haste slowly*- "That you should not go fast but slowly," "Run slowly." "That snails go slowly," or even "Do not run across the street."
2. *Never look a gift horse in the mouth*•- "Do not look a naughty horse in the mouth," "Do not look as it may bite you." or "Because its teeth are dirty."
3. *Strike while the iron is hot*- Most children simply repeated the sentence, often adding: "Otherwise it will get cold." Some stated that "The iron gives heat" or that "The sun is hot," which shows that they gave attention to individual words only. Some loosely connected statements also appeared, such as the following: "Iron till the electricity is not out."

An ability to properly explain the meaning of a given proverb increases with age, yet even some adults have problems with their understanding. Such difficulty seems to be connected with the level of education or, rather, with the linguistic experience of a particular individual (see also Ttokiriski, 1976, 1995).

LANGUAGE AND BEHAVIOR

Many psychologists stress the significance of language in programming and performing willful actions. The importance of language for the mediation of human behavior has been heavily stressed by Luria (1961, 1979). The main idea behind his research is that a child is at first instructed to do various tasks by an adult, then learns to give him- or herself linguistic commands. These self-instructions are at first uttered aloud and then gradually take the form of internal covert instructions.

On the basis of Luria's writings, four stages of development of the regulatory function of language can be distinguished:

1. Between the ages of 1 and 2 years, instructions given by an adult do not play the regulatory role as yet, and they may lead to a paradoxical reaction because a child is not able to stop an action he or she was asked to complete. Thus, if an 11-month-old child occupied with putting colored circles on a stick is told to stop, he or she will continue putting them on, and a louder command will only hasten the original action. A child may also start reaching for an object in reaction to the instruction of an adult, but he or she might eventually grasp the object that is more brightly colored and thus attracts his or her attention.
2. An ability to inhibit a motor action is established at the age of 2 years, but children have problems with fulfilling more complex instructions. In particular, they are not able to stop from an immediate action after being given a command: "When the light appears, press the bulb." They simply squeeze the bulb. not waiting for the light to appear.
3. The child older than 3 years is capable of inhibiting the motor reactions, but he or she is not able to discriminate the responses in accordance with the color of the stimulus lights. Hence, if the child is asked to press a rubber bulb in reaction to the red light, and not to press it when the light is blue. he or she cannot refrain from pressing it whenever any of the lights appears. Also. self-commands "press" and "don't press" are not of any help because both trigger the motor response regardless of the meaning. This is so even though the child can repeat the instruction and explain it. If, however, the same commands are given by an adult, the child is able to accomplish the task. This shows that a child's behavior can be controlled by the adult, which is in accordance with Vygotsky's (1962) basic conjecture.

At the same time, Vygotsky stressed the importance of a child's own utterances in formulating a plan of the ongoing action. In this respect, he opposed Piaget's (1970) idea of "egocentric speech." Contrary to the famous Swiss psychologist, he believed that the utterances produced by a child during play are an important step in his or her social development and do not reflect a lack of contact with his or her surroundings.

4. The final stage in establishing the regulatory role of verbal instructions takes place between 4 1/2 and 5 years of age, when the meaning of words prevails over their impulsive aspect. This allows inhibition of unnecessary movements in accordance with the verbal command. Moreover, "egocentric speech" disappears at about this age, and a child does not need to utter the self-instructions anymore.

Luria also pointed out that such development coincides with the first stage of maturational sprout of the frontal lobes.

Luria's theory has received some criticism, particularly his ideas of the dominance of the verbal system over motor behavior, and its developmental aspects (Bloor, 1977). Certainly, it is disputable whether language is responsible for the specificity of the human brain action or if the specific organization of the nervous system is responsible for language. As Bloor says, "If language does indeed regulate, the question can be asked: what regulates

language?" (p. 80). At the same time, he writes that Luria's theory is concerned mainly with the relations and dispositions of functional various subsystems of the human brain and not with their origin. Therefore, it is perfectly legitimate to hold that the verbal system is the best information processor within the brain, which makes it capable of controlling other systems' action.

A relationship between language and self-control was investigated by Pontius (1974). She noted a close correlation between narrative skills and the ability of a child to control his or her own behavior. Such a correlation was also observed in some cases of conduct disorders in adolescents (Pontius and Ruttinger, 1976), which caused the authors to discuss frontal lobe maturational lag in the juvenile delinquents.

Pontius pointed to Luria (1966, 1975). who noted that planning activities and maintaining a course of action, particularly modifying one's actions to conform to changing environmental demands, are severely disturbed after frontal lobe lesions are sustained. This finding is corroborated by the increasing ability of children to plan, organize, and perform complex tasks as the prefrontal cortex matures. Similarly, patients with frontal lobe injuries who manifest difficulty in behavioral regulation show a considerable impoverishment of their language output.

My studies (Kaczmarck. 1984, 1987, 1993b) have shown a notable simplification of the grammatical structure of narrative language following frontal lobe injury. An analysis of the syntactic as well as the semantic complexity of verbal narratives reveals several variants of the frontal lobe syndrome. Accordingly, clear-cut differences have been noted among the structures of the narratives elicited (1) from patients with left dorsolateral lesions, (2) from patients with orbitofrontal lesions of the left frontal lobe. and (3) from patients with right frontal lobe damage:

1. Most typical of patients with left dorsolateral prefrontal lesions is a difficulty in developing narratives, combined with a strong tendency to persevere individual statements. This is accompanied by a considerable simplification of syntactic structure of their utterances.
2. Left orbitofrontal lesions are commonly followed by a strong tendency to digress from the main topic, which frequently leads to confabulation. Verbal fluency is high, and the grammatical structure more complex, but the subjects exhibit difficulty in controlling a proper course of their verbal output.
3. Characteristic of right frontal lobe lesions are problems in sequencing a story and misinterpretation of events. At the same time, a tendency to overuse stereotyped phrases can be observed.

The impairments of the verbal output correspond to behavior disorders observed in subjects with frontal lobe lesions. Thus, left dorsolateral injuries are followed by considerable difficulty in carrying out any activity, while left orbitofrontal damage leads to inability to maintain a course of action, and to react to any external impulse. On the other hand, patients with right frontal lesions demonstrate disorientation in place and time as well as an inability to evaluate their true condition.

The diagnostic value of the linguistic structure of verbal utterances was also demonstrated in a series of Australian studies (Morice, 1986; Morice and

McNicol, 1985). A careful analysis of language samples elicited from patients with schizophrenia, performed with the use of computer programming, revealed a considerable simplification of their verbal output. This finding made the authors look for a probable frontal lobe deficit underlying schizophrenia.

Their findings were further confirmed by my research (Kaczmarck, 1993a, 1998). At the same time, I found that deficits characteristic of frontal lobe dysfunction correlate with the severity of psychotic symptoms and that they are more pronounced in persons with schizophrenia who exhibit aggressiveness.

Thus, one can conclude that because it is objective and it may be easily performed empirically, language analysis can serve as a convenient diagnostic measure of brain functions.

NARRATIVE ABILITY TEST (NAT)

If we look at any textbook on psychiatry, we can easily see that the majority of classifications of thought disorders are based on analysis of statements uttered by HI subjects with psychosis. This is reflected in such terms as incoherence, peculiar verbalizations, confabulations, SM flippant responses, echolalia, neologisms, and pressure of speech, which in fact refer to language abnormality. Evaluation of thinking is also one of the basic problems psychologists encounter. Because it is impossible to study this process directly, we are forced to do so indirectly. Most techniques used so far aim at the assessment of problem solving or creative thought. In effect, we learn little about the way an ordinary person thinks in everyday situations. Yet, as pointed out previously, an analysis of the structure of narratives produced by examined subjects can yield a considerable amount of information on their intellectual abilities. This finding prompted the creation of the Narrative Ability Test (NAT), aimed at the evaluation of thinking. The test stemmed from our more than 20 years of research on deviant populations (Kaczmarck, 1984, 1987, 1993a, 1993b). At present, however, we are trying to adapt it for the evaluation of normal populations, with emphasis on developmental aspects of cognition.

Accordingly, the test was administered to preschool children (aged 3-6 years, N = 106), schoolchildren (aged 7-11, N = 143), adolescents (12-18, N = 89), adults (19-45, N = 126), and older persons (65-96, N = 175). Persons with various educational levels and social backgrounds were included, and the ratio of women to men was 3 to 2. In this way, the development as well as the deterioration of narrative abilities during the human life span could be recorded. Yet, the groups were varied and not all the tasks were given to each subject, which does not enable a careful statistical analysis. Therefore, only general trends are presented here.

The test is administered individually, and all the utterances of a given subject are tape-recorded and then transcribed verbatim. Three types of tasks are used to elicit the subject's responses:

1. Reproducing a story
 - a. that is told by an examiner
 - b. that the subject read
2. Sequencing a picture story

- a. arranging the pictures to form a story
 - b. describing the story
3. Talking about a given topic
- a. relating to subjects' personal experience (hometown, family)
 - b. of a more general interest (mountains, sea)

The semantic and syntactic structure of each narrative is then analyzed. So that the content can be analyzed quantitatively, a number of propositions have been distinguished in each story. The propositions are chunks of information that the story contains. The two stories selected for the test from the nine used originally in our experiments are given next. Naturally, no propositions are singled out in the third task because the subject must construct a whole narrative in that case.

The Two Narratives

The Bear and the Rabbits

- A. The picture story (Fig. 1)
- B. B. Propositions

1. The bear meets two rabbits.
2. He invites them into the forest.
3. The rabbits are following him into the forest.
4. The bear is climbing the tree to get some honey.
5. The rabbits are waiting near the tree.
6. The bear is attacked by the bees.
7. The bear is falling down.
8. The rabbits are laughing at him.
9. The bees are attacking the bear and the rabbits.

The Gardener and the Bear

- A. The story presented to the subjects

Once, a gardener met a bear in the forest. He had been very frightened at first, but the bear wanted some company and he invited the gardener to have some berries. The gardener also was fed up with his loneliness, so he invited the bear to his home. They got on quite well together. The gardener was working in the garden, and the bear was cooking. The bear, however, liked to catch flies. One day, when the gardener was sleeping in the garden, a fly sat on his nose. The bear wanted to kill the fly. but it managed to get away each time. The bear got very angry, he got a big stone and hit the fly with it. Killing the fly, he killed the gardener as well.

- B. Propositions

1. A gardener met a bear in the forest.
2. The bear invited him to have some berries.
3. The gardener invited the bear to his home.
4. They were living together.
5. The bear liked to catch flies.
6. A fly sat on the gardener's nose.
7. The bear wanted to kill it
8. He hit the fly with a stone.
9. Killing the fly, he killed the gardener, too.

Experimental Procedure

The preceding procedure enables an analysis of both the content and the grammatical structure of the stories produced by individual subjects. At the same time, the textual (discourse) structure of the narratives can be evaluated. In addition, each subject is asked to state the moral of the story, which enables an assessment of his or her level of abstract thinking, while sequencing a picture story shows the manner in which the complex material is processed.

Semantic Structure of the Narratives

The most common content deformations observed in the narratives produced by the examined subjects are presented in Table I.

Plus marks in Table I indicate that a given phenomenon occurred in the group examined. It can be noted that preschool children are not able to develop their narratives as yet. They digress from the main topic and perseverate, displace, and omit propositions. Besides, they cannot give the moral of a story and tend to confuse events and characters presented in the picture. They also exhibit difficulty in sequencing a picture story and often turn to the examiner to provide them with a plan of the narrative.

A significant difference between 3- to 4-year-old children and 4 1/2 to 6-year-olds can be noted. Namely, narratives of the younger group lack any planning. Children either talk about the most distinct (e.g., brightly colored) elements in the given picture or digress to the events they happened to experience. In effect, they tell a story that has no connection with the topic in question. The older group of preschool children try to describe the events shown in the picture and often turn to the examiner for help in case of difficulty.

The same is true of young schoolchildren, but some of them (especially those having educated parents) are better in producing narratives.

Narrative competence is established in adolescence, although the youths still exhibit a tendency to displace and miss propositions. They also show an ability to state the moral of a story. Characteristic of that period are also *phatic** comments, which enable the speaker to maintain contact with the interlocutor and to gain time required for processing information. The phatic comments do not convey meaning, taking a form of general statements such as

"Wait a moment" or "Let me see what comes next." Our experiments indicate that the use of such comments reflects a high level of linguistic and cognitive functions.

Phatic comments are also typical of the adults. At the same time, adults exhibit a strong tendency to add general remarks that have no direct connection with the main topic (e.g., "As you know, the bears like honey very much" or "The rabbits cannot climb trees; therefore, the bear did it"), but give comments on the situation described in relation to their own life experience. A relationship between the level of education and the level of performance could be noted also in that group.

A considerable deterioration of the ability to communicate can be observed in older persons. In this respect, they are similar to subjects with frontal area lesions. They have problems with developing their narratives, which in effect are characterized by numerous repetitions, digressions, and misinterpretations. In most cases, these individuals digress to tell the examiner about their previous experiences that arouse their emotions. Furthermore, they not only miss essential chunks of information, but often get them mixed up.

Another significant feature is an inability to give the moral of the story. Instead, they offer a straightforward interpretation (e.g., "Do not go where you are not allowed to"). In addition, a difference between the older men and women can be observed because the men often put the pictures in the wrong order, yet they usually find a logical explanation for the proposed sequence. This might reflect the ways in which women and men used to be raised, especially because no such differences are found in the young population. It might be worth noting that healthy older persons are much better at accomplishing the test than those who have various diseases, even though the latter may be younger. In summary, an analysis of the content of narratives reveals that an ability to unfold a story depends significantly on the subject's age, educational level, and neurological status. This means that all these factors—developmental, social, and medical—need to be taken into account while one is evaluating a particular person's skill in telling a story.

Syntactic Structure of the Narratives

The efficiency in processing the information corresponds with the linguistic complexity of utterances. Table II shows that simple, unextended sentences prevail in preschool children's narratives because such sentences constitute almost half of all their utterances. Moreover, no extended sentences are produced by children at that age, and the ratio of simple sentences to all the embedded structures (i.e., extended and complex sentences) is 3.3 to 1. In addition, the percentage of compound sentences is almost twice that of complex ones. A reminder: The prevalence of simple structures has proved to be a mark of difficulty in language processing (see Kaczmarek, 1984, 1987, 1993a, 1994, 1995a).

The utterances produced by young school children are more complex. First, the percentage of simple sentences drops to 28, and, second, extended sentences appear. In effect, the ratio of simple to embedded structures is 1 to 1. Yet, compound sentences still prevail over the complex ones. At the same time, the

number of nonfinite clauses, often consisting of one word only is high in both groups.

In adolescence, a considerable increase of the complexity of narratives can be noted. In consequence, the ratio of simple to embedded sentences is reversed into 1 to 4.6, which is the result of a considerable increase in the number of complex sentences. A notable decrease in the number of nonfinite clauses can be observed also (see Table II).

Adults' utterances are also complex. The ratio of compound to complex sentences is similar to that occurring in the adolescent group, but the number of embedded structures drops and only slightly exceeds the percentage of simple sentences (ratio 1:1.3). Nevertheless, the proportions of nonfinite clauses remain the same as in previously described groups. This might be because about one-third of the adult group constituted subjects with little education.

A considerable simplification of utterances of older persons confirms their difficulties in formulating thoughts. Hence, a very high percentage of nonfinite clauses as well as of interjected phrases and sentence fragments appear. Moreover, the ratio of simple to embedded sentences is similar to the proportions stated for preschool children with an even higher predominance of simple structures (4:1). At the same time, the number of complex sentences is almost three times lower than that of compound ones. This is especially true of subjects who have health problems.

These findings suggest that grammatical structure corresponds with a high level of thinking, whereas the poverty of thought also means the poverty of language.

DISCUSSION

Our findings show that the narrative ability unfolds along with the cognitive development of a given individual. This unfolding depends not only on age, but also on general health, neurological status, and a capability to cope with life's problems-hence, the difficulties encountered by deviant groups. Accordingly, significant differences have been found among the test scores of patients with brain damage; those with epilepsy; those with schizophrenia; juvenile delinquents; children with learning difficulties; and the matched healthy subjects. The significance level was .05 or even .001, depending on the groups being compared.

In addition, a significant correlation between the performance on the Raven Progressive Matrices and the scores of the NAT has been stated at the .01 or even the .001 level (in the case of some tasks) as measured with the Spearman rank correlation coefficient. This finding confirms the assumption that the NAT measures an ability to process complex material that requires a considerable level of abstraction.

Another significant factor having a bearing on linguistic skills of a given individual is education or, rather, a person's social class. Thus, children of educated parents are much better in telling stories than are children coming from the working class. A considerable discrepancy between an ability to narrate (and to plan one's activity) can also be noted between the pupils attending grammar

school and those attending vocational school. The latter not only exhibit a considerable poverty of language, but they prove to be unable to accomplish most intellectual tasks that Piaget (1970) invented to examine children. At the same time, many less educated adults appear not to be able to unfold a narration.

In other words, generating stories proves to be difficult for people using a restricted code (cf. Bernstein, 1960). It seems, therefore, that not all adults reach the highest level of abstract thinking, as it is presumed by some academically minded psychologists. In effect, they may have difficulty with appropriate processing of the information they receive from an outside world. Because that world becomes more and more complicated, the information to be processed often is too complex for people using a restricted code. Hence, they are apt to look for simple, straightforward solutions of the problems they encounter. This may be one of the reasons why nationalistic ideologies have become so popular in recent years along with the complication of our surroundings.

As mentioned earlier, the social and developmental features of thought and language were studied by Luria and his collaborators at the beginning of the 20th century. Our own studies dwell upon this lesser known aspect of his interests and aim at the refinement of the original techniques. At present, we have discussed the tasks that allow evaluation of expressive language, but we are also working on the tasks that would enable assessment of the receptive language.

One of them is the interpretation of proverbs, which unfortunately, allows only a qualitative analysis. Therefore, to ensure a precise quantitative calculation, we ask the subjects to select the statements that best match a given aphorism out of three sentences provided by the examiner. Only one of the sentences reflects the true sense of the proverb, the other is its paraphrase, and the third simply uses the same words but conveys a different meaning.

Another task requires the subject to supply the missing words in a story. There are several versions of this task (e.g., in one of them, the words are easy to guess, and in the other, the subjects must use their imagination). At the same time, control groups have been introduced to verify the validity of particular tasks. As could be expected some of the proverbs originally used by Soviet authors were difficult to interpret, even by healthy people. Those proverbs were excluded from the final version.

In sum, the aim of the present article was to remind the reader of some of the hitherto neglected aspects of Luria's research. They certainly are worthy of presentation because they constitute elementary components of his scientific outlook. In fact, they were essential for further development of his neuropsychological studies. As Luria used to say: "In order to learn more about human cognitive functions we must study both their unfolding and disruption."

REFERENCES

