

The development of voluntary attention in the child

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The problem of the nature and mechanism of voluntary attention and the general questions of the voluntary behaviour of man belong to one of the least accessible fields of the science of psychology. The difficulties associated with the problem of voluntary acts arise, undoubtedly, from the fact that the main principles upon which the scientific study of higher forms of behaviour are built have not been sufficiently worked out. The first important step towards the construction of a scientific theory of voluntary attention is made when we refuse to regard the higher forms of attention as immobile, completed phenomena, subject to direct research, and, instead of that, proceed to their genetic study.

The idea of development alone, taken as a methodological principle, cannot, of course, determine the direction to be taken by the research work. The conception of development may be interpreted variously. We may regard development either as the result of the unfolding of forces inherent in the nature of the given creature, or as the result of a concrete process of interaction of the organism and the environment. According to the point of view we choose, differences will be found in the comprehension of the phenomena studied, and, consequently, in the main method of research. Even in the latter case, however, when the development of the higher psychological functions is regarded as a result of interaction, there still remains a fundamental question – the question of the central factor determining this interaction.

If, on the one hand, we can take the genetic point of view as a sufficiently established one in contemporary psychology, on the other hand, the question of the principal factor lying at the basis of man's psychological development has also been decided in the main.

In particular, and in connection with the development of voluntary behaviour, the role of this factor, that is, the specific part played by the social environment of man, has more than once been indicated in psychology, and there exists a number of fully worked-out theories on this subject. Blondel's theory of will and Ribot's theory of voluntary attention are especially interesting in this connection.¹ Until lately, however, these theories had no place in the great psychological systems, and did not constitute an organic part of any one integral structure, which, creating this whole,

would at the same time acquire significance as a part of the whole. In this respect the fate of Ribot's theory of attention is typical. In present-day psychology this theory is shown persistently from one side only, that is, as a 'motor' theory, while the other, and from our point of view much more important side – bringing out the sociogenetic conception of voluntary attention – remains in the background. Obviously, it does not find a sufficiently wide response in present-day psychological thought.

The social nature of voluntary attention is constantly being emphasized, but this does not mean that attention is actually being examined from this point of view. 'Both voluntary and involuntary attention are the result of the dominant process, of choice between disturbing factors,' says one of the most recent writers on this subject.

If this choice is conditioned chiefly by *peripheral causes* (intensity of irritation) or internal organic causes, we speak of *involuntary attention*. If this choice is conditioned chiefly by *central causes*, which are expressed, so to speak, in the routine work of associative nerve routes, we speak of *voluntary attention*.

It is clear, then, that voluntary attention arose as the result of the development of social relations, and is the product of social connections and environment. (Dobrinin, 1928; original emphasis)

Are the actual premises for the study of the mechanism of this important psychological function contained in this and similar assertions? To merely indicate the importance of social environment is not sufficient. 'The routine work of associative routes' is by no means the result of the specific influence of this environment. It is the work of the central agent, the most complicated associative connections we discover in the higher animals, where voluntary attention does not exist and behaviour is not influenced by social environment. Here the point is not the formal recognition of the important role of social factors, but, first of all, discovering the inter-relation of phenomena and laying bare that concrete mechanism, on the basis of and due to which, is formed the highest of activities regulating behaviour.

On the other hand, there is no doubt that until the main principles of development have been formulated, and the specific means of functioning of these higher forms of behaviour are discovered (which are subject, genetically, to social conditions), the collision between the simplified mechanical-materialistic and idealistic points of view will also remain insuperable. This collision creates contradictions which destroy the present-day psychological system.² To remove the cause of these contradictions, we must lay bare the mechanisms of those qualitative, peculiarly human forms of behaviour, which are created by social environment, unknown to the biological world; or, in other words, we must create a general theory of the social and historical development of behaviour. Such a theory of social genesis ('the theory of cultural development') was first formulated and brought forward by L. S. Vygotsky.³ His theory forms the basis of the present experimental-psychological sketch. The task we have set ourselves is two-fold: on the one hand, it aims at providing, on the basis of the methods worked out by us, new experimental material for some general lines of this theory, and, on the other hand, to map out the route of its further development in the field of study of voluntary behaviour.

The problem of the voluntary regulation of behaviour, the problem of voluntary acts, is often carefully avoided in materialistic psychology. It is just in this problem that different philosophic systems collide, and it should be solved by materialistic science. For this reason, therefore, admitting its complexity, we apply ourselves to its solution to the utmost of our ability. In this lies the justification for this article, which claims least of all to be a finished and exhaustive study of the question, and assumes significance only in connection with the theory forming its basis.

I

The simplest, primary acts have been fairly well studied in psychology. In this respect psychology is greatly indebted to physiology. Thanks to the psychological researches conducted by Pavlov and Ukhtomsky on the work of the higher nerve centres, it has been possible to establish the main nervous mechanism lying at the foundation of the processes of the elementary regulation of behaviour. This simplest kind of activity which organizes and regulates behaviour and to which, in psychology, corresponds the conception of involuntary, primary attention, expresses itself with the help of the innate psychological mechanism, and is wholly conditioned by external stimuli and their direct bearing on the particular state of the organism.

The problem of voluntary attention presents a much greater difficulty to the research worker. In this higher form of regulation of behaviour, the immediate degree of intensity, 'newness' or affectogeneity of the active stimuli, are already not decisive factors. At the basis of this lie new and much more complicated mechanisms, which create a certain independence of behaviour from its direct elementary stimulus. The term 'voluntary attention' seems to us to express correctly the peculiar nature of this higher form of regulating and organizing activity, indicating its two specific signs: first, its outward independence of direct factors, and secondly, the presence of effort, which finds both its subjective and objective expression.

All regulation of behaviour requires two orders of change, change of *direction* of behaviour and change in the distribution of *force*. The question of direction of behaviour is that of the domination of one or another competing stimulus. In the simplest cases it is decided by the respective strength of stimuli acting directly in their struggle for the common field of action. What is meant when we speak of regulation of the distribution of energy is usually associated with the simplest factor of the continuation of behaviour. According to Sherrington, in spinal dogs the unconditional 'scratch reflex', after prolonged action of the stimulus, exhausts its resources of energy and ceases. Only after a certain interval the necessary stock of energy is restored and the reflex appears again. In dogs which have not been deprived of the brain the activity of the reflex decreases at a much slower rate, since an additional stock of energy is mobilized in the higher centres. This is, then, the simplest case of the regulation of the energy side of the process.

Both these forms of regulation are determined in the above examples by peculiar situations: the direction of behaviour lends itself directly to external situations, the

necessary redistribution of energy is conditioned either by the repetition of the action of the main stimulus, or by the action of some stimulus co-existent with the main stimulus; what Ukhtomsky calls the 'sub-dominant stimulus'.

An entirely different condition obtains in more complex behaviour. The behaviour of a child, let us say, is fixed on a book which he is reading. The child's attention is distracted from reading by other stimuli: we stimulate the child to continue his reading, and he turns again to the book. Now let us study the following situation; the child is reading in conditions excluding the interference of outside stimuli. After a while, reading ceases, the first flush of energy for reading is exhausted. If the child is stimulated by promises of a reward, it will be possible to continue the process.

How does the regulation of behaviour in the simple and rather artificial examples with the child differ from the regulation of which examples were given above? What, in both cases, determines the continuation of the reading? A special factor in this case is the stimulus which we create in addition. We promise the child a reward – that is, not the repetition of the first main stimulus, the book, nor is it the direct increasing of this stimulus (the book does not increase in size nor become brighter, newer or more interesting) – we create a second new stimulus which determines the victory of the former. The relation of this second stimulus to the main centre of agitation is qualitatively not unimportant, it is not a simple sub-dominant agitation, mechanically increasing the 'dominant'. Although it strengthens the primary direction of behaviour, our second stimulus does not stand side by side with the first; it does not stand in relation to the general behaviour of the child as simply co-existent, but as a means to an end. The regulation of behaviour is realized in these examples by means of the second stimuli: such regulation we might call 'instrumented regulation',⁴ as opposed to direct regulation, of which examples were given above.

Is there, in the latter examples of a child's behaviour, a case illustrating what we call voluntary regulation of behaviour and of voluntary attention? Yes – and no. In so far as both series of stimuli are equally independent of the child, no; but, on the other hand, this regulation *is* 'voluntary' from the point of view of the person influencing the child, the person controlling the stimulus which controls the behaviour of the child. The process as a whole is here divided between two people, whose behaviour is subordinated to one general aim: one person reacts directly, and the other reacts in a direction of creating a series of stimuli intended to react on the first. Let us now take both these forms of behaviour united in one person: the child reacts to the present situation, not directly, in his main line of behaviour, but in the direction of attracting an additional series of stimuli organizing his own behaviour. This would be a case of voluntary regulation of behaviour. The Chinese postman delivering an urgent telegram acts in just the same way; he organizes his own behaviour, creating for himself additional stimuli. He hangs a number of objects – a piece of coal, a feather and some pepper – on the end of a short rod. This he keeps before his eyes on the road. This will remind him that he must fly like a bird, run as if he was stepping over hot coals or had burnt himself with pepper. As he goes on his way, some unusual occurrence in the street, or tempting goods displayed in the shops, or the prospect of a nice rest in the

shade of the trees, might distract him from his business, and might destroy and disorganize his behaviour. The artificial 'stimuli' or 'signs' created by him serve to direct his attention anew to his real task.⁵

The examples given suggest an outline of the structure of the higher forms of regulation of behaviour; voluntary regulation appears to us as instrumental regulation, 'instrumental' realized by attracting means as a second series of stimuli. The controlling of behaviour becomes possible only by the mastering of stimuli: this condition is justified in relation to our own behaviour (Vygotsky). To render one's own behaviour voluntary means to master it, subject, of course, to its own natural laws. The sensation of effort, which sometimes accompanies our voluntary acts, and particularly all efforts of voluntary attention, creating the illusion of voluntary action in the specific meaning of the word (that is, in the sense of freedom of action, carried out by means of a special psychic force), is explained through this particular, double structure of voluntary acts, which creates the mobilization of energy.

Thus, the sensation of effort appears to be a sensation which naturally accompanies 'the awakening and unfolding of the secondary tendency, which arises in connection with the first and increases its energy' (Janet).⁶

The conception unfolded by us of voluntary regulation of behaviour is that working hypothesis which lies at the basis of the present inquiry and which determines its central task: to trace the route of development of the outward forms of behaviour in children.

II

The history of voluntary attention begins when the first elementary social stimuli make their appearance in behaviour. Already the tribal hunts which were the earliest instances of collectivism in man entailed the necessity of controlling the attention of the hunting group: this was an indispensable condition for organized hunting. The function of the leader here was to submit the behaviour of the collective to a common end, which meant that first of all the aim had to be *indicated*, that is, attention had to be drawn to it. That is exactly what we do in our first attempts to influence the child: we begin with indication, that is, with attracting his attention. Here there is as yet no new and higher structure of the act of attention: the reaction of the child remains natural, directly conditioned by the external stimuli acting upon it. This kind of reaction, as is well known, can be found also in the higher animals (see Darwin, 1888; p. 49).

The process of attracting attention, however, the act of indicating, already bears its own peculiar characteristics; this act is social in its essentials. In some animals we meet with activities reminiscent of indicating but their nature proves to be quite different. Birds collecting in flocks select sentries; their duty seems to be to warn the rest when danger is near. If we examine the behaviour of the sentry birds, we become convinced that these possess no special acts of behaviour for this purpose. When a bird

is startled it shrieks and starts up with a great flapping of wings; that is, it acts in the same way as the rest of the birds act at its signal. That is why we never see, among animals, sentries placed outside the field where the flock may observe it. Such a disposition of sentries, which would best secure the safety of the flock (or herd), is not possible among animals, since it presupposes the existence in the sentry bird of such special action as would regulate the behaviour of the flock. Even as regards the most complicated forms of instinctive reactions, we are not in a position to discover such specially instrumented actions: the common crane, for instance, before returning to the place it has left, first sends a scout: this scout, however, does not possess any specific action for its work.

Thus, with the exception, perhaps, of only a few, much disputed cases, where the so-called 'warnings' are issued by thoroughbred hounds subjected for generations to the influence of man, we do not meet in the animal world any special forms of action having as their sole and special end the mastery of behaviour of other individuals by attracting their attention.

The history of one man's mastery over the regulation of behaviour of another repeats in many points the history of his mastery over tools. It presupposes a change in the structure of behaviour, which turns behaviour directed to an end into behaviour directed circuitously. The selection and production of instruments or tools is supplanted here by the creation of a series of stimuli which, through the object of influence, determine the achievement of the end. In this sense these stimuli prove to possess an instrumental function. At first, their indispensable factor is their intensity, but in the process of their development and differentiation they become specialized and acquire the character of a conventional *sign*: in this way *indication* is born, as a sign of attention. It is exactly the indication (gesture, speech, etc.) which conditions, in the primary history of behaviour, the development of the higher forms of attention. As the researches of L. S. Vygotsky show, it is that catalytic factor which modifies the inter-central relations and, destroying the even balance of the situation, causes the activation of corresponding processes (see Ribot, 1888; Vygotsky, 1929a).

In some of our experiments with instrumented memorizing, and in that series where we suggested to the child that he should remember a number of words with the help of one complicated picture, we also had an opportunity to observe this function of the indicative gesture; the subjects upon which we experimented were mentally backward children who, when turning their attention to one or another detail of the picture, quite spontaneously used the indicative gesture as a means of distinguishing the given detail from the general whole. Figure 1 shows a cutting from a film taken of this experiment.⁷

The regulation of attention presumes, as we have already remarked, a change of a double nature: the change in the direction of behaviour and also in the distribution of force; that is, an increase in the duration of the act. Attention is directed to a definite object and remains fixed on it for some time; this 'action of the will directed to a certain aim and expressed in attention' is an indispensable condition for all kinds of ordered work and is all the more necessary as the action becomes less attractive.

A savage is passionately devoted to the chase, war and play: he loves the unexpected, the unknown, the accidental, in whatever form it appears; he does not know what persistent labour is, or if he does, he treats it with contempt. Love of labour is a feeling which developed secondarily along with the progress of civilization, and labour, as is well known, is simply the concrete expression of attention. Even half-civilized tribes feel a certain repulsion to ordered labour. Darwin once asked the Gauchos why they did not work but were given over to drunkenness, play and thieving. 'Because the days last too long', was the reply. The life of a primitive man, says Herbert Spencer, is almost entirely devoted to the tracking of animals, birds and fish, which provide him with pleasant excitement. Among civilized peoples, the hunt, although it serves as a form of entertainment, is far from being widespread and is only temporary . . . But, whereas in primitive man the power of persistent attention was very poorly developed, with us it has attained a very considerable degree. [Ribot, 1888/1908, pp. 60-1]

Thus, the transition of the savage from capricious and fitful dissipation of energy to the specific, systematic and organized labour of man, signifies, as we see, the transition to a higher form of activity of attention. This fact holds a tremendous significance for psychology. The task before research workers now is to show how the voluntary attention of man developed together with his working activity. Of course, any detailed historical or sociological analysis of this process would demand special research. We will here confine ourselves to the indication of two series of historical facts of particular interest to us in connection with the conception of attention described above.

It is well known that the transition to regular labour is usually achieved with its division. At first only part of the tribe, the women or the slaves, were obliged to do *systematic work* as a punishment. On the other hand, we know what a tremendous part in the labour processes of primitive man was taken by external organizing environment – the activities of foremen, the ceremony of beginning and ending the work, the rhythmic musical accompaniment to labour. It may be admitted that this labour activity, achieved under the influence of direct compulsion, could be called labour only in the sense that we apply the word to the 'labour' of animals. But the very necessity of compulsion arouses the organizer of these living instruments to the creation of special stimuli regulating their behaviour. The originally direct and simple stimuli undoubtedly speedily gave way to conventional stimuli; and what is most important, along with this, the stimuli formerly used on others could be adapted to the first person. Signals given by the foremen, the rhythmic sounds of a drum, working songs – these created the centre around which the labour activities of the primitive man were built up.

'The savage avoided work not as a *physical* but as a *spiritual* effort', says Schurtz; that is, he avoided or rather was not capable of straining his attention. These means of organizing and regulating work were directed first of all to the organization of attention: their aim was to communicate to the work the necessary direction and continuance. 'Working songs are important documents, giving evidence of the half-conscious self-education of humanity' (Schurtz, 1900, vol. 2, ch. 6). It might be said

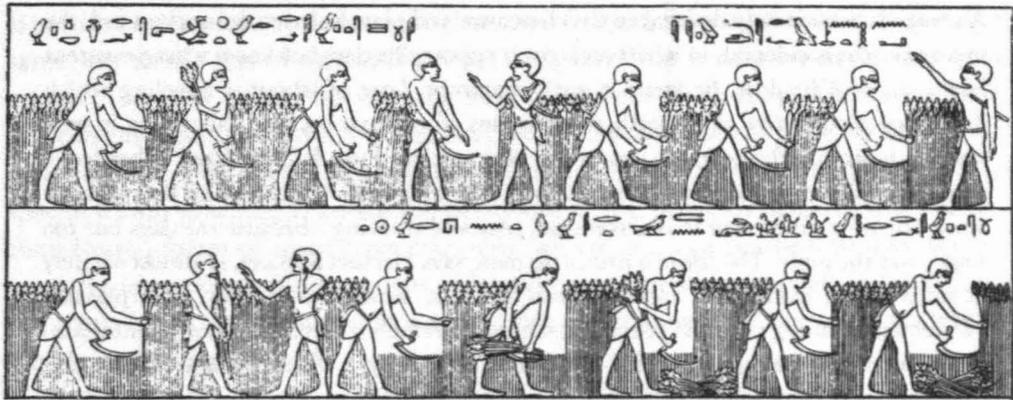


Figure 11.1 Egyptian peasants reaping oats following the sounds of the flute. In each row there is a man marking the time. (From the Guimetian Museum, Vigouroux, *Diction de la Bible*.)⁸

that first of all they are evidence of the education of higher forms of attention, indispensable for the further unfolding of labour activity.

The transition from the organization of attention of others to the creation of stimuli organizing their own attention – this is the route marked out in the history of development of voluntary attention. Mastering stimulation, man masters his own behaviour; in submitting himself to its natural laws he in this way subjects it to himself, in this sense turning it into voluntary behaviour. We see that at the foundations of this process lies the general process of the socialization of man. The beginning of collective labour and economic activities, which signify that humanity has entered the historical phase of its development – this is the chief condition for the appearance of higher forms of behaviour. Here we have an extremely complicated process of the double relation of interchange between the individual and his social comrades. In this process, in J. M. Baldwin's terminology, 'the *social* element *projecting itself* into the personality forms the "subjective", which by a return movement is transmitted anew to other people and thus becomes "ejective"'.⁹

Therefore, voluntary attention is a later and extremely complicated product of prolonged development. Its root lies at the very earliest stages of the history of human society. It develops, says Ribot [1888/1908, p. 47], on the basis of involuntary attention, onto which it seems to be artificially grafted and from which it derives the conditions of its existence, as branches grafted to a tree trunk feed on its sap.

Primary involuntary attention, influenced by the employment of 'psychological instruments' which are first directed to surrounding people and subsequently to itself, turns into voluntary attention. These 'psychological instruments', originally simple, unconventional, intense stimuli, differ from labour instruments in that they are directed to the mastery of man's behaviour. The process of their inception and development is also the process of their acquiring a conventional meaning; they are the 'instrument-signs', and in this lies their specific character. When they are turned

on oneself they may become internal, and thus behaviour is free from external stimuli-signs which regulate it.

The place of the external sign is taken by internal psychological elements, acquiring a *significant* meaning. Such applied-to-oneself, instrumental, significant regulation of behaviour is what we call voluntary attention.

III

In the behaviour of a very young child, just as in that of a primitive man, we are not in a position to discover acts of voluntary behaviour. It is only at an advanced stage of individual psychological development that voluntary attention begins to take on that central importance which it possesses in the general system of behaviour of the cultured adult. This most important psychological function of a modern man is the product of his social and historical development. It was born in the primitive savage out of the process of his socialization; being a product of labour activity, it is at the same time an indispensable condition for it. In this sense, this function has developed historically, and not biologically. Each subsequent generation, says Ribot [1888/1908, p. 58], *learns* voluntary attention from the preceding one. Thus the development of voluntary attention means, first of all, that the child acquires a series of *habits of behaviour*.

Through the mastery by surrounding people of its attention, the child masters, at first imitatively, the attention of the people surrounding it. While stimulating others, the child learns to stimulate itself. At first, the external stimuli-means which the child organized in order to master its own behaviour, are replaced, in the process of their development, by internal stimuli: as they 'grow in' external stimuli turn primary attention into significant; and attention becomes voluntary.

The business of experimental-psychological research now is to show how, under laboratory conditions, this process takes place; that is, to bring it within closer range and make it accessible for direct study.

The methods which we have worked out with this end in view are as follows: the child to be experimented on was placed in conditions of such activity as required active concentration of attention: along with this, the child was offered a number of external objects ('second series of stimuli') which might serve as 'psychological means' for this activity. For instance, during the experiments, which took the form of play, the child was given the opportunity to 'win' a certain prize. In order to create such activity, we used the old children's game 'Don't say white or black, don't answer yes or no' (having, of course, slightly altered it). The whole experiment consisted usually of three or four series and was carried out in the following way.

In each series, the child was given, according to a special formula, 18 questions, out of which seven concerned the colour of things ('What colour is . . .?'). The instructions demanded that the child should answer each question promptly and in one word, especially in the case of colours – simply the name of the colour. The first

series, which was of a controlling and also of a training character, passed without any additional limitations. In the second series only we began the 'play' itself, introducing, as a condition for winning, two new demands: the child won only when he answered our questions, first, without repeating the name of one and the same colour, and, second, if he did not name one of the 'forbidden' colours. The third series differed from the first only in so far as the child was given nine coloured cards as means of assistance ('they must help you to win').

Having placed the cards before them, the children, when answering questions, usually picked out and then placed on one side cards of the colour named or turned them over, and at the same time fixed the 'forbidden' colours. As if introducing into the process, in this way, a new series of external additional stimuli-means, the child solved the task set him, turning his behaviour into indirect, instrumented behaviour; his perception and reactions were realized through these interposed signs, which here took the place of the refracting glass of which Revault d'Allones speaks in his work (1914, p. 32; see also his 1923, pp. 846-919). These cards were used before the beginning of the experiment in order to find out whether the child knew the names of colours. The fourth series was built up similarly to the third, and was carried out in cases where the child did not show evidence of having found out how to use the cards or did so only towards the end of the experiment. Before and after each series it was ascertained by means of special questions how far the child mastered and remembered our instructions.

All four series of questions in our lists were practically analogous to each other, containing an equal number of equally distributed 'critical questions' about colours and presenting certain obstacles to the correct solution of the tasks. In a number of cases they were even provocative of error, but still allowed the fulfilling of all the conditions of the experiments and the evoking of thoughtful answers.

In the experiments we tried to link our questions together and ask them in the form of 'Tell me!' and 'What do you think?', speaking in an ordinary conversational tone. In this way the questions contained in the list, asked in their exact form and order, formed a necessary element of our 'experiment-play conversation' with children, but did not compose its only contents.

The series we offered contained the following questions:

- First series:* (without 'forbidden' names) (1) Can you draw? (2) What colour is your handkerchief? (3) Did you ever go in the tram? (4) What colour is the tram? (5) Do you want to study? (6) Were you ever at a meeting? (7) Do you like reading? (8) What colour is the paper? (9) and pencils? (10) Do you play with toys? (11) Have you seen the sea? (12) What colour is the sea? (13) Did you ever listen to music? (14) Have you seen vegetables growing? (15) What colour are cucumbers? (16) Do you like dogs? (17) What colour are cats? (18) What does one do with a saw?
- Second series:* (green and yellow are chosen as 'forbidden' colours) (1) Have you a playmate? (2) What colour is your shirt? (3) Did you ever go in a train? (4) What colour are the railway carriages? (5) Do you want to be big? (6) Were you ever at

the theatre? (7) Do you like to play in the room? (8) What colour is the floor (generally)? (9) And the walls? (10) Can you write? (11) Have you seen lilac? (12) What colour is lilac? (13) Do you like sweet things? (14) Were you ever in the country? (15) What colours can leaves be? (16) Can you swim? (17) What is your favourite colour? (18) What does one do with a pencil?

Third series: (forbidden colours blue and red) (1) Do you sometimes go for walks in the streets? (2) What colours are the houses? (3) Does the sun shine brightly? (4) What colour is the sky? (5) Do you like sweets? (6) Have you seen roses? (7) Do you like vegetables? (8) What colour are tomatoes? (9) and what colour are exercise books? (10) Have you any toys? (11) Do you play ball? (12) What colours are balls? (13) Do you live in the town? (14) Did you see the demonstration? (15) What colour are flags? (16) Have you a book? (17) What colour is the book cover? (18) When does it get dark?

Fourth series: (forbidden colours black and white) (1) Do you go to school? (2) What colour is ink? (3) Do you want to be a soldier? (4) What colour are boots? (5) Do you like to play? (6) Have you ever seen a lion? (7) Do you know what underclothes (linen) are? (8) What colour are collars? (9) and bags? (10) Are you a good pupil? (11) Do you like pears? (12) What colour are apples? (13) Were you ever in a hospital? (14) Did you see the doctor? (15) What colour are overalls? (16) Do you go for walks in the garden? (17) What colour are paints? (18) When does it snow?

Although these series of questions seemed to us, *a priori*, to be of practically equal difficulty, we changed their order in certain cases (2nd, 3rd and 4th series). The cards we used were black, white, red, blue, yellow, green, purple (lilac), brown and grey.

As the experiments showed, the tasks set the children were, in cases where they were to be carried out without the help of the cards, difficult enough even for adult subjects. On the other hand, children of school age experienced no difficulty in finding out how to use the cards, and had usually learned to use them in the first (III) series with cards. In cases where the method of using the cards was not discovered by the child itself in Series III, we told him and carried out Series IV with him also. In summing up, we have generally taken account of the data of this last series.

Not counting trial experiments, 30 subjects were experimented upon. They included children of below school age and of school age, and adults, numbers being practically equal in all the groups. The comparatively small number of experiments made, owing to the fact that experiments with children are a comparatively difficult matter, scarcely permits us to insist on the exactitude of the average figures obtained, but they are sufficient for the immediate purposes of our inquiry.

Some of our experiments were filmed and separate sections of these are shown in figure 3 [not reproduced].

It must be remarked that the experiments were usually carried out in a very natural and lively way. We noticed later that very often, when playing with others, the children faithfully reproduced the conditions of our experiments, substituting coloured paper for our cards and repeating more or less accurately our questions. This

circumstance afforded us considerable difficulty in getting children for the experiment, since under these conditions we were prevented from using children belonging to the same group.

If we add up the average number of wrong answers given during experiments with different groups of subjects (see table 11.1), the sharp difference between the groups will become evident. From the table it is clear that children of below school age answered a little more than half of the 'critical' questions without following the rules of the game. Children of pre-school age are very easily distracted from their main task by the subject of the question, and easily give way to 'provocation', sometimes not even noticing their mistakes. For the third series (with cards), we have almost the same figures as for the second, the difference between them being expressed by the insignificant figure of 0.3. As a rule, children of pre-school age are unable to discover by themselves how to use the cards. Even after they have been told (Series IV) children, while handling the cards, are not capable of using them in fulfilling the task set them. We discover here, as well as in experiments with instrumented memorization, a point characteristic of the pre-school age: the almost complete inability of using external stimuli as an auxiliary means for organizing one's own behaviour.

In some instances we did not limit ourselves to the simple communication of the method, but first (before Series IV) allowed other children, who had fully mastered ways of using the cards, to demonstrate them to our subjects. Even then the results only showed external imitation in the case of children of pre-school age (subjects 14 and 15). This is illustrated by the following excerpt from minutes. The method of using the cards was shown by other children who had previously been experimented upon.

In fact, the cards not only do not help the child of pre-school age, they actually hinder him from carrying out his task. On the examples given above the repeated reactions 'white' arise from the fact that the child fixes his attention on the white card. The cards take a certain part in his behaviour, but this part is absolutely different from that taken in the case of the school child. These secondary stimuli only co-exist

Table 11.1

<i>Group</i>	<i>Age</i>	<i>No.</i>	<i>Number of wrong answers</i>		
			<i>In Series II</i>	<i>In Series III or IV</i>	<i>Difference between Series II and III</i>
Below school age	5-6	7	3.9	3.6	0.3
School age: younger group	8-9	7	3.3	1.5	1.8
School age: older group	10-13		3.1	0.3	2.8
School age: average	8-13	15	3.2	0.9	2.3
Adults	22-27	8	1.4	0.6	0.8

*Case 14**10 December 1928**Subject: 5 years of age*

Series III 'Forbidden' colours, blue and red

- | | | |
|----|--|---|
| 2 | What colour are houses? | Red (without looking at forbidden colours). |
| 3 | Is the sun shining bright? | Yes. |
| 4 | What colour is the sky? | White (without looking at card, but after replying, searches for white card. 'Here it is!' Picks it up and keeps it in his hand). |
| 8 | What colours are tomatoes? | Red (throws a glance at cards). |
| 9 | And what colour are exercise books? | White - like this! (pointing to white card). |
| 12 | What colour are balls? | White - (looking at card). |
| 13 | Do you live in the town? | No, etc., etc. |
| | Do you think you have won? | Don't know - yes. |
| | What must you not do if you want to win? | Mustn't say red or blue. |
| | And what else? | Mustn't say the same word twice. |

with the main stimuli, instrumental functions are not inherent in them and their part in the process is of quite an accidental nature. Still there is no doubt that in children of pre-school age we sometimes meet with forms of behaviour which might serve as premises for the development of the instrumental employment of external signs. From this point of view certain cases registered (subjects ten and 11) are of special interest. In these cases, the child, after we had suggested to him that he use the cards in carrying out his task ("Take the cards, they will help you to win"), searched for the forbidden colours and put all such cards out of his sight, as if trying to prevent himself from naming them. One operation is substituted by another: the child in our example acts in the same way as an Australian or African savage might act in freeing himself from a dangerous man by destroying his image or symbol. The 'magical' nature of the operation of putting away dangerous colours is, in the case of the child of pre-school age, emphasized by the circumstance that the child thus limited himself to this and pays no further attention to the cards. This circumstance is of special interest to us since, although in nature it is quite different, externally it reminds us of an abbreviation of the method of using the cards by adults, and also because it clears up the origin of one of the methods to which school children have recourse when they want to carry out their task.

This 'magical' attitude toward the means is still more clearly illustrated by subject 17 (Leont'ev, 1929b; Lubbock, 1872). This subject exhibited in the third series all the cards without any order at all and as a result gave several wrong answers. Before trying the fourth series, in order to give the subject some idea of the method of using the cards, we asked him: 'Did the cards help you?' 'Yes.' 'And what should you do to make the cards help you still more?' 'Make a house with them.' The child at once began to build a house with the cards, again without separating the forbidden colours. 'And how do you think they will help you?' 'I don't know.' 'Well, perhaps you can do yet another thing with them so that they will help you still more?' 'Put them in a circle,' the child guessed. At last, after a few more suggestions, the subject discovered the proper method and in the fourth series made no mistake.

Comparing the figures obtained from the experiments on children of pre-school age with those obtained from children of school age (see table 11.1), we notice a very slight reduction in the number of wrong answers in the second series, whereas the number of mistakes in the third series falls sharply. This is particularly noticeable in the case of the group of older children where the difference between the figures of Series II and III reaches a maximum of 2.8. We find a direct explanation of this in our experiments. At school age, as we have seen in the data on the investigations of the development of memory, children begin to use the external 'means-stimuli' and thereby considerably increase the effect of their psychological acts.

The behaviour of a child of school age remains natural and does not differ greatly from that of a younger child. In our experiment, in fact, we obtained figures in the second series which were quite near to each other: 3.9, 3.3 and 3.1. The number of wrong answers in cases when the operation remained direct decreases slowly with the growth of the child, but it is sufficient to allow him to equip himself with the means accessible to him for the mastery of his behaviour, as the effectiveness of his psychological acts increases speedily; a tremendous change takes place in the sphere of his psychological possibilities.

The methods of using the cards can be reduced, in spite of their apparent variety, to two different types. First comes the case when the child puts out of his range of vision cards of forbidden colours, exhibits the remainder, and, as he answers the questions, places on one side the cards of the already named colours. This is the least perfect and at the same time the earliest method used. The card here serves more as a memory sign than as an attention sign; its function is only to register the named colour. At the beginning of the experiment, children often do not turn to the cards before they answer the question about colour, and only after it is named search among the cards, turn over, move or put away the named one (see Report 3, pp. 303-4). This operation is carried out, as we see, with the idea of registering their reaction. It is undoubtedly the simplest act of memorization with the help of external means. It is only later that the conditions of the experiments bestow a new function on the card. Before naming the colour the child must necessarily make a selection with the help of the cards. It makes no difference whether the child has within his field of vision a series of so-far-unused cards, or whether he will get his bearings by the colour already

named to him; in both cases the cards will be interposed in the process, and will serve as a means of regulating his acts. Actually, the separation of the used cards without putting them out of sight, for instance by placing one of them in another row, presupposes the same subsequent operation as is required by the exhibition of the forbidden colours, which is met with in the second type of employment of cards. The preliminary putting out of sight of forbidden colours, which is a distinguishing characteristic of the first method of using cards, does not yet lead to the 'simulation' of an act, to the complete substitution of one operation by another; it represents merely a step in that direction. It is explained partly by the greater simplicity of the operation of mastering memory and partly by that 'magical' attitude to means, which is constantly met with in children (see Luria and Morozova), and which we have already noticed in the given situation with the children of pre-school age experimented upon.

Material gathered in the course of experimental research on instrumented memory, attention and arithmetical operations shows that the part played by external means of behaviour is especially important in children of school age.¹⁰ As to children of the earliest school age, we might even speak of a peculiar 'hyperfunctioning' of external means which they have just begun to master. Experiments made by L. S. Vygotsky and A. R. Luria (Luria, 1928) are in this respect extremely illustrative. They suggested to the children that in order to remember a number of figures they should somehow record them, for which purpose they placed at the disposal of the children different objects such as paper, thin cord and various small articles, including hunters' shot. The children of early school age as a rule tried to build up figures to be remembered out of the given objects.

Report 3

1 December 1925

The case of Nastya D., 13 years old

Series II Forbidden colours, green and yellow

- | | | |
|---|------------------------------------|---|
| 1 | Have you playmates? | Yes. |
| 2 | What colour is your blouse? | Grey. |
| 3 | Have you been in a train? | Yes. |
| 4 | What colour are railway carriages? | Grey (notices that she has repeated the same colour twice; laughs). |
| 5 | Do you want to be a big girl? | Yes. |
| 6 | Were you ever in a theatre? | Yes. |
| 7 | Do you like to play in the room? | Yes. |
| 8 | What colour is the floor? | Grey . . . again - I repeated it. |
| 9 | And the walls? | White. |

- | | | |
|----|---|---|
| 10 | Can you write? | Yes. |
| 11 | Have you seen lilac? | Yes. |
| 12 | What colour is lilac? | Lilac colour. |
| 13 | Do you like sweets? | Yes. |
| 14 | Were you ever in the country? | Yes. |
| 15 | And what colour were the leaves? | Green – no, shouldn't have said green – brown, red sometimes. |
| 16 | Can you swim? | Yes. |
| 17 | What is your favourite colour? | Yellow! I can't! (throws up hands behind the head). |
| 18 | What do you do with a pencil? | Write. |
| | What do you think, did you win or lose? | Lost. |
| | What should you not have said? | Green and yellow. |
| | And what else? | Shouldn't repeat.
(4 mistakes) |

Series III (with cards, forbidden colours blue and red)

The subject puts on one side cards of forbidden colours, and spreads out the remainder in a row before him.

- | | | |
|----|------------------------------------|--|
| 1 | Do you go for walks in the street? | Yes. |
| 2 | What colour are the houses? | Grey (after answering looked at the cards and turned over the grey one). |
| 3 | Is the sun shining brightly? | Brightly. |
| 4 | What colour is the sky? | White (first looks at card and then turns it over). |
| 5 | Do you like sweets? | Yes. |
| 6 | Have you seen a rose? | Yes. |
| 7 | Do you like vegetables? | Yes. |
| 8 | What colour are tomatoes? | Green (turns over card). |
| 9 | And exercise books? | Yellow (turns over card). |
| 10 | Have you any toys? | No. |
| 11 | Do you play ball? | Yes. |
| 12 | And what colour are balls? | Grey (without glancing at cards; after answering glances and notices mistake). |
| 13 | Do you live in the town? | Yes. |
| 14 | Did you see the demonstration? | Yes. |
| 15 | What colour are flags? | Black (first looks at cards and then turns one over). |
| 16 | Have you any books? | Yes. |
| 17 | What colours are their covers? | Lilac (turning over card). |
| 18 | When does it get dark? | At night.
(1 mistake) |

Thus, in spite of the obvious inexpediency of using the method under the circumstances given, instead of, for instance, putting aside two grains of shot or two torn-up bits of paper, the children tried to form figures out of the extremely inconvenient grains of shot, which rolled all over the table. As well may be imagined, much material and time was wasted. The children of pre-school age, who had not yet mastered the system of figures, behaved quite differently. They chose a more economical method from the point of view of time and energy, acting just as a modern adult might who had already got over the first phase, when the external methods adopted have the greatest power over one.

In our experiments we had the opportunity of observing closely this over-exaggerated role of external media. In a number of cases, in children of early school age, we met with replies which were irreproachable from the point of view of conforming to instructions, but were at the same time quite senseless. The child, in these cases, worked strictly by the cards, and named colours irrespective of the subject of the question. This 'formalism' which is peculiar to children and throws them completely under the influence of the method assimilated, is also met with in the development of arithmetical operations. It is a well known fact that the slightest change in the position of figures, in the actual writing of them, is sufficient to render the child incapable of even the simplest arithmetical action (Thorndike).¹¹ Probably it is just this phase of the domination of external psychological media, through which the development of the higher instrumented, 'significative' acts of behaviour pass, that reveals itself in the history of the cultural development of humanity, in those numerous and extremely carefully worked-out systems of external methods of behaviour which compose a typical feature of primitive society.

If we turn now to the figures illustrating the behaviour of adult subjects, we discover a new and peculiar relation between the indices of our main series. Comparing these indices with the figures obtained with children of school age, we see that the difference existing between them does not concern the third series with cards, as was the case with the transition from pre-school age to school age, but is determined by the data in the second series. In this series we notice a distinct falling-off in the number of wrong answers given by adults.

The general change in the coefficients obtained upon various groups of cases is illustrated in table 11.2. Here the positive data are given by graphs showing not the number of wrong, but the number of right, answers; that is, the total number of answers to critical questions minus the number of answers not corresponding to the demands of the instructions.

The curves of development shown in table 11.2 are very similar to the corresponding curves obtained in a course of experiments on instrumented memory. Like the latter, they approach each other in their extremities, forming in their outline something like a parallelogram.

Therefore, quantitative characteristics obtained in our experiments indicate three principal stages of the development of instrumented behaviour. First of all (pre-school age), the stage of natural directed acts. At this stage of development the child is not capable of mastering his behaviour with the assistance of the organization of special

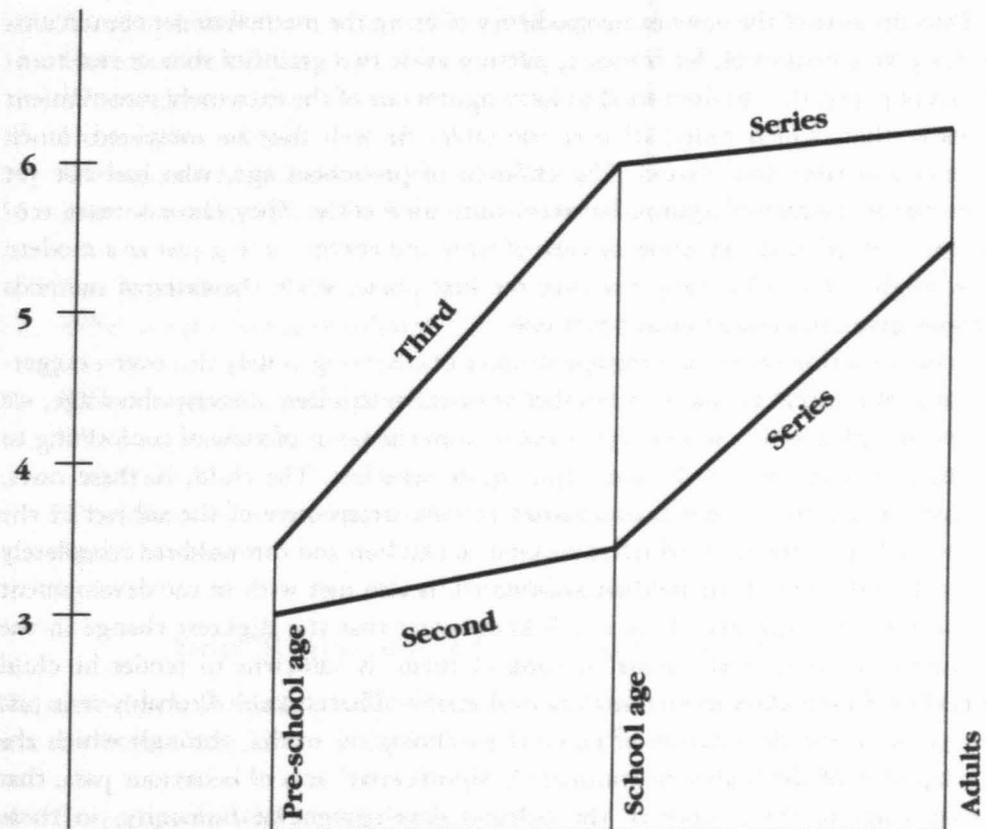


Table 11.2

stimuli-means. The introduction into the operation of a number of cards, which might help the child in his task, does not increase to any considerable extent the effectiveness of this operation. The child proves incapable of their functional use. Although they take the part of stimuli in his behaviour, they do not acquire an instrumental function. The next stage of development is characterized by a sharp difference in the indices in both of the main series. The introduction of cards, used by the child as a system of auxiliary external stimuli-means, raises the effectiveness of his acts considerably. This is the stage of predominance of the external sign – the psychological instrument in the stimuli acting from without. We see at last that, as regards adult cases, the difference between the indices of both series is smoothed over again and their coefficients become more nearly equal, but now on a new and higher basis. This does not mean that the behaviour of adults becomes again direct natural behaviour. At this higher stage of development, behaviour remains instrumented. At the same time the second series of stimuli-means is emancipated from primary external forms. What takes place is what we here call the process of 'ingrowing' of the external means: the external sign turns into an internal one. This is how the external forms of human behaviour – instrumented, significative behaviour – develop.

This theory of 'ingrowing', formulated in the course of our study of the development of memory, is provided with some new proofs in the experimental material of our present inquiry. Among the many different methods of using cards, two, chiefly used by adults, are deserving of special attention. First of all, the case of employing cards to fulfil only one of the conditions of the task set. Some subjects limited themselves to the exhibition of the forbidden colours, while the other cards remained outside their range of vision. Thus, the operation is divided into two parts, one taking place without the help of external means, and the other with the assistance of the cards. This way of using the cards is met with twice: in the case of children of pre-school age, but only in one instance (subject 11), and of some adults. It is probably due to absolutely different causes. In the first case, it is no more than an embryonic form, out of which the respective method begins to develop. With respect to the adults, it is much more complicated. Can we actually admit that one side of the operation here remains natural and direct, while the other side bears an obviously instrumented character? From our point of view such a presumption is scarcely possible since, on the one hand, we cannot discover any difference in the number of mistakes of a corresponding type, and, on the other hand, it is scarcely possible that an integral process should have a double structure. There is no doubt that we have here a case of the transformation of one or two series of external signs into internal signs, similar to that which we can clearly observe in the development of the counting operation, where the carrying out of a complicated arithmetical action presupposes a number of intermediary actions completed mentally. Even in the simple operation of adding up a number of figures, it usually happens that the child must 'carry in his head' higher quantities.

These quantities, at first noted over the higher row with the help of figures and dots, very soon lose their external graphic signs and are substituted by internal signs. It is obvious that the process analogous to this operation, performed simultaneously with the help of both the external and internal signs, takes place in the cases where cards are partially used.

The second form of incomplete use of external means is much more interesting. This is again met with most frequently among adults. In this case all the cards are exhibited, while the usually forbidden colours prove to be the last in the row, or are placed in the centre. The subject answers the questions while looking at the cards but does not touch them. One of our subjects, No. 2, was asked after the experiment whether the cards had helped or not: 'They helped, of course, I looked at them and saw which I could mention and which not'. This reply indicates clearly the essentials of the methods used by her. The means by which the task is solved seems here to assume a double form. While remaining external, it already becomes half internal. The card, an external object, continues to exist as a card, but becomes a means only as the sign into which it is transformed with the help of the internal sign. The external removal of the cards in the group of 'forbidden' colours, which we observed in other, simpler cases, was carried on here 'in the head'. The subject, mentally marking the cards of the colours named, imparted in this way a certain meaning to

the cards, that is, transformed them into signs. Thus, the process has here a sharply defined internal character and it is only supported by cards. It is clear from this that it keeps the same structure which it possessed in those cases when the operation was carried out entirely with the help of external stimuli-signs.

We are inclined to ascribe a particular importance to these observations because they give new proofs to the theory of the significative nature of external intellectual processes, and along with this allow us to outline in still greater detail the transition from externally instrumented operations, accomplished with the assistance of internal signs.

IV

Placing on one side the process of development of attention in the child to the stage when it becomes instrumented, and on the other side the later process of the development of higher, significative forms of attention, we see that they are absolutely different in type. Biological development is replaced by development which we might call historical. It consists in this – that the child, under the influence of its social and cultural experience, masters a number of methods of behaviour, which transform his primitive, psychological acts into higher acts of new and complex structure. This structure is characterized by the presence of secondary stimuli-means, which in the form of internal or external stimuli are interposed in the process.

The development of voluntary attention only repeats the development of other higher psychological functions; it becomes voluntary, turning from signal to significative. That system of social relations into which man steps at the dawn of his historical existence, and which forms for him a new environment unknown to the biological world, a social environment, determines the particular path of his psychological development.

Equipping himself anew for the struggle with nature, man places between himself and the physical objects of his operations the tools which he has produced; by influencing nature with his tools he changes his own nature. The use of the tools creates a new series of labour processes, a new series of conditions of existence for man. These demand from him new actions and new forms of activity, and call for the redistribution of his physical possibilities, changing his skeletal, muscular and nervous system. A still greater change takes place in the nature of man as a result of his interaction with his social environment. In influencing social environment man creates a system of conventional stimuli with the idea of mastering the behaviour of other people. Thus he creates conditions for the mastery of his own behaviour, radically altering thereby the principal mechanism of behaviour itself.

These stimuli-signs, which at an early stage of development took on the form of stimuli acting from without, when turned upon themselves, are capable of being transformed in the process of psychological development into internal signs. The synopsis, which in principle exactly corresponds to the cards of our experiments, is

necessary to every lecturer at the beginning of his career, keeping his attention on the consistent unfolding of the contents of his speech. It is soon cut down in size, and the large sheaf of papers, with its methodical guiding text and mass of notes in coloured inks, gradually gives way to a number of bits of paper covered with a few words, which are almost never looked at.

The external stimuli-means are at first not sufficiently specialized. In the examples given by us, objects filling the role of means, organizing the behaviour of the Chinese postman, are as much mnemotechnical signs as signs of attention, just as in our experiments coloured cards usually fulfilled both these functions. Only at a higher stage of their development, when they are divided into two lines – the line of further development of external means and the line of transformation of external means – we meet with a system of fully differentiated external signs, such as, for instance, writing and connecting signs.

A much greater obstacle is presented by the problem of the differentiation of internal stimuli-signs. When they are 'growing in', external signs are not only deprived of their original form, but undoubtedly assume new and peculiar features. Their functional classification is possible only in a conditioned sense; entering the process, they determine not the direct elementary psychological functions as such, but those operations at the biological basis of which these functions lie.

In the analysis of the higher forms of behaviour it is impossible, therefore, to oppose to each other or else to associate [lump together – eds] the higher psychological functions, treating them as separate items and thus mechanically reducing these higher forms of behaviour to their primary, simple mechanisms.

Summary

The development of a child's attention is not confined only to the development of its primary biological forms, but includes the transformation of these elementary forms into new and higher forms. The child's attention, which at first is involuntary, i.e. directly dependent on the action of stimuli, is transformed in the process of its development into the voluntary attention characteristic of an adult. This process of transformation takes place on the basis of the control of the child's attention from without, with the help of external stimuli. The child, feeling the effect of these external stimuli on himself and learning in his turn to react on others around him, becomes capable of using external stimuli with the idea of organizing his own behaviour. By thus controlling stimulation, the child controls his own attention; by submitting to the natural laws of his own behaviour, he thus makes the latter submit to him, and in this sense transforms it into voluntary behaviour.

Research work in the development of voluntary attention, which was carried out by means of special methods, confirms the above theory. Children of early pre-school ages prove incapable of actively using external auxiliary stimuli as means of organizing their own behaviour. The attention task is fulfilled by all the children in exactly

the same way, both in the series of experiments without auxiliary means and in the series in which the child is called upon to use definite auxiliary means. In early school age, however, the child learns to organize his behaviour from without, with the help of external stimuli, and the difference in the indices of these two series of experiments, reaches its maximum. With the transition to a more advanced age, the role of external means organizing behaviour becomes less significant. The function fulfilled by these external means gradually passes over to the internal elements of the experiment. What takes place now is emancipation from the external forms of the stimuli which were at first indispensable. The external signs of the operation are transformed into internal signs.

In this way the development of the voluntary attention of the child should pass through a stage when his behaviour is controlled with the assistance of external stimuli-signs, which are subsequently replaced by internal signs.

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Notes

Originally published as Leontiev, A. N. 1932: The development of voluntary attention in the child. *Journal of Genetic Psychology*, 40, 52-81. The article was the third and last paper in the series 'Studies on the cultural development of the child' edited by Luria and Vygotsky and published in this journal. Like the first two it was based on research conducted at the Krupskaja Academy of Communist Education in Moscow. With the exception of the introductory paragraph and the summary, the text is a translation of the fourth chapter of Leont'ev, A. N. 1931: *Razvitie pamjati*. Moscow-Leningrad: Uchebno-Pedagogicheskoe Izdatel'stvo. The original contained two photographs of the experimental setting (labelled figure 1 and figure 3) which could not be reproduced.

- 1 The references are to Blondel, Ch. 1914: *La conscience morbide. Essai de psychologie générale*. Paris: Alcan; and Ribot, Th. 1888/1908: *La psychologie de l'attention*. Paris: Alcan.
- 2 A detailed explanation of this is given by us in another place in a study of the problem of memory. See Leont'ev, A. N. 1929a: The dialectic method applied in the psychology of memory. In *Voprosy marksistskogo vospitanija*. Moscow: Academy of Communist Education [original footnote].
- 3 See bibliography at the end of this article [original footnote].
- 4 'instrumented' is the translation of *oposredstvennyj*, which is nowadays mostly translated as 'mediated'.
- 5 It is possible that these stimuli-signs, still in use in some Chinese provinces, have already lost their meaning; there is no doubt, however, that originally their use was dictated by necessity. Describing the Indian tribe of Dajibis, Richardson says: 'We became convinced, after experiments, that in spite of high rewards offered for the prompt delivery of a letter, it was impossible to trust them to do it. The slightest difficulty, the prospect of a carouse or of a tasty roast dinner, or the sudden appearance of a desire to visit a friend, was sufficient to make them postpone the delivery of a letter for an indefinite time (quoted from Lubbock, 1872; p. 454) [original footnote].
- 6 The reference is to p. 54 of Janet, P. 1928: *L'évolution de la mémoire et la notion du temps*. Paris: Maloine. As can be inferred from the references to Blondel, Ribot and Janet, Leont'ev was very well aware of what was going on in French psychology and in later years he would have intensive personal contacts with several French psychologists, among them Henri Wallon.

- 7 Not reproduced. Various films of psychological experiments carried out by Vygotsky, Leont'ev and Luria were made and may still be in some private archives waiting to be restored and seen.
- 8 The title Leont'ev gives is wrong. The reference should be to pp. 1217-18 of Vigouroux, F. (1895). *Dictionnaire de la Bible*. Paris: Letouzey et Ané.
- 9 See Baldwin (1895, vol. 1, ch. 1; vol. 2, ch. 14; 1897, vol. 2). We here use only the terminology of this author, leaving his general conception of development aside [original footnote].
- 10 In our work we were able to register (in subject 16) an instance of spontaneous turning of a child of school age in Series II (without cards) to coloured objects among his surroundings, with the idea of using them to assist him in his task; in this series the subject gave only two wrong answers altogether and in the third series none. We have observed analogous instances in our experiments with indirect memory [original footnote].
- 11 Refers to Thorndike, E. L. 1928: *The Psychology of Arithmetic*. New York: The Macmillan Company.