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A.V. ZAPOROZHETS

The Development of Perception and Activity

While perception orients the practical activity of a subject, at the same time, its development depends on the conditions and nature of this activity. This is why in the study of the genesis, structure, and function of perceptual processes, a "praxiological," to use J. Piaget's term, approach to the problem becomes very important.

For a long time, the interconnection of perception and activity have virtually been ignored in psychology: perception was studied separately from practical activity (various trends in subjective, mentalist psychology), or activity was investigated independently of perception (strict behaviorists). Only in recent decades have the genetic and functional connections between them become the object of psychological research. Proceeding from well-known philosophical notions of dialectic materialism concerning the role of practice in cognition of the environment, at the beginning of the 1930s, Soviet psychologists (B.G. Anan'ev, P.Ia. Gal'perin, A.N. Leontiev, A.R. Luria, B.M. Teplov et al.) set out to investigate the dependence of perception on the nature of a subject's activity. In a similar vein, we carried out an ontogenetic

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study of perception with colleagues from the Institute of Psychology and the Institute of Preschool Education.

The specifics of children's practical activity and changes in their age apparently influence the ontogenesis of human perception in a substantial way. Neither the activity as a whole nor the perceptual processes involved in it develop spontaneously. Their development is determined by the conditions of life and education, in the process of which, as L.S. Vygotsky has correctly pointed out, the child acquires social experience that has been accumulated by previous generations. In particular, specifically human sensory education presupposes not only adaptation of perceptual processes to one's individual living conditions but also the acquisition of systems of sensory standards developed by society (including the conventional scale of musical sounds, a system of phonemes in various languages, systems of geometric forms, etc.). An individual uses the acquired sensory standards to examine a perceived object and to evaluate its properties. Such standards become the operational units of perception. They mediate the child's perceptual actions in the same way as tools mediate his practical activity, and word mediates his mental activity.

According to our hypothesis, perceptual actions not only reflect the actual situation but also, to a certain extent, anticipate transformations in it that might occur as a result of practical actions. Due to such sensory anticipation (essentially differing, of course, from intellectual anticipation), perceptual actions are capable of establishing the closest perspectives of behavior, regulating it in accordance with the conditions and tasks confronting the subject.

Although our studies focused primarily on the child's processes of vision and touch, it seems that the regularities we have established have broader significance. As our colleagues' research has demonstrated, such regularities also manifest themselves in special ways in other sensory modalities (aural and kinesthetic perceptions, etc.). We studied the dependence of perception on the nature of activity: (a) in the area of the child's ontogenetic development and (b) in the area of functional development (i.e., in the process of the formation of various perceptual actions under the influence of sensory instruction).

Our studies in the ontogenesis of perception (Zaporozhets et al., 1967; *Perception Development in Early Childhood and Preschool Years* [Razvitie vospriiatiia v rannem i doshkolʹnom detstve], 1966; *Sensory Education of the Preschoolers* [Sensornoe vospitanie doshkolʹnikov], 1963; *Preschooler's Perception Forming* [Formirovanie vospriiatiia u doshkolʹnika], 1967), as well as the studies of other authors, testify to the existence of complex interrelations between perception and action that change over the course of a child's development. According to N.M. Shchelovanov's data (1955), in the first months of a child's life, the development of sensory functions (in particular, the function of distance receptors) precedes the ontogenesis of somatic motions and considerably influences the formation of the latter. M.I. Lisina (1966) discovered that an infant's orienting reactions to new stimuli reach great complexity very early and are realized by an entire complex of different analyzers.

Although at this stage the orienting movements (e.g., eye orienting movements) reach a relatively high level, according to our data (Zaporozhets et al., 1967), they fulfill only the function of orienting setting (they set a receptor for perception of a specific kind of signal), but not the function of orienting research (they do not inspect the object and they do not simulate its properties).

As demonstrated by the studies of L.A. Venger (1962), R.L. Fantz (1966), and others, by the first months of life, such reactions already serve as a rather subtle orienting recognition of old and new objects (differing in size, color, form, etc.). At this stage, however, the constant object-oriented perceptual images that are necessary for control of the complex and changeable forms of behavior have not yet formed.

Later, beginning at age three to four months, the child forms the simplest practical actions related to grasping and manipulating objects, to motion in space, and so on. The special characteristic of these actions is that they are directly achieved by body organs (mouth, hands, legs), without the aid of any tools. Sensory functions join in the service of these practical actions, reconstruct themselves on their basis, and gradually acquire the nature of orienting-researching, perceptual actions. Thus, studies by G.L. Vygodskaia (1966), H.M. Halverson (1931), and others reveal that beginning approximately in the third month of a child's life, the formation of grasping motions significantly influences development of the perception of an object's form and size. Similarly, progress in depth perception in children aged six months to one and a half years, revealed by E.J. Gibson (1963), is connected, according to our observations, with the practice of a child's movement in space.

The unique, direct nature of the infant's practical actions determines the specifics of his orienting, perceptual actions. According to Venger's data (1962, 1965), perceptual actions anticipate mainly the dynamic interrelations between the child's own body and the object-related situation. This takes place, for example, during the infant's visual anticipation of the course of his motion in a given circumstance, and his anticipation of perspectives for grasping the visible object with the hand. At this stage of development, the child first singles out the properties of the object that are directly turned toward him and that his actions directly encounter, while a totality of other properties, irrelevant to him, are perceived globally without differentiation.

Later, from the second year of life, under the influence of adults, the child begins to master the simplest tools, acting upon one object with another. As a result of this, his perception changes. At this genetic stage, perceptual anticipation becomes possible not only in terms of dynamic interrelations between the child's own body and the object-related situation, but also with respect to some transformations of relations between the objects (such as anticipation of the possibility of dragging a certain object through a specific opening, of moving one object with the help of another, etc.). Perceptual images lose their global and fragmentary features, characteristic of the preceding stage, and, at the same time, they acquire a more precise structural organization, more adequate to the perceived object.

For instance, in the area of perceiving form, a general configuration of the outline gradually emerges, which, first of all, delimits one object from another, and second, determines certain possibilities for their interaction in space (combining, superimposing, picking up one object with the help of another, etc.).

During the transition from early to preschool age (three to seven years old), children undergoing appropriate instruction begin to master some forms of specifically human productive activity, directed not only toward using objects that already exist, but also toward creating new objects (the simplest forms of manual labor, construction, drawing, clay-modeling, etc.). Productive activity poses new perceptual tasks for the child.

Studies of the role of construction activities (Luria, 1948; Podd′iakov, 1963, 1965; Sokhina, 1963; and others), and also of drawing (Boguslavskaia, 1966b; Sakulina, 1965; and others) in the development of visual perception show that under the influence of such activities, children learn complex forms of visual analysis and synthesis. They develop the ability to take an object apart visually, and then to unite it into a whole before actually performing this action. Correspondingly, the perceptual images of the form also acquire new content. Besides further refinement of the object's outline, its structure, spatial characteristics, and the relationship between its components emerge—things to which the child has paid virtually no attention earlier.

These are some experimental data testifying to the dependence of perception ontogenesis on the nature of practical activity in children of various ages.

As we pointed out earlier, the child develops not spontaneously but under the influence of instruction. Ontogenetic and functional developments constantly interact with each other. In connection with this, we can examine yet another aspect of the problem of perception and action, namely, the formation of perceptual actions during sensory instruction. Although this process acquires very different characteristics depending on the child's previous experience and age, nevertheless, it follows some general patterns and passes through certain phases that in some ways resemble those established by Gal′perin and other researchers in their investigations of how mental actions and concepts are formed.

During the *first stage* of the formation of new perceptual actions (i.e., when a child faces a completely new class of perceptual tasks that were previously unknown to him), the process begins with practical problem solving, aided by external, material actions with the objects. This, of course, does not mean that such actions are performed blindly, without any preliminary orienting. But insofar as orienting is based on past experience while the problems are new, at first, it proves insufficient. The necessary corrections are introduced in the process of a direct encounter with the material reality in the course of performing practical actions. Thus, the experimental data presented above testify to the fact that children of different ages, when encountering new tasks, such as pushing an object through a specific opening (Venger, 1968a) or constructing a complex whole from available parts (Luria, 1948), initially reach the desired result through practical probing. Only later do they develop the appropriate orienting perceptual actions, which initially also have an external large-scale form.

The studies we conducted in collaboration with Usova, Sakulina, Podd′iakov (*Sensory Education of the Preschoolers* [*Sensornoe vospitanie doshkol′nikov*], 1963) and others show that the rational setting of sensory instruction requires, first of all, the correct organization of external orienting actions directed at examining certain properties of the perceived object.

The experiments of Boguslavskaia (1966a), Venger (1968), Endovitskaia (1955, 1964), Neverovich (1954), Repina (1966a, 1966b), Ruzskaia (1966b), and others reveal that the highest results are achieved when, at the initial stages of sensory instruction, the necessary actions themselves—the sensory standards—offered to a child, as well as the models of the perceived object constructed by the child, are presented in their external, material form. This optimal situation arises, for example, when the sensory standards are given to the child as object-related patterns (strips of colored paper, collections of planar shapes of various forms, etc.) that he can compare with the perceived object in the process of external actions (putting them together, superimposing them on each other, etc.). Thus, at this genetic stage, a kind of external, material prototype for the future ideal, perceptual action begins to form.

During the *second stage*, sensory processes, transformed under the effect of practical activity, become a kind of equivalent of perceptual actions. Such actions are performed with the aid of motions of receptor apparatuses and anticipate subsequent practical actions. We will dwell only on some particular aspects of these processes and their genetic ties to practical actions.

The studies of Boguslavskaia (1961), Ruzskaia (1966a, 1966b), and others show, for example, that during this stage children become acquainted with spatial properties of objects with the aid of extensive orienting-researching motions (of the hand and eye). Analogous phenomena are observed in the course of formation of acoustic perceptual actions (Endovitskaia, 1959; Zhurova, 1965; Mukhina, 1966; Repina, 1966a, 1966b), as well as in the process of formation of kinesthetic perception of children's own postures and movements (Neverovich, 1954). At this stage, examination of the situation using the external movements of gaze, touch, and so forth, occurs prior to practical actions and defines their direction and nature. Thus, a child who has some experience in passing through a maze (experiments of O.V. Ovchinnikova, 1954 [reference missing in original text—Ed.] and A.G. Poliakova, 1958) can trace the way in advance using external movements of gaze or hand sensing in order to avoid dead-ends and maze barriers. Similarly, in Venger's (1968 A) experiments, after learning to pull various objects through openings of different forms and sizes, children begin to correlate the objects by merely moving their gaze from the object to the opening. After this preliminary orientation, they solve the practical task without a single mistake.

Thus, at this stage, external orienting-research actions anticipate the paths and results of practical actions, conforming to rules and limitations imposed by the latter.

In the *third stage*, perceptual actions contract, their time span shortens, their effector's components become inhibited, and perception begins to resemble a passive, inactive process.

Our studies in the formation of visual, tactile, and aural perceptual actions (Zaporozhets, 1963, 1967, 1968 [see the list of literature A.V. Zaporozhets, "Problema genesisa, funktsii i struktury pertseptivnikh deistvii," *Tretii vsesoiuznyi s″ezd obshchestva psikhologov SSSR*. Vol. 1]; Zaporozhets et al., 1967) show that at the late stages of sensory education, children acquire the ability to quickly recognize specific properties of an object without using any external orienting-researching movements. They learn to differentiate these properties from each other, reveal their connections and interrelations, and so on.

The available experimental data allow us to suppose that during the third stage, external orienting-research action transforms into ideal action, into the movement of attention across the perception field.

[. . .]

At the highest stage of formation of perceptual actions, genetic connections between the subject's perception and practical activity become apparent. Specifically, the rules of an *algorithm* for the ideal movement of attention across a field of perception correspond to the rules and limitations of those real actions, which were previously performed by the subject for the practical solution of an assigned task (such as passing through a maze, pushing an object through a specific opening, constructing a complex figure out of available elements, etc.).

[. . .]

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