Cultural Psychology of Education 16

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Psychological Significance and Difference Between Tools Use by Humans and Animals

P. Y. Galperin's Dissertation

Springer

Cultural Psychology of Education

Volume 16

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Piotr Galperin—photo from the personal file retrieved from the archives of Kharkov Institute of Neurology, Psychiatry and Narcology of the National Academy of Medical Sciences of Ukraine, taken truly in 1928

Preface of the Series Editor

The surviving beauty.
Piotr Galperin's dissertation comes to light

It was the beginning of 2020 when Prof. Irina Engeness announced to me and my Springer associate editor Natalie Riborn that the original Galperin's dissertation was discovered in the Kharkov Institute of Neurology, Psychiatry and Psychology's archives; and she would like to edit the very first edition of Galperin's dissertation in my book series. My immediate reaction was of wonderment and of excitement, not only because of Irina Engeness' incredible discovery. Of course, I admired her incredible intellectual work on Galperin's legacy. At that time, she was just editing another outstanding volume (Engeness, 2021) that collected the translations of Galperin's Lectures in Educational Psychology. Neither my amusement was merely due to the pride of including Galperin's original dissertation in my book series. Instead, I was genuinely and deeply pleased by the idea that the original typed manuscript in Russian—safely stored in Kharkov's archives—could be made available to a wide community of cultural-historical scholars, researchers, and educators. Despite Galperin being acknowledged as an important figure in cultural-historical psychology, his work is still poorly known in Western academia.

This volume, *Psychological Significance and Difference Between Tools Use by Humans and Animals*, sees the light thanks to the tremendous work made by the two dedicated editors, Irina Engeness and Gethin Thomas, who took care of the entire translation process. They complemented the volume with a Foreword by Engeness and Shestopalova and a conclusive chapter by Thomas and Engeness, which provide the contextualising material to understand Galperin's contribution to Kharkov's Academia and the relevance of his theory for current research and practice on learning and teaching.

As the editors pointed out, '*Galperin's dissertation can be considered as an accurate summary of the work of the Kharkov School in the 1930s*' (Engeness,

Shestopalova, this volume). Clearly, Galperin's work builds upon the original line of inquiries opened by Vygotsky[1] and Leont'ev, but also extends it.

Galperin comparative analysis of tool use found a fundamental difference in way tools are developed and used by humans and animals. This difference has a psychological foundation: the tool used by humans reorganises the existing psychological processes and promotes new advancements, while in the case of animals, they are extensions of the their arms or legs.

Human consciousness originates in the external tool-mediated practices and undergoes developmental transformations initiated with tools- and speech-mediated activities.

In his dissertation, Galperin also focused on the development of children's motor skills. He identified four developmental phases: from *trial and error* to *tool-oriented action.* Galperin's dissertation accounted for the complex dynamic of the external tool-mediated and the internal psychological activity of humans.

These findings were rooted in Vygotsky theory. However, they provide an empirical explanation of the development of mental actions as they emerge in the practical activities children participate.

Galperin's dissertation is with no doubt an unvaluable contribution to understanding of human consciousness and its developmental processes.

Aside of being an important contribution to the twenty-first-century psychology, this book is important also because it acknowledges the 'surviving beauty' of those works, texts, dissertations, and books that went unscathed through the horrible barbarism of war times—displacement, devastation of cultural heritage, and any form of intellectual neglect. This dissertation survived to all this in its incredible beauty, too.

I can't believe I've written the editorial preface after the COVID pandemic and in the middle of Russia–Ukraine war, which are two historical circumstances that could further threaten the preservation and the cultivation of the scientific production.

Thus, having this work published represents an act of resistance and a message of hope that we are still able to use tools for improving our mind and our collective consciousness.

Salvador, Brazil
June 2022

Giuseppina Marsico

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[1] For Vygotsky legacy, see in this series, Roth & Jornet (2017).

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First and foremost, we would like to thank the Administration of Kharkov Institute of Neurology, Psychiatry and Narcology of the National Academy of Medical Sciences of Ukraine for providing the copy of P. Y. Galperin's dissertation. In particular, a big thank you to the director of the Institute Professor Igor Vladimirovitch Linsky. We would like to thank Professor Liudmila Shestopalova for her genuine interest in this project, her valuable contribution, and for co-authoring the Foreword. We would like to thank Yakov Abramson—P. Y. Galperin's grandson for granting his permission to translate the materials of the dissertation. Finally, our gratitude goes to the editor of the series Cultural Psychology in Education, Associate Professor Giuseppina Marsico, for including this book in the series.

Fredrikstad, Norway — Irina Engeness
Cardiff, UK — Gethin Thomas
January 2022

P. Y. Galperin's Psychological Significance and Difference Between Tool Use by Humans and Animals

The idea for this book arose when I was working on *P. Y. Galperin's Development of Human Mental Activity: Lectures in Educational Psychology*. I drew to Kharkov to take some pictures of the places connected with the biography of P. Y. Galperin. While walking on campus of the former Ukrainian Psychoneurological Academy (now Institute of Neurology, Psychiatry and Narcology of the National Academy of Medical Sciences of Ukraine), I asked passing by employees about the building where Leontiev, Luria, Vygotsky, and Galperin were working at in the 1930s. It should be mentioned that the Institute campus occupies a substantial territory with older and more modern buildings of various purposes: hospital buildings for patients with different disorders, buildings for lectures and seminars of medicine students, a library, several laboratories, and archive buildings. I was directed to a 1930s-style red bricks' building and encouraged to talk to the administration of the Academy who was in possession of quite a lot of documents and memories from this period connected with the work of the 'Moscow group'. I received a very warm welcome—lots of stories and memories were shared during my talk with the administration of the Academy. The former Institute director Piotr Vlasovitch Voloshin who made a significant contribution to collecting and publishing materials related to the history of the Institute refereed to P. Y. Galperin as 'our Kharkov scientist'. Of course, I was curious if any documents remained from 1930s in the old Academy archives; however, I was informed that the archives were destroyed during the World War II and the German occupation of Kharkov. Prior to the German occupation in 1941, the Academy archives were evacuated to Tumen, some documents were damaged during transportation, and some never returned back. The archive premises were partly destroyed in bombings and vandal actions of the occupants. After the war, the archive premises suffered from several floods—wet documents were just thrown away as completely damaged. The old archive building, which still exists, has hardly been renovated: it is extremely hot in summer and unbearably cold in winter. Due to such temperature difference, the paper becomes easily brittle and decomposes fast—some old documents have simply vanished with time. However, I wondered if P. Y. Galperin's dissertation that was written in Kharkov in 1930s remained in the archives. This dissertation has never been published completely, and it exists

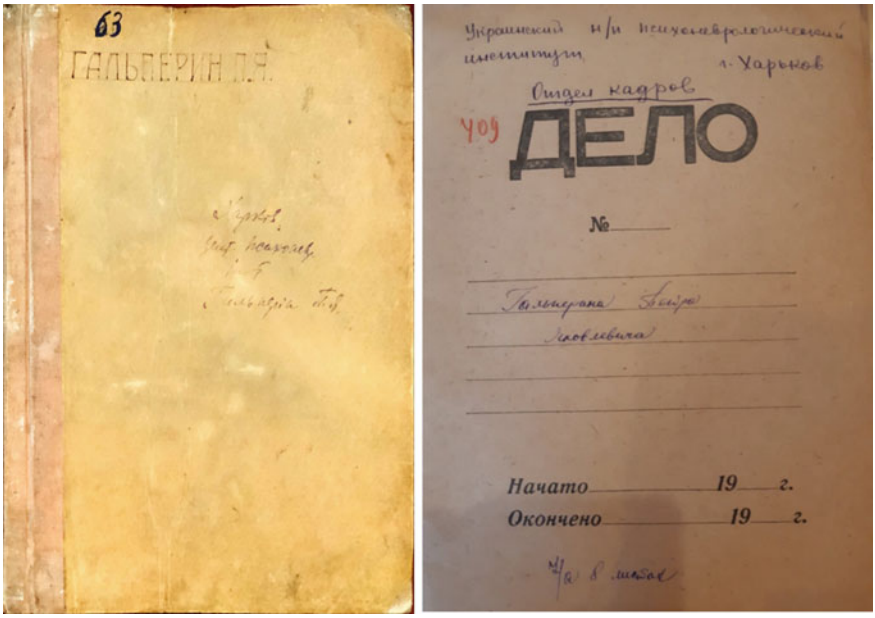

Fig. 1 P. Y. Galperin's Dissertation (left) and Personal File (right). *Photo* Irina Engeness 2020

as short paragraphs in the textbooks for psychology and pedagogy students used in Russia and beyond (Galperin, 1998). The answer was 'highly unlikely' because of the substantial damage of the archive buildings during World War II and improper conditions of the documents storage in the archive.

Upon my return to Norway, approximately three weeks after my visit to the Institute in Kharkov, I got a phone call. In a trembling voice, Prof. Liudmila Shestopalova informed that not only P. Y. Galperin's dissertation, but also his personal file was found in the old archives. Although the information in the personal file was readable, some pages were touched with mould. Galperin's dissertation, however, was in an excellent condition and almost intact! I was really excited, got my tickets to travel to Kharkov in April 2020; however, the whole world shut down in the middle of March 2020 because of the COVID-19 pandemic. I could not wait until the first opportunity presented itself to travel to Kharkov in July 2020. It was a long trip with several connection flights as direct flights were already put on halt. I had only one day to scan the dissertation and the personal file on the premises of the Academy. It was a hot summer day; I was wearing a mask and rubber gloves. Standing by the window to get enough light, I was scanning page after page of the documents with my IPAD. The paper was extremely brittle and could not bear the heat from the scanner. After five hours of work, I had a digital copy of the documents (Fig. 1), ready to be translated and introduced to a wider circle of researchers in the West.

P. Y. Galperin's dissertation *Psychological Significance and Difference Between Tools Use by Humans and Animals* has never been published in full before, not even in Russian. Some parts of the dissertation were included in the textbooks used in several courses for psychologists and in teacher education in Moscow and other universities familiar with Galperin's legacy (Galperin, 1998). We believe that parts of the dissertation were restored from memory when P. Y. Galperin moved to Moscow and was working at Moscow State University. When talking to Galperin's grandson, Yakov Abramson who lived in Moscow to find out whether he had a complete copy of the dissertation, he explained that the copy might had been lost during their family move from Kharkov to Moscow. It seems that the copy found in the old Institute archives in Kharkov was the only complete remaining copy of P. Y. Galperin's dissertation. This copy is included in this book as an original document. Before we reveal the content of the dissertation, we would like to create a historical backdrop of the events that happened prior to the times when the dissertation was written and that might have significantly affected its content and Galperin's contribution to the cultural-historical theory.

A Brief Historical Backdrop

Although Piotr Yakovlevitch Galperin was born in Tambov (Russia) on 2 October 1902, the whole family moved to Kharkov and then the capital of Ukraine when his father became a professor in Kharkov Medicine Institute in 1911. Galperin grew up in Kharkov, he went there first to the grammar school, where he met his wife, Tamara Meerzon (Haenen, 1996) and then to Kharkov Medicine Institute. According to the information in the personal file, he lived in Pushkinskyi Drive 3—this building still exists in Kharkov (Fig. 2).

Piotr Galperin graduated from the Medicine Institute in 1926 as a psychoneurologist—a specialisation in medicine that dealt with both organic and functional nervous and mental disorders (Fig. 3).

After graduation, Galperin worked as a physician at a hospital for drug addicts. He successfully used hypnosis to treat drug addicts, and he became a skilled hypnotist. However, after a while, Galperin began to understand that addiction was not really a human weakness, but a real disease. He suggested that addicts had a sort of weak link in their metabolism that could be compensated for another type of poison, such as alcohol or other drugs. Although Galperin's hypothesis seemed to be promising, he did not pursue any research on this matter.

In 1928, Galperin was invited to work at the psychoneurological research laboratory, which together with the hospital for drug addicted was part of the Ukrainian Psychoneurological Institute in Kharkov. In 1932, it merged with another large psychiatric clinic, the Central Clinical Psychoneurological Hospital of the Ministry of

Fig. 2 Pushkinskyi drive in Kharkov. *Photo* Irina Engeness 2020

Fig. 3 Kharkov Medicine Institute (2020). *Photo* Irina Engeness

Railways, and finally reorganised to the All-Ukrainian Psychoneurological Academy (UPNA) (Yasnitsky, 2009).

The period 1928–1936 in Piotr Galperin's biography is associated with his work in UPNA and the so-called Kharkov school, headed by Leontiev. The best professionals in the areas of psychology, neurology, neuropathology, and other areas from the whole Soviet Union were invited to Kharkov to work at the newly founded UPNA. Vygotsky, Leontiev, Luria, and others from the so-called Vygotsky's circle—the leading psychologists in the Soviet Union at the time—were also invited to join the Academy (Yasnitsky & Ferrari, 2008b). The members of Vygotsky's circle accepted the invitation for two main reasons: first, Kharkov was the capital of Ukraine and a well-recognised scientific centre. The second and perhaps more important reason was that the atmosphere in Moscow in the 1930s had become difficult and even life threatening (Gindis, 1998; Van der Veer & Valsiner, 1991). There were attacks on pedology (the science that combined physiology, defectology, psychology, and pedagogy). Some of Luria's works were banned, and the decree of 1936 abolished pedology as a science (Engeness & Lund, 2020). Kharkov was away from the hectic hub of Soviet affairs, and it was a place where the invited scientists could continue their work and remain relatively safe. In addition, at the time, Soviet psychology was divided into several conflicting schools, such as Pavlov's physiology, Bekhterev's reflexology, Kornilov's reactology, and Vygotsky's cultural-historical approach (Haenen, 1996). Kharkov seemed to be a quiet harbour where Leontiev, Luria, Vygotsky, and others could pursue their ideas apart from other conflicting schools and the threatening political atmosphere in Moscow.

Piotr Galperin and his colleagues took an active part in arranging the move of Vygotsky, Luria, Leontiev, Bozhovich, and Zaporoshets to Kharkov (Haenen, 1996). However, Vygotsky, who suffered from occasional bursts of tuberculosis (Vygodskaya & Lifanova, 1996), did not move to Kharkov. Like Luria and Leontiev, he was offered only one room in a communal house and could not bring his family—his wife and two daughters. He received and accepted Rubinstein's 1931 offer to take a position in the Department of Psychology at the Leningrad Institute of Pedagogy. Nevertheless, Vygotsky actively participated in the founding of the Psychological Sector of the UPNA and closely supervised the research of the Kharkov group (Yasnitsky & Ferrari, 2008a).

Galperin got exposed to the works of Vygotsky at the beginning of 1930s—upon the move of Luria, Leontiev, Bozhovich, and Zaporoshets to Kharkov. The essence of conflicting schools that attempted to explain human consciousness, Vygotsky described as a crisis in psychology in his famous essay 'The Historical Meaning of the Psychological Crisis' (Dafermos, 2014; Vygotsky, 1997). In the essay, Vygotsky argued that psychology should overcome the Cartesian dualism of body and mind in order to understand human cognition. Vygotsky postulated that the higher psychological functions could be studied by objective and experimental science and that human consciousness is rooted in social life. Consequently, in order to understand human consciousness, one should turn to real life, which is stimulated by the development of relationships among humans involved in practical activities (Vygotsky, 1980). The central idea in Vygotskian theory is that participation in social practical

activity, using tools, is the main factor influencing the development of the human consciousness. Although Vygotsky's essay on the crisis in psychology was written in 1926, the fact that Galperin met Vygotsky in the early 1930s and worked closely with him on a regular basis for several years (Haenen, 1996) makes it quite possible that Galperin had the opportunity to read Vygotsky's manuscripts already at the beginning of the 1930s. Considering Galperin's interest in dualism and psychology, the influence of Vygotsky's work might have been significant.

While sharing Vygotsky's ideas on the need to overcome Cartesian dualism of body and consciousness, Galperin engaged in polemics concerning matters arising from Pavlov's theory. Galperin insisted on keeping physiology and psychology as distinguished sciences, although with some overlapping areas. Pavlov stated that it was possible to study psychological phenomena using the method applied in physiology, and, in general, he was openly sceptical of psychology as a science. Galperin argued that physiology and psychology were essentially different sciences with their own laws that could not be used interchangeably to examine psychological and physiological phenomena. For example, Galperin disagreed with Pavlov's understanding of the development of human consciousness through establishing stimulus–reflex responses, but he suggested the development of human consciousness as a process of internalisation of external social activity with tools. Such an understanding presents, in a nutshell, the methodological and epistemological approach to studying human consciousness the members of the Kharkov School suggested in the 1930s. Galperin's candidate dissertation presented in this book can be considered as an accurate summary of this perspective.

A further argument also suggests that Galperin was familiar with and influenced by Vygotsky's view on the crisis in psychology. In the early 1930s, Vygotsky wrote a study on emotions (Vygotsky, 1987), which was published in full only in 1984. In this study, Vygotsky attempted to connect the crisis in psychology with the issue of mind–body dualism (Van der Veer & Valsiner, 1991). In 1970, a short excerpt of this manuscript was published in the Soviet journal *Voprosy filosofii* (Philosophy Matters), accompanied by a preface written by Galperin. This suggests that Galperin might have been familiar with Vygotsky's works through the original manuscripts and that Galperin's quest to overcome mind–body dualism might have originated in Vygotsky's works (Haenen, 1996). The issues related to the mind–body dualism, the origin, and the development of human consciousness were central in the work of Kharkov UPNA scientists.

The account of the internal structure of the psychological sector of the UPNA was presented in Galperin's article 'Psychological Sector' in the first collection of the works of the UPNA, published in 1934 in the materials of the First All-Ukrainian Psychoneurological Conference (Galperin, 1934; Yasnitsky & Ferrari, 2008a). In this paper, Galperin presents three main research units: (1) the Department of General Experimental and Genetic (i.e. Developmental) Psychology, headed by Leontiev; (2) the Department of Clinical Psychology, headed by Lebedinskii; and (3) the Department of General Psychological Theory, headed by Galperin, which worked on developing theoretical grounds of psychology. Luria was the founder and the first director of the psychological sector of the Academy. Even after his departure to Moscow

Fig. 4 Galperin's personal file—retrieved from the archives of the former UPNA. *Photo* Irina Engeness 2020

in 1934, he was closely associated with the Kharkov group, especially with the Department of Clinical Psychology (Engeness, 2021; Yasnitsky, 2009) (Fig. 4).

Galperin's candidate dissertation presented in this book was written during his work in UPNA in 1930s. However, before introducing its content and reflecting on the significance of Galperin's dissertation to the cultural-historical psychology, we would like to introduce all very briefly the fascinating history of UPNA.

All-Ukrainian Psychoneurological Academy: A Historical Glimpse

All-Ukrainian Psychoneurological Academy (UPNA) was founded in the premises of so-called Saburova Datcha built in Kharkov after the famous resolution of Petter III in 1761 that ordered not to place people suffering from mental illnesses in monasteries, but to build hospices where these people had to live under a daily supervision and medical care (Zelensky, 1946). It was particularly emphasised that people with mental

illnesses had to be offered professional medical care instead of a supervision of monks and priests. In addition, it was suggested to offer mental patients' opportunities for meaningful work. After a special order of Ekaterina II in 1775, a hospice for people suffering from mental illnesses was built in Kharkov. The hospice was active for the following hundred years. For example, in 1869–1870, 88 people with mental illnesses were living permanently there; one doctor, two caretakers, and three female helpers were looking after of the patients. After the war with Turkey in 1876, the premises of the hospice were considerably extended with the two new buildings that were built to accommodate for the wounded soldiers. When the soldiers recovered, the new premises allowed to accommodate 150 mental patients in the hospice. In the following years, the number of patients continuously increased. Thus, in 1880, 221 patients were admitted to the hospice; in 1884—352 and in 1886—450 patients. In 1890, the hospice was considerably renovated and extended for 40 new places; however, this did not meet the demand to considerably improve the situation in the hospice—the premises were still overcrowded—in 30 years, the number of the patients increased 10 times. Insufficient funding, often change of medical personnel, and overcrowded premises imposed challenges on running the hospice (Zelensky, 1946).

In 1897, a decision was made to build a new hospice for 800 places equipped with electricity, running water, and a steam kitchen. However, the number of patients continued to grow and in 1907 the hospice accommodated already 1163 patients who came not only from Kharkov, but many other regions, for example Donbass and Caucasus that did not have similar hospices. By 1912, the number of patients increased to 1587 which let to considerably overcrowded premises of the hospice. The average number of days spent by each patient in the hospice in 1912 was 183. However, by the beginning of the 1900s, the quality of medical care considerably improved, the number of qualified doctors significantly increased, and the hospice acquired a hospital status.

The revolutionary movement in Russia in 1905 affected the management and organisation of Saburova Datcha. The hospital employees demanded to organise a board as a central managerial body with four employees' representatives. Other demands included increase of salary and annual leaves, establishing a school for employees' children. In general, these demands reflected significant concerns with the working conditions and were penetrated with the spirit of humanism and care for the patients. Some of the demands were satisfied: the chief doctor retired, and the hospital board was organised that included six doctors, six nurses, and six caretakers. However, new economic demands were put forward by the caretakers in 1906. Among these demands was an eight-hour working day, salary increase, and establishing a hospital employment committee responsible for recruitment. Initially, these demands were not followed through; however, most of them were satisfied by the end of 1906. A new collective form of hospital management contributed to improvement of the working conditions and medical care for the patients: the hospital board consisted of a chief doctor and four other elective doctors. In addition, representatives of nursers and caretakers participated in the work of the hospital board. Similar to previous times, in the period 1906–1917, the hospital suffered from lack of premises and

remained considerably overcrowded. By 1912, the average daily number of hospital patients reached 1587. It was decided to extend the premises by building up to 40 new buildings each of them was to be equipped with running water, electricity, and toilets. However, these plans were realised only partially.

Interesting to mention that labour therapy was introduced and widely used at Saburova Datcha. For example, since the end of 1890s, the patients engaged in growing pigs and other domestic animals. A small brick factory was built on the premises of the hospital: in 1896, the patients produced 500 bricks a year; in 1897, the production doubled, and in 1900 above, 319000 bricks were produced on hospital premises. Lately, the patients became involved in honey and silk production as well as carpentry. By 1920s, about 28% of all patients were actively engaged in labour therapy. The patients' cultural development was also in focus in the hospital—by 1907, a library included over 4112 volumes, and the patients were often engaged in group readings, various games, theatre role-plays, and performance production.

Scientific work was highly prioritised at Saburova Datcha. Professor P. I. Kovalevsky, who developed foundations of Ukrainian psychiatry, was in charge of the psychiatry department and engaged in lecturing and clinical demonstrations for medical students. Besides, Kovalevsky was the chief editor of the Journal of Psychiatry and Neurology; he was the author of several important scientific publications. Other doctors working at Saburova Datcha such as T. I. Yudin and A. I. Geitmanovitch were engaged in editing Kharkov Medicine Journal and were lecturing medicine students. Several outstanding psychiatrists engaged in research in the hospital and made considerable scientific contributions, such as S. N. Davydenkov, T. I. Yudin, T. A. Geyer, V. M. Gakkebush, and S. I Zander. In summary, the developments, medical care, and scientific work at Saburova Datcha were in line with the most prominent hospitals and psychiatry scientific environments in Europe (Zelensky, 1946).

After the revolution of 1917, the principle of *prophylactics* was introduced in psychiatry. In addition, the principle of *inclusion* offered a different societal attitude to psychiatry patients—they considered to be valued members of the collective society and, therefore, could not be excluded from it. The concepts of psychohygienics and psychoprophylactics became central in the work of Saburova Datcha which in 1923 was headed by the student of Bekhterev and Pavlov—V. P. Protopopov who was actively engaged in administrative reorganising of the hospital and stimulating scientific work of the staff. By 1924, the hospital had 1307 patients, and labour therapy was actively used with 30% of the patients.

In September 1926, the hospital was reorganised to the Ukrainian Institute of Clinical Psychiatry and Social Psychohygienics. The number of scientific publications was growing exponentially: in the period 1920–1932, the Institute published 16 volumes of scientific publications and one monography.

In 1932, the Ukrainian Institute of Clinical Psychiatry and Social Psychohygienics was reorganised into All-Ukrainian Psychoneurological Academy (UPNA). By this time, the most prominent scientists in the field were employed in the Academy: A. I. Yuschenko, A. I. Geitmanovitch, A. M. Grinshtein, V. P. Protopopov, G. V. Folbort, D. E. Alpern; K. I. Platonov, and many others. As mentioned above, A. V. Luria, A. N. Leontiev, L. I. Bozhovich, and A. V. Zaporoshets were invited to Kharkov to join

the newly organised UPNA. By 1939, UPNA had 177 doctors, out of which 112 had PhD qualifications: 19 professors, 21 docents, 71 scientific assistants, and above 1400 patients. UPNAs premises were considerably renovated, and significant investments were made to the Academy material equipment: modern furniture, extended library, and innovative medical equipment became available for the patients and staff of UPNA. It was planned to convert UPNA into one of the biggest centres in the field of psychoneurology. The following Institutes consisted of the Academy: Institute of Clinical Psychoneurology, Institute of Experimental Psychoneurology, Institute of Child Psychoneurology, Institute of Social Psychoneurology, Institute of Human Resources—each of them was considerable in size. In addition to the Institutes, the Academy included four Scientific Research Institutes, an Institute that educated psychoneuroligists and where Vygotsky was enrolled as a student (Vygodskaya & Lifanova, 1996a), the Psychiatry Hospital (consisted of twelve departments and had a capacity for 700 patients), and a Medical-Labour Colony, located 45 km away from Kharkov for 300 patients.

However, as a consequence of the odious decree on pedology in 1936 that banned pedology as a science and the fact that the capital of Ukraine was moved to Kiev in 1935, UPNA lost its funds and was considerably reduced in size. Finally, at the end of 1936 and the beginning of 1937, the Ukrainian Psychoneurological Academy was reorganised to Kharkov Psychoneurological Institute (Voloshin, 1994).

During WWII, the Germans occupied Kharkov for over three years, and in 1941, the major part of the Institute was evacuated to Tumen in West Siberia. The remaining parts of the Institute continued their work; however, the directions of their practice and scientific research were modified to respond to the new demands. For example, military trauma of the central and peripheral nervous system and mental disorders of wartime were intensively studied. In the first days of the war, a military neurosurgical, neurological, and psychiatric hospital was created on the basis of the Institute. Piotr Galperin followed the evacuated Institute to Tumen where he worked as a neurosurgeon dealing with rehabilitation of motoric functions in wounded soldiers. On 14–16 February 1943, in Tumen, Galperin participated in the Ninth Conference of the Ukrainian Psychoneurological Institute and the Second Conference of Neurosurgeons, where he presented the results of his study entitled On the Development of Conscious Movements in Rehabilitation Therapy. His findings demonstrated that a movement that a wounded soldier could not initially perform could be accomplished when the movement became tool oriented. For example, a person who was initially unable to lift his hand could lift his hand to comb his hair. In sum, Galperin suggested that tool orientation was fundamental to understanding the nature of human movements. Therefore, the process of rehabilitation required a systematic approach and had to be completed gradually to target both neurological and psychological aspects of human activity. These findings had significant implications for the development of rehabilitation programmes for wounded soldiers that restored movements through a process of meaningful tool-mediated actions. This research was a sequel to Galperin's research in Kharkov, particularly his findings concerning human tool-oriented actions, presented in his dissertation and which are central to the cultural-historical theory.

Fig. 5 Main building of Institute of Neurology, Psychiatry and Narcology of the National Academy of Medical Sciences of Ukraine, located on Pavlov's street (*Photo* Irina Engeness 2020)

On 20 April 1944, the hospital returned from evacuation back to Kharkov—most of the premises of the Institute were either completely destroyed or suffered badly from bombings of the German occupants. The original building of the hospice built in 1820 was destroyed, several other buildings were burnt down, and others were used by the Germans as automobile garages. The hospital's electro power station, kitchen, washing rooms, workshops, and many other buildings were in ruins. More than 1000 patients with mental illnesses were killed by the Germans. Much efforts were invested to bring the Institute back to life; moreover, there was a need to establish 200 places for the wounded soldiers after the bloody fights to liberate Kharkov. Shortly after, this capacity was extended to 600 places, four neurological hospitals, including the children's neurological hospital, four psychiatry hospitals, a neurosurgery hospital, and a psychoneurological clinic which were open. Together with that, multidirectional scientific work was relaunched.

In the 50s–60s, much work was done to examine the consequences of cranio-cerebral trauma and rehabilitation of invalids of WWII. In the early 80s, in order to continue examining traumatic brain injuries, a Republican target programme of scientific research was developed at the Institute. The leading Institute professors, such as M. S. Gorbachev, Ya. V. Pishel, V. S. Mertsalov, I. I. Shogam, and B. V. Mikhailov, developed improved methods of diagnostic, surgical and conservative treatment, rehabilitation, prevention, and medical examination of injuries. In the 50s–70s, the Institute worked on the issues of the clinic treatment of infectious diseases of the nervous system by adopting a broad evolutionary-biological multidisciplinary approach. In addition, clinical, psychological, and pathophysiological approaches to diagnosis and treatment of mental diseases were developed. A new department of narcology, which conducts a comprehensive study of the problems of alcoholism and drug addiction, was established in 1959.

In 80s–90s, a comprehensive Republican target scientific programme was developed at the Institute to combat vascular brain diseases. The programme covered the central aspects of cerebrovascular pathology and included fundamental, epidemiological, clinical, and paraclinical approaches aimed at elucidating the pathogenesis, risk factors, improving early diagnosis, treatment, and prevention of these diseases (Fig. 5).

In 1992, the Institute received the status of Institute of Neurology, Psychiatry and Narcology of the National Academy of Medical Sciences of Ukraine. The Institute has a scientific centre that examines complex issues related to theoretical and practical neurology, psychiatry, and narcology.

P. Y. Galperin's Dissertation Psychological Significance and Difference Between Tools Use by Humans and Animals

As indicated above, in 1928, Galperin was invited to work at the psychoneurological research laboratory, which together with the hospital for the drug addicted was part of the Ukrainian Psychoneurological Institute in Kharkov. In 1932, it merged with the Central Clinical Psychoneurological Hospital of the Ministry of Railways and finally reorganised into the All-Ukrainian Psychoneurological Academy (UPNA) (Yasnitsky, 2009). Galperin acquaintance with Vygotsky and his theory in the 1930s greatly influenced the beginning of his career as a psychologist and his subsequent research (Arievitch, 2008).

At the beginning of the 1930s, Vygotsky made a thorough revision of his theory of sign mediation, suggesting a new direction for his research, which he defined as the theory of a dynamic system of significance (Zavershneva & van der Veer, 2018) and the psychology of experience (*perezhivanie*) (Clarà, 2016; Roth & Jornet, 2016). Until May 1934, Vygotsky often commuted between Leningrad, Kharkov, and Moscow, and he remained the main connecting link between these research groups (Van der Veer & Valsiner, 1991; Vygodskaya & Lifanova, 1996b; Zinchenko, 2013). He not only gave lectures and participated in scientific conferences and seminars but also studied at UPNA and organised 'internal conferences' for his closest colleagues. At these conferences, new scientific ideas were discussed. The Department of General Psychological Theory, a cross-sectional unit that included scholars from different fields headed by Piotr Galperin, had the main research direction to examine the development of human consciousness and speech through engagement in practical activities. In addition, the researchers studied the effects of human consciousness and speech on other psychological functions as well as the deterioration of these psychological functions caused by the dysfunction of the human brain. In one report about the contribution of his department, Galperin offered an impressive list of the currently pursued research directions that were related to numerous areas in psychology (Yasnitsky & Ferrari, 2008a).

In the early 1930s, Galperin carried out his well-known experiments on the differences in tool use between human beings and animals and on the appropriation of tool-mediated activity that were used as a baseline for the discussions presented in his dissertation (Galperin, 1998). In summary, Galperin's dissertation can be considered as an accurate summary of the work of the Kharkov School in the 1930s.

The outburst of scientific activity by the Kharkov Group occurred during a short period of favourable relationships between the Soviet government and the science of

psychology (Bogdanchikov, 2008). During this period, Vygotsky's most influential works were published, such as *Thinking and Speech* (1934)*, The Dynamics of the Schoolchild's Mental Development in Relation to Teaching and Learning* (1935), and *Foundations of Pedology* (1934). His publications included collections of the works of his colleagues on child development, such as *Mentally Retarded Child* (Vygotsky & Danyushevskiy, 1935), *Pedology* (Blonsky, 1934), *The Foundations of Psychology* (Rubinshteyn, 1935), the biodynamic works of N. A. Bernshteyn, (1935), and a collection of works by the Kharkov Group (Galperin, 1934).

As mentioned above, Galperin was familiar with Vygotsky's works, and they have had great influence on his development as a psychologist and his research. In his candidate dissertation, Galperin studied the differences in tool use between humans and animals. He argued that there was a fundamental difference between the tools humans developed and used and the auxiliary devices animals used that was psychological in nature. Galperin suggested that the tools humans created and used in practical activities enhanced the development of new psychological functions and human consciousness. Such use of tools totally differs from the way animals utilise tools as an extension of their limbs. The core difference between humans' and animals' tool use was in the functional significance of the used tools. For example, when holding a tool in the hand, a human or animal can use the tool as an extension of the arm. In this case, the tool acquires the arm's functions, and therefore, the tool's own functional significance appears to be downplayed. Alternatively, when a human or animal holds a tool, their arm can comply with the requirements of the operations of the tool use, and therefore, the arm acquires the tool's functional significance. By mastering the used tools and revealing the practices encapsulated in these tools, the human consciousness, in contrast to the animal mind, undergoes developmental transformations initiated in tool-mediated activities. In postulating so, Galperin extended Vygotsky's understanding of the difference between tool use in humans and animals in the appearance of tools signs. Galperin suggested that utilising tools not as an extension of the human arm but through acquiring the tool's functions by the arm and mastering the culturally developed operations of the tool use made humans' tools fundamentally different from animals' ones. He concluded that tools that had psychological significance for humans were characterised by the historically and culturally developed operations encapsulated in these tools, and these operations had to be mastered by humans for them to be able to employ the tools. In addition, as opposed to the animal mind, human consciousness undergoes developmental transformations initiated in tool- and speech-mediated activities. Such an understanding of psychological significance of human tools urged the discussion about how these tools may acquire such a significance for humans. In the second part of his dissertation, Galperin studied the development of motor skills with children and suggested that such development goes through four distinct phases: i) trial and error, ii) alertness, iii) persistent intervention, and iv) tool-oriented activity. Galperin's dissertation consists of five chapters that reflect in detail his research and considerations. In the following, we present an overview of the chapters in the dissertation.

Chapter 1: The chapter starts by considering the psychological difference between human and animal tools. Galperin refers to the Köhler's experiments that demonstrated that apes were able to solve problems by identifying connections, establishing relationships between tools and objects, and even creating tools. While not denying Köhler's conclusion, Galperin questions whether animals' thinking activity can be considered a simplified version of a human's. To answer this, Galperin suggests examining human and animal tool use to develop understanding of the tools' characteristic features in general and animals' tools in particular. Galperin suggests that animals use tools accidently, they cannot be preserved for the future, and they do not have defined areas of application. Their functions are not expressed in their shape, are of natural origin, and are not employed in the system of social production. He highlights that all features of animals' tools emphasise what these tools are lacking, but they do not provide an explanation about why they are lacking these features. To offer an explanation, Galperin examines the nature of animals' auxiliary means by considering them as intermediate links between animals and the surrounding environment. He argues that animals' means do not present opportunities for new activities, and on the contrary, their natural behaviour determines how the means are used. In humans, tools determine and affect the activities in which they are used. To develop an understanding about how tools affect the activities that employ them, the relationships between (i) a mean (tool) and a purpose of the activity and (ii) a mean (tool) and an acting subject should be considered.

While considering *the relationship between a mean and a purpose*, Galperin suggests that such a relationship reflects the mean's technical-rationalistic feature (e.g. how well the mean is suited to achieve the desired purpose). However, neither the relationship to the purpose nor the mean's technical-rationalistic feature offers a foundation to reveal the mean's mediating role. Therefore, a mean's relationship to the desired purpose cannot be essential to examine its mediating function.

To consider the *relationship between a subject and a mean*, Galperin suggests examining the mean's convenience and how well the subject uses the mean to achieve the desired purpose. This examination is required to reveal how the subject masters the mean and its usefulness for the subject's needs. By adopting such an approach, however, examination of the mean appears to be downplayed. Therefore, to examine the relationship between the mean and tool, its functions and suitability to achieve the desired purpose should be considered.

It is also important to consider the ways of working with the tool as a system of encapsulated operations. The opportunities of interaction with the tool depend if the surrounding environment is (i) natural or biological and (ii) human social environment. In both the social and biological environments, tools can encapsulate (i) a system of mediated operations developed during social tool-mediated practices and (ii) a system of manual operations, developed in the process of using a hand as a natural tool.

If the *arm is included in the tool-mediated operations*, it complies with the requirements and rejects its own operations. As the arm and hand hold the tool, it is positioned between a human and the environment, and a new reality appears. By offering new

opportunities of interaction in the surrounding environment, the tool acquires its historical and psychological significance.

If the *tool is included in the system of the arm's operations*, it loses its own operations and acquires the functions of an arm by becoming its extension. In this instance, a tool does not present new opportunities for the human and offers only a slight variation of the already existing ones. Galperin concludes that through tool use, a new reality emerges for humans. Such a reality is comprised of the tools' properties and the historically and socially developed ways of working with these tools. The system of tool operations reflects the outcome of the development within social collective production. Human tools are not only used as intermediate objects, but they are also encapsulated operations and activities with these tools. Therefore, such activities are tool mediated. Animals' auxiliary means only resemble tools; however, they are employed in manual activities and cannot be considered true tools even in their simplest modifications. As an example, Galperin considers how small children learn to master a spoon by gradually transferring from manual to tool-mediated operations.

Chapter 2 offers a detailed description of the empirical research Galperin conducted. Several groups of children, between two and seven years old, participated in the experiment. The children were tasked to lift toys out of the 'pool'—a box without bottom (70 × 50 and 60 cm height). There were a variety of toys: a celluloid fish, a frog, swan, a large and small roller (for electricity wiring), a small and large blue wooden cube (7 × 7 cm), a cylinder, a trihedral and tetrahedral pyramid, an iron top, three polished barrels, and others. The children's task was to lift the toys out of the pool by using a spade which had a blade sized 9 × 11 cm attached at a right angle to its handle (40 cm). The spade had a specific and simple logic: for a successful action, it had to be lifted up and out of the pool vertically.

The two-year-old children were first to engage in the experiment which demonstrated that they used the spade only as a stick, and the spade blade was regarded as an inconvenient addition, not useful for the operations. The children attempted to lift the toys by pressing them against the pool's wall with the spade handle and moving them upwards as if it was an extension of their arm. Galperin summarises the different ways the children (also seen in older groups) held the spade in their experiments: *as a stick, as a reversed stick, as a wand, as a fork, as a teaspoon, and as a pinch.* He also explains that lifting the toys out of the pool consisted of three relatively independent tasks: (i) sliding the spade under the toy, (ii) stabilising the toy on the spade blade, and (iii) lifting the toy.

Galperin observed that when the two-year-old children engaged in manual operations, their movements did not correspond with the objective requirements of the tool and the spade functionally merged with their arms. These manual operations were particularly visible at the beginning of the experiment. The children bent their arms as if the spade was an extension of their arms and the blade was their hands, holding the toys. When the toy fell off the spade, this provided evidence that the logic of such an instinctive operation did not correspond with the logic of the tool. Such inconsistency was quickly noticed by the children and was eliminated. Further manual operations were visible when (i) the children slightly tilted the spade to their

left hands, (ii) they lifted the spade with a quick movement, and (iii) they changed their grip on the spade handle. When performing these movements, the children did not realise that the toys were unstable and did not stay on the spade in the same way as if they were holding them. Sliding the spade under the toys was almost impossible for the two-year-old children, they operated with the spade as a stick, and the blade was perceived by them as negative and useless.

In Chap. 3 Galperin poses two questions: (i) What are the differences between manual and tool-mediated operations? and (ii) How do tool-mediated operations develop with children?

He starts by considering tool-mediated operations that comprise a system of arm movements with a tool aimed at achieving a desired purpose. Galperin specifies that it is not the arm's movement itself, but the movement with the tool that constitutes a tool-mediated operation. For example, in the experiment described in Chap. 2, a spade was used in a tool-mediated operation to lift the toys out of the pool. How the children slid the spade under the toy and the toy's leaning position on the spade handle were crucial for the success of the activity. On the other hand, the lifting operation and the children's grip on the spade handle were insignificant. Based on such considerations, Galperin concludes that a tool-mediated operation is a system of movements with a tool, transferring target objects from initial to a desired position. Tool-mediated operations are determined by the target task: to perform an activity. Although some hand movements might be useful, it is the child's ability to identify the productive tool movements that is crucial for a successful operation.

Manual operations are defined as a system of hand movements aimed at performing the desired operation with the target object. When a hand acts as a tool, manual operations can be considered as individual cases of tool-mediated operations. *Manual and tool-mediated operations, however, differ in the system of movements that comprise these operations.* For example, Galperin uses empirical data to offer descriptions of how the tool (spade) was used by different aged children. He highlights that in manual operations, tools become an extension of the acting subjects' arms. Tools do not affect the interactions of subjects with the surrounding reality. In tool-mediated operations, tools are included in a particular system of social relationships, and the subjects' interaction with the object is mediated by the tool. In doing so, the subjects discover new ways of interacting with the surrounding reality which exceeds natural opportunities.

Galperin concludes that by comparing tool-mediated and manual operations, a tool's characteristic features can be identified. These characteristic features, however, are not sufficient to create a clear distinction between a tool and a mean. Only the structure of the tool-mediated activities, the structure of the operations with the tool, can reveal the systemic characteristic features of the tool and uncover the true nature and difference between tools and means.

Galperin suggests that earlier experiments of Köhler and Thorndike offered significant difficulties for researchers and theorists, such as Plekhanov, Vygotsky, and Vagner, to identify differences between human and animal tools since the empirical data collected were unsuitable. The differences between tools and means become visible when (i) the experiment involves participants' operations with the tool that

has its own logic of use and (ii) the employed tool can also be used in manual operations. Galperin argues that in Köhler's experiments, the apes were using tools in manual operations which did not correspond to the publicly accepted operations encapsulated in these tools. In doing so, the apes demonstrated their instinctive consciousness. Galperin suggests that *animals' auxiliary means simply extend their natural organs, and therefore, they do not play an essential role in the development of their consciousness.* These means do not add any new functional opportunities, and animals perform their functions with the means considerably worse. Therefore, animals' auxiliary means should not be considered as simple tools, but as their biological opportunities, not as a seed that will evolve into a tool, but as a necessary precondition for the development of tools.

By employing natural opportunities, the process of social production emerges. A tool first appears, however, during such a process and more precisely in social and not individual production. *An animal's mean is separated from a human tool by a period of human historical development*. Human social production accidentally discovered auxiliary means that were gradually transformed into tools. During this process, the employed natural means acquired their social logic of labour, and from this very moment, the true tools emerged. Therefore, from the very beginning, *a tool carries the burden of its social nature that presents itself for humans as an objective reality, similar to other material things.*

Galperin concludes that material or psychological links do not exist between animals' auxiliary means and human tools. Animals' means and human tools are separated by the existence of human society, developed on the grounds of collective labour. Tools and means do not represent different phases in the development of the same objects; rather, they are objects that belong to two different and independent lines of development. Animals' auxiliary means present only opportunities and do not reveal their essence as tools even in their simplified forms. They are considered as natural preconditions for the emergence of human tools; however, their appearance belongs to another historical reality.

Chapter 4 starts by considering the operations used by the children in the empirical material. Galperin focuses on examining the psychological significance of the types of operations used and difference between tools and means. The empirical data demonstrate that there is a relationship between the children's age and the types of operations used: older children perform more tool-mediated operations than younger ones. This correlation gives rise to two hypotheses. First, older children are more acquainted with the tool properties, and they consciously realise the opportunities for interaction with the tool (spade). The shift in the performed operations and the transfer from the mean to the tool, therefore, is caused by the development of children's consciousness. Second, the development of children's consciousness is not of primary importance, and the changes in their operations happen due to acquiring skills through interacting with objects. Therefore, the properties of tools and objects become signals for children's purposeful operations. These changes in operations are caused by the accumulation of experience and the development of more sophisticated connections between elements within the environment and children's reactions.

Despite being different, these hypotheses are similar if it is considered that (i) in the development of children's consciousness, the accumulation of experience is of primary significance for developing tool-mediated operations and (ii) the differences between psychological tools and auxiliary means are of less importance. Galperin argues that both perspectives contradict considerations of the importance of children's engagement in tool-mediated operations for developing consciousness. He emphasises that children's engagement in tool-mediated operations should not be considered as a phase following manual operations. Social collective production cannot be considered as an advanced type of animals' activity with or without means.

Galperin emphasises that the characteristics of tool-mediated operations can be identified by asking the following questions: (i) How are manual and tool-mediated operations connected in child development? and (ii) How does a child master various tools? He believes that tool mastering and the transfer from manual to tool-mediated operations in children happen gradually, involving transformations, establishing relationships and connections. Galperin examines the empirical data presented in Chap. 2 to identify how the transfer from manual to tool-mediated operations happens in children.

The empirical data demonstrate that children of different age groups engage in *four phases* when mastering the tool (spade).

In the first phase(the phase of trial and error), the children pursue an approach of 'trial and error' by persistently repeating high tempo movements which are mostly unsuccessful. The children experience difficulty using the tool and attempt to adjust their actions to the affordances of the tool. Successful attempts are not recognised quickly, and once noticed, they are used occasionally with unsuccessful ones. The children's actions are mostly manual operations which occur as a natural response to changes in the situations, and their actions are not consciously realised. Over time, children use successful operations more often, and general improvement in actions is achieved.

In the second phase (the phase of monitoring the flow of activity), the children perform the same operations for considerably longer, through engaging in multiple attempts and eventually identifying a favourable position for the tool (spade) and the object of their interaction (the toys). Their actions are directed at repeating this favourable position, through slow and careful movements, and are aimed at maintaining the benefits of a successful, albeit accidental opportunity. It appears that the children are waiting for such favourable situations; however, they do not possess skills to create these situations. When the children notice favourable positions which have occurred accidently, they analyse factors that constitute these situations, and this separates the whole activity to 'before' (accidental and unconscious) and 'after' (deliberate and conscious).

The children's actions in the *third phase (the phase of persistent interference)* can be defined as 'good mistakes' and are directed at creating favourable situations by using previously successful operations. Here, the children are not acting blindly (first phase) or waiting for a favourable situation to present itself (second phase) but are deliberately attempting to create favourable situations. Their attempts, however, may

not always correspond to the circumstances of a new situation. Although the operations used in the previous phases prevail, the child's consciousness determines the flow of the activity. These are experiences developed in previous phases transformed into ideas initiating further actions, which are different from ones used previously. Previous unsuccessful experiences are particularly visible in children's persistent attempts to achieve the desired purpose, despite the unsuitability of the employed operations. The flow of the activity is accompanied, however, by the children's thinking and conscious evaluations.

The fourth phase (phase of objective regulation) is characterised by children mastering the performed operations. The flow of the activity is controlled by the child which is demonstrated in immediate corrections of occasional deviations from the intended flow. Such an approach highlights that the child's consciousness regulates the activity by considering the properties of the target objects. In doing so, the child considers the tool's properties that are appropriate for the task's conditions. In summary, this phase is characterised by the child (i) recognising the objective relationships between the features of the surrounding environment and (ii) mastering a skill when performing movements with the tool.

Galperin suggests that although the fourth phase is the last phase visible in the empirical data, it is not the last one in the development of human intellectual activity. The children's understanding of the relationships between the object and the tool does not reflect their understanding of the tool's structure. For example, children tasked with creating a tool similar to the spade used in the experiments spent considerable time studying the tool's dynamic properties. In addition, only children above five years old were able to construct a tool, and this task was too difficult for younger children. This experiment highlighted that mastering the tool and understanding its mechanical properties is different for children in various age groups. In addition, mastering the operations in the fourth phase does not reflect children's understanding of the relationships between the object and the tool as they would have been considered by an engineer. However, these relationships are realised by the child as the tools' affordances and limitations when applied in the practical activities. The child's consciousness determines behaviour and reflects the affordances and limitations of the performed operations. Engagement with properties of objects creates links between these operations and the development of the child's consciousness. To summarise, the four phases of the development of actions differ by the role of the child's consciousness.

The 'trial and error' approach used in the *first phase* demonstrates the challenge of acting with a tool for younger children. Even in this first phase, however, a tool-mediated task is already presented for the child, and the suggested tool is included in the activity as a compulsory and essential link. However, the child is unable to use the spade and, instead, largely employs manual skills. In the *second phase*, the child identifies (i) favourable positions for the toys in relation to the spade and the (ii) operations needed to lift them out of the pool. These operations divide the whole process into several distinctive tasks; however, the links between them are still missing. The *third phase* is characterised by the presence of links between the tasks; however, these links are limited and not flexible. The natural position of the object

(toy) determines how the child interacts with it. Mastering a particular operation determines the position the child attempts to place the object when lifting it out of the pool. In the *fourth phase*, the link between the operation and the object's position becomes flexible, and the child's choice of operation is determined by the situation. The four phases identified in the empirical data build upon each other: the child by accumulating experience acquired in the first phase through trial and error starts to manage his/her practical activity. From this perspective, the *child's mental activities are nothing but external activities that first occur by chance during changes in situations*. Over time, the child begins to perform these activities intentionally, and such behaviour makes visible how the child's consciousness develops out of the accumulated experience. *The child's consciousness is visible in the ability to select useful operations and adjust them to the conditions of the surrounding reality.*

Such an understanding reveals that there is a delay between the development of a child's consciousness and the ability to engage in practical activity. To explain the link between the child's engagement in the practical activity and the development of consciousness, the following aspects should be considered.

First, the similarities between intellectual and practical activities demonstrate that they are inherently connected. They also, however, highlight that there is a delay in the development of the child's consciousness and the ability to engage in practical activity. Children's intellectual activities originate accidentally within activities and are identified and used deliberately in later phases. Gradually, relationships between the activity and child undergo transformations to become psychological activity.

Second, the relationships between the operations and objects also transform. Initially, these operations are used accidentally; however, they become determined by the task requirements and the child's thinking about interacting with the target object. In doing so, the child identifies the relationship between the object and the operations used which initiate changes in the object. The operations used in early practical activities become mental operations that determine the content of future practical activities. Therefore, psychologically, the child's thinking moves ahead of the practical activity.

Third, the transformation of practical to thinking activity reflects the growth of the child's conscious understanding of the activity. Activities which have been consciously realised by the child are applied on multiple occasions which signifies the transfer from practical to thinking activity and, therefore, movement to the next phase of mastering the tool. By engaging in practical activities with objects through successful and unsuccessful attempts, the child starts to recognise object–tool relationships and, in doing so, transfers to the next phase. In summary, the process of the child's development occurs as if continuously looking back while moving forward, with each phase that follows building upon the previous one.

Galperin identifies the following transformational patterns between the practical activities and the development of the child's consciousness.

First, the four phases identified in the empirical data may overlap (in particular phases' two and three); however, the subsequent phases do not replace previous ones. These phases reflect the child's gradual understanding of the relationships

between the tools and objects. They signify changes in employed operations and not a transformation from one type of operation to another.

Second, the operations used by children in various age groups differ through the role of consciousness. Successful operations occur in younger children accidently, and the target task is solved by trial and error, which suggests that consciousness depends on age. Empirical data, however, show inconsistency in the development of a child's consciousness with different levels demonstrated in various tasks. Galperin concludes that consciousness as an individual capacity does not exist; only individual intellectual operations can be developed and applied. Inconsistency in the development of human consciousness signifies that it can be considered as a type of human psychological activity. Consciousness develops when a child engages in practical activity with material objects. In early phases, the child's consciousness consists of individual operations which are a reflection of situations in which they are applied. Generalising individual situations and the ability to apply similar operations in various situations demonstrates a thorough understanding of the object and operations. In the absence of the ability to generalise situations of engagement with objects, the child's consciousness consists of various groups of operations which differ in their structure, links, and connections. Such an understanding reflects the inconsistency in the development of the child's consciousness.

Finally, Galperin summarises the analysis of the empirical data by outlining the following aspects:

1. Inconsistency in the development of the child's practical activities causes inconsistency in the development of consciousness.
2. In diverse operations, children of various age groups demonstrate different thinking and level of consciousness.
3. In the early phases of mastering the tool, the child's thinking and consciousness are delayed from the practical activity. Thinking, as a theoretical engagement, reflects the child's previous engagement in practical activities.

By considering these aspects, Galperin suggests that the role of skills and consciousness can be identified in the process of transformation from manual to tool-mediated operations. Contrary to the hypothesis that skills are crucial in the transformation from mean to tool, children do not use trial and error to solve tasks—the way how skills usually develop. Instead, when engaged in practical activities, children's thinking is particularly visible. It is only in the first phase that children master the tool by developing skills through trial and error. In the second phase, the method of trial and error is accompanied by the child's thinking which acquires the leading position in the third phase. Although skills are important, their role and significance change in different activities. In the trial and error phase, skill development comprises identifying movements that are beneficial to the present situation. In the following phase of objective regulation, skills are integrated into the activity to ensure its smooth flow. If, however, the suggested task requires mastering an important skill, its importance is not equal in all phases of the performed activity.

In a similar vein, Galperin argues against the primary role of consciousness in children of different age groups. In the initial phase of trial and error, thinking as a

type of activity exists in its embryonic form. Even in the second phase—'alertness'—practical activity plays the primary role and thinking is of secondary importance. In the third phase of 'persistent interference', thinking begins to dominate the external flow of the activity, and it is in the final phase that thinking completely manages the performed activity.

The experiments of creating a tool (spade) highlight that the development of children's consciousness is delayed in comparison with their practical activity, including its individual operations. *Children's consciousness develops during their practical activity by mastering various operations and gradually realising their content, opportunities, and limitations.*

The main disadvantage of the decisive role of skill development and primary role of consciousness development concepts is that they are grounded in abstract relationships between the development of activities in children and their age. In addition, neither of these concepts consider the complexity and variety of these relationships. These concepts may offer explanations of the differences in the children activities by different levels of skill development and consciousness. Such generalising is not only empirically insolvent, but it does not correspond to the real structure of children's activities. In conclusion, both concepts offer limited opportunities for practical application and are theoretically inconsistent.

In Chap. 5, Galperin discusses the role of skills in the development of new forms of behaviour. He starts by considering the concept that suggests that a skill is a decisive factor in the development of new forms of behaviour. Here, he defines skill as a way of developing new physiological movements which initiates a new type of behaviour. He argues that this skill definition can be understood as a combination of individually acquired and independent inborn activities. Therefore, depending on the conditions, a skill can enhance the development of individual forms of behaviour.

Galperin adds that a skill consists of the development of individual movements, which, initially, have to be extracted from other complex movements. In order to create a skill by using mechanisms of unconditioned reflexes, individual movements have to be repeated and reinforced, and the sequential flow of these movements has to be maintained. Galperin argues that adopting this approach limits a skill's role in developing new forms of behaviour.

In order to develop individual movements, they have to be extracted from their natural flow and recombined in a new way. Galperin explains that such an approach should also be developed as a skill. The initial phase in developing a skill is adopting and maintaining natural situations that cause an unconditioned response.

In summary, the *first condition* of skill development is that natural situations, in which individual actions occur, should be maintained. The *second condition* is that in a newly developed skill, the combination of individual actions should be changed and rearranged to create a new sequence of actions. Therefore, the appearance of new forms of behaviour is determined by changes in the surrounding environment. It is the sequence of the actions and the relationships between them that should undergo changes while individual actions that constitute a skill should remain unchanged. In nature, individual actions can be rearranged in a new way when the situations change; however, these changes undermine the first condition of skill development.

When changes in the surrounding environment occur in nature, an animal adapts its behaviour by using the degrees of freedom present. In doing so, an animal adapts to the new conditions of the environment, and a new variation of the existing form of behaviour appears. Therefore, new external conditions initiate transformations in the existing forms of behaviour and lead to the appearance of new forms of behaviour. New forms of animal behaviour can also emerge as a response to bodily changes; however, only animals that manage to adapt to new environmental conditions survive. In both cases, the gradual development of new forms of behaviour does not happen through the addition of new elements, but through the development of one form and regression of other forms of behaviour. Both ways of developing new forms of behaviour aim to improve adaptation to the environment, thus enhancing further development. It is not individual skills, but variations in species and the process of natural selection that initiates new forms of behaviour.

Humans can extract individual components from their natural connections to enhance new forms of behaviour, through changing the environment during the labour process. By adopting such an approach, first, a new form of behaviour remains on the external plane and is not consciously realised by a subject. Second, the new form of behaviour never develops through mastering skills and is only possible in individual subjects. For example, it might be possible to train young children to use the spade; however, mastering the use of the spade will never lead to a child teaching another child as the theoretical significance of such an activity will never be realised. Galperin concludes that explaining the appearance of new forms of behaviour through skills' training leads to neglecting the main conditions of skill development and its characteristic features.

This argument is supported by the second feature of training which is combining previously mastered individual actions to develop new skills. Such an approach to skill development aims not to create but only to master already existing activity. In other words, skill development is only possible in the context of an already created activity; a skill does not represent this activity but offers a way to perform it by the acting subject.

Galperin proceeds to discussing the issue of intended and unintended training. He explains that new forms of behaviour can be developed by accident which he terms as unintended training. Such training is not realised and therefore remains unconscious to the acting subjects. On the contrary, intended training can only happen in human social environments which differ from animal environments. In addition, intended training always presupposes an ideal image which has to be (re)created in reality. Unintended training cannot happen in nature as new forms of behaviour are unknown to animals and therefore, they do not exist.

Skills, as a way of mastering activity, develop on the foundations of old ones. Therefore, *skills do not create new forms of behaviour, but are present in created forms of behaviour connecting individual parts.* Hence, skills can be considered as physiological mechanisms consisting of a sequence of nervous impulses and responsive muscle contractions. *Skills do not create new forms of behaviour but stabilise forms of behaviour or activities within which they exist.* Galperin argues that skill development is not creative, but rather a conservative way of developing new forms

of behaviour. He adds if the theory of skill accumulation to develop new forms of behaviour was true, animals would have many opportunities to develop new forms of behaviour by utilising ready-made inborn and unconditioned skills. In an animal's biological development, however, the opposite trend is observed and human evolution from apes was due to the absence of unconditioned instinctive forms of behaviour.

As skills do not develop new forms of behaviour, it is not the accumulation of skills in a growing child that initiates the transfer from means to tools. On the contrary, the child's transfer from manual to tool-mediated operations is initiated by the surrounding social environment. Therefore, the development of new forms of behaviour cannot be explained by skill development in children.

It is visible in the experiments described in Chap. 2 that mastering a new form of behaviour did not happen through the accumulation of skills, but by mastering an already created form of behaviour. During the process of mastering a psychological tool and its transfer into a sign, the so-called ideological tool movements had to be mastered by the children: sliding the spade under the toy, stabilising, and lifting it. These ideological movements coincide with the naive or 'magical' phase, identified by Vygotsky, Leontiev, and Luria, and this phase is of a particular significance.

A child engages in the offered task through the process of meaning-making during verbal interactions with an adult and not by training using old instinctive movements. It is the adult's verbal instruction that reveals the position and meaning of cultural objects. The meaning may still be unclear for the child; however, it is included in the system of objective tool-mediated relationships that has to be mastered and is reflected in actions. It is concluded that tool-mediated operations do not emerge but are mastered and realised during the process of developing activities by the child. By engaging in this process, the child develops as a social and acting person. Human tool-mediated activities have to be developed in children and do not emerge by themselves.

Besides the theory of skills, the theory of intellectual development offers an explanation of children's transfer from means to tools in the development of consciousness. This theory emphasises the importance of mental development and is similar to the theory of skills in considering the subject's practical activity as a secondary phenomenon, presenting itself as a new sequence of old actions. This new sequence of actions, however, appears through consciously realising new objective relationships and not by recombining the already developed skills. A new activity (which according to the theory of skills has to be developed in a specific environment) cannot be developed naturally; rather it is developed in human consciousness through considering the properties of objects and tools used. Therefore, the ability of human consciousness to reveal ways of acting with objects and tools by considering their properties is important. It is not the development of practical activity that initiates human ability to think, on the contrary, it is the human consciousness that determines practical activity. Human practical activity is important for the development of human consciousness by offering 'raw materials': posing new problems and introducing new objects with various properties. It is human consciousness, however, that reveals new relationships between objects and identifies new ways of acting. Human consciousness identifies

only the features of the surrounding world that an acting subject can directly engage with and influence.

During such interactions, new relationships between objects can be established. Old connections are deconstructed, and new forms of activities are reconstructed, determining the amount, direction, and meaning of new relationships identified in the target objects. These new relationships cannot be identified by the acting subject through thinking only. For example, success in hunting first and foremost depends on whether the hunter is in possession of guns and does not only depend on the hunter's intention to kill as many animals as possible and by recognising the animals' habits and ways of life. Even by identifying the relationships between objects, ways of interacting with these objects can only be identified during practical engagement.

Galperin argues that the limitation of the intellectual theory of behaviour development is that it reduces thinking to simple perception and does not consider it as a type of activity. Thus, perception can be understood either as an observation of external objects and activities. In doing so, the intellectual theory of behaviour presents perception as a completely passive action, where human thinking loses its content and its independent proactive nature. The intellectual theory explains thinking as a process of reflection of reality. Therefore, such a theory rejects a theoretical approach and, in doing so, rejects itself as a theory.

Galperin believes that the development of human thinking should be considered as a transformation from manual to tool-mediated operations. This approach is supported by his findings which he summarises as follows.

Human thinking solves tasks that arise in the process of practical activity by employing means that were previously used. Therefore, human thinking is a particular type of activity that emerges during the development of practical activity. It also evolves out of this activity; thus, practical activity is a foundation for emerging human thinking. Gradually, human thinking is enriched with experience, content, methods, and directions of further development of the practical activity. In doing so, *human thinking is nothing else but an ideal recreation of human practical activity.*

The purpose, opportunity, and further development of human thinking depend on the structure of the practical activity which initiates the whole trajectory of practical interactions. Thinking opens new opportunities for the practical activity which can lead to further development. Therefore, thinking does not only initiate development of present forms of behaviour, but also a person's understanding of this behaviour. Human thinking develops and improves practical activities, and only when a tool-mediated activity becomes a reality does the need to use tools arise, posing new thinking tasks.

Based on the analysis of the empirical data in Chap. 2, Galperin highlights that a change in consciousness is initiated by a child's transfer from manual operations to tool-mediated operations. Therefore, a child's consciousness does not initiate a transfer from manual to tool-mediated operations. A child's transfer to tool-mediated operations happens during the mastering of publicly accepted ways of acting with these tools which initiates transformations in the child's consciousness. These changes highlight the transfer of the child's consciousness to its social, tool-,

and language-mediated unlimited line of development and away from its biological line of development limited by its relationships with the natural environment.

In adopting such an explanation, human consciousness loses its limitations and develops a capacity to reflect the connections between objects and processes. Through the process of developing an understanding of these interconnections within the surrounding world, human consciousness evolves as a homogeneous, unified, and well-organised structure.

Galperin summarises that human consciousness realises and evolves in the process of historical development and does not exist at the beginning of development. Human consciousness develops in the process of generalising ways of interacting practically with objects, acquiring its structural and meaningful organisation. The boundaries of human consciousness are constantly expanding and are potentially unlimited. These boundaries, however, reflect the capacity of human consciousness to generalise the current understanding of the unlimited and never completely examined subject of science.

Significance and Implications of P. Y. Galperin's Dissertation—Further Insights

The considerations presented in Galperin's dissertation exemplified in detail the unity of external tool-mediated and internal human psychological activities. These findings were influential to provide explanation of human psychological tools, their differences from animals' means, and significance for human psychological development.

These considerations and other were accurately summarised and presented by Galperin in his speech delivered on 6 January 1935 in Moscow in the House of Science which was dedicated to Vygotsky, who died at the age of 37 years six months prior to this event (Luria, 2003). In the Luria archive, a so-called blue notebook was discovered, which contained a list of conferences held in the period from 1930 to 1935, including the theses presented at some conferences. In this notebook, Galperin's speech was listed under the title *On Our Psychological System*, which might indicate that Galperin considered himself a proponent of Vygotsky's system (Engeness & Zavershneva, 2021).

In his speech, *first*, Galperin argues for the *systemic organisation of human consciousness* and a process of development it undergoes. Vygotsky identified three ways in which the process of the development of human consciousness may happen: (i) metamorphoses, (ii) consistency (cyclic), and (iii) inconsistency. However, metamorphoses and consistent (cyclic) development reflected the general process in humans. Therefore, the process of inconsistent development was of particular importance in understanding the development of a child's consciousness. In Vygotsky's work, inconsistency in the development of a child's consciousness was characterised

by the presence of one *dominating* psychological function in the child's consciousness. Other psychological functions were manifested through this dominating function. Inconsistency in the development of a child's consciousness was reflected in the different psychological functions that were predominant at different periods in his or her development. The sequential order of these functions was the *following*: perception, memory, and thinking. It was argued that the appearance of one dominating function in the hierarchy of existing psychological functions reorganised the existing psychological functions—the establishment of a dominant psychological function caused the *reorganising and restructuring* of the existing psychological functions, establishing *their dependency* on the new dominant function. While partly agreeing with Vygotsky's law of parallelogram, Galperin considered that mediation happened in the process of human communication, including the first scream of a child. He highlighted the need to examine the significance of the role of human speech from the moment of its appearance in the development of human consciousness. In summary, Galperin suggested to re-evaluate the significance of the law of the parallelogram and examine the role of mediated psychological processes in personal needs and the mediational significance of individual speech. Importantly, he suggested to consider the structure of the mediated action and its influence on the development of meanings and signs with humans.

Second, Galperin argued that human consciousness as a hierarchical organisation of psychological functions could be developed only in humans and was inherently connected with the human use of cultural means. These cultural means were operations mediated by signs. Therefore, to trace and understand the process of the development of the systemic structure of human consciousness, one must develop an understanding of the (i) origin, (ii) development, and (iii) functional meanings of signs.

Regarding the origin of signs, Galperin, in line with Vygotsky, argued that they first appeared in the process of communication among people; the established norms of communication eventually 'grew inside' to become psychological functions of a person, which was described and reflected in the processes of mediation, sociogenesis, and the internalisation of higher psychological functions.

According to Vygotsky, the development of mediated actions in *children* happened through the following phases: the natural phase, the naïve-psychological phase, the external phase, and the internal mediation phase. These four phases were important because they reflected the considerably late development of mediated psychological functions in older children. These phases were elaborated in the research presented in the dissertation. They also demonstrated the increasing role of consciousness and sign mediation in the activities of older children. Following Vygotskian line of thinking, Galperin summarised that the sign:

- established new and changed old connections and relationships among the existing psychological functions,
- became a structural and functional centre of newly developed psychological functions, and
- established new and identified higher and lower psychological functions.

Thus, a sign became a tool for creating the structural and systemic organisation of human consciousness. This understanding allowed to conclude that higher psychological functions were nothing else but internal operations that were mediated by forms of communication. The development of higher psychological functions occurred in the process of mediated social communication during the external activities of humans.

The sequential appearance of the predominant psychological functions—perception, memory, and thinking—reflected not only different types of activities that a child could engage in but also the gradual transformation from actual external psychical interactions with material artefacts to internal mental activities. This transformation was characterised by distancing from observable situations, and it required qualitative changes in the existing psychological functions. Therefore, the development of new psychological functions and the sequential appearance of one predominant function occurred through social interactions.

Galperin summarised that *human consciousness was a hierarchical system of psychological functions. Higher psychological functions as activities of human consciousness comprised a historic phenomenon that could be developed specifically in humans.*

In considering meaningful the organisation of human consciousness, Galperin indicated the need to examine (i) the tools that were used in the process of the development of human psychological functions and (ii) the internal structure of the mediated action that employed these tools.

Galperin suggested that the internal structure of the mediated action was determined by two aspects: a task to solve and the tools available to solve it. Previously, it was believed that the process of the mediation of the action was determined by the selected tools. However, Galperin urged to undertake a more thorough analysis of a mediated action as such. A task as a problem that needed to be solved encapsulated its motive—the reason to solve this task. A motive was subjective and internal, and the task was something that confronted humans and was therefore external and objective. The motive was an expression of a need, and the task was a mean to satisfy this need. Hence, a task could be seen as the objective expression of a motive. However, a motive could be expressed in several ways. For example, a motive could be a child's willingness to play, and the task was the game that the child wanted to play.

A mean was a sign with the help of which a person could 'transmit a message' to another person or a group of people. In doing so, first, a sign had the potential to reflect reality; second, it was a unit of reality. The activity, in turn, could have a double role: (i) as an activity of interaction and communication and (ii) as a part of a broader activity that had the unique function of transferring the meaning of the sign.

In other words, a sign had a double meaning: (i) its original meaning and (ii) the acquired meaning, which depended on the reality in which it was used. The original meaning of the sign could be understood as a generalisation of the reality in the process of communication; therefore, it was a set of internal operations aimed at generalising a reality. The second meaning of the sign was acquired in the process of communication during human social and practical activity.

The relationship between the sign and its meaning could be identified as a complex relationship between the speech (in its individual psychological meaning of ideal form) and the real objective meaning that was transferred. Similarly, the relationship between the task and the motive and the relationship between the sign and its meaning could vary, so in the process of mastering the ideal form, several transition (ideal) forms could appear.

Galperin suggested an unstable relationship between the motive and the task and the changing relationships between the sign and its meaning. Finally, the relationship between the task and the mediated action that was aimed at solving the task could also change: the same task could be solved by using different approaches and by applying different mediational tools. Therefore, the characteristics of the signs used in the activity determined the characteristics of the mediated action in which they were employed.

Galperin concluded that the four aspects were interrelated: sign, meaning, task, and motive. On the one hand, these aspects were relatively freely joined links in one chain. On the other hand, this freedom remained when these aspects were presented outside the context of a practical activity. When they were employed in the activity, the situation radically changed, and these aspects appeared to be integrated in the meaningful activity that was aimed to solve a particular task by the use of consciously selected mediational tools.

Galperin suggested that a meaningful activity with mediational tools consisted of two sides: internal (with the motive and the meaning) and external (with the task and the tools). Moreover, this process happened in time and through several phases. It was important that each sequential phase encapsulated the previous phases in the process. These considerations were supported by the phases in the development of actions he examined in the dissertation: (1) the phase of trial and error; (2) the phase of monitoring of the flow of the activity, (3) the phase of persistent interference, and (4) the phase of objective regulation.

Galperin argued that the unity of the motive, task, signs, and tools constituted the meaningful activity, *and the enacted unity of these four aspects comprised sense.* Separating one aspect from another might cause the activity to lose its sense. For example, when for various reasons, the child was not able to engage in the activity, the task lost its appeal, and the motive lost its driving force. Therefore, the presence of all four aspects was required for the activity to become meaningful and acquire sense.

Galperin concluded that higher psychological functions were nothing else but the mediated and meaningful actions of a person. The ability of a person to engage in meaningful actions reflected the advanced organisation of human inner world and attitude to the external world.

Galperin argued that human consciousness was not an advanced combination of mechanical[2] functions, but a meaningful activity. The systemic organisation of human consciousness had implications for a person's ability to engage in a meaningful activity and the predominant psychological function reflected the meaningful activity

[2] That is, the psychological meaning of mechanical.

in which the person was able to engage. The external world, represented in the motive, sign, task, and tools, became an integral part of the person's internal world. Therefore, a mediated action reflected the degree of awareness of the surrounding world and oneself in this world.

Human consciousness differed from animal consciousness not in its individual elements and not in its composition but in its organisation, which presented itself in relation to the external world and to reality.

Galperin argued that human consciousness, as a system of meaningful activities, was developed through engagement in meaningful actions. The meaningfulness of an action was expressed in the nature of the task this action was employed to solve, and the tools used in this action. The development of meaningfulness happened by altering the tasks and the tools. However, when the task was altered, the motive and the mediational tools were also altered, which affected the meaning of the action. Therefore, the central aspects of the development of meaningfulness of the action were the changes in the motive and the sign. Meaningful actions were developed through the development of meanings. In doing so, humans developed their understanding of the surrounding world. The development of meanings in children happened through *the interaction of the ideal form of speech*[3] *with its actual psychological content*. A child interacted with the environment through the accumulation of the meanings, which *was crucial for the mechanisms and the speed of the child's development.* The ideal form of understanding reality should be achieved in the process of this development. Therefore, *the meaning of a sign was simultaneously a generalised reality and a set of internal operations that constituted the meaningful activity*. This approach reflected a pathway of making sense of the surrounding reality and how well the person could master the activities in which he or she is engaged.

The development of meanings was nothing else but the process of the development of meaningful activities. This was the pathway of the development of freedom of human consciousness.

Galperin suggested that understanding the functional meaning of a mediated action presents the pathway to studying the systemic organisation of human consciousness, and by examining the organisation of a mediated action, we develop our understanding of the meaningful organisation of human consciousness.

The study of human consciousness could be considered as an approach to developing the study of human personality. The key to this approach was to further examine meaningful activities, particularly the process of the development of tasks and motives. Galperin emphasised the need to examine 'the natural origin of signs' by considering their social origin in practical activities in which humans and material objects interact to create a stable, viable, and necessary structure. Finally, Galperin urged for the need to make a transfer from the cross-sectional examination of the activities to study the causality of the activities in which humans engage.

The arguments presented in the dissertation were further elaborated in Galperin's study of the development of human mental activity at the beginning of the 1950s as an

[3] Ideal form of speech in the meaning of inner speech with the self.

approach to improve students' learning in mathematics and languages and, in particular, to develop their ability to solve mathematical and linguistic problems mentally. With Vygotsky's perspective that any psychological function was external and social before it became internal and individual, the process of internalisation reflects the transfer and transformation of human thought from the external interpsychological to the internal, intrapsychological plane (Vygotsky, 1987). The principle of internalisation and externalisation was developed further by Galperin through considering the phases of the development of mental actions. He viewed such a process as the gradual transformation from external object-oriented activities (materialised action) into mental action (acting mentally) through social communication (communicated thinking) and individual speech (dialogical thinking) (Engeness & Lund, 2020). Galperin suggested that transformation of the action from the external to the internal mental plane of the learner happens through six consecutive phases or forms of activity: (a) motivation, (b) orientation, (c) materialised action, (d) communicated thinking, (e) dialogical thinking, and (f) acting mentally. In the motivational phase, a learner's attitude and relation to the learning outcomes that have to be achieved are formed. This is followed by the phase of orientation, where the orienting basis of the action is achieved by the learner developing a generalised orienting scheme of action. By applying the scheme as a guiding tool, a person who has never been previously exposed to the task completes it one step at a time. Creating an orienting basis of the action can happen in three possible ways:

- *Incomplete*, where learning happens through trial and error. In this case, learning takes place slowly with many mistakes, and it is extremely sensitive to the slightest changes in the conditions of the learning situation;
- *Complete and offered by the teacher*, where learners are informed in detail about the characteristic features of the target concepts and about how they will engage in learning. This implies that the learners are equipped with all the necessary mediational resources and the plan of action (what to learn and how to engage in learning);
- *Complete and constructed by learners* following an approach aimed at identifying the essential characteristics of the target concepts. Using this approach, learners construct a specific orientation suited to solve the problem at hand. Galperin argued that with this type of orientation, humans develop their understanding of how to go about learning, and their agency as independent and conscious learners may be enhanced.

The transformation from materialised action to communicated thinking happens during learners' interactions with material or materialised objects and in making sense of these objects in speech. In the phase of a materialised action, the action is directed outside, and it connects the learner with external objects and the outside world. The transformation from communicated to dialogical thinking happens by learners substituting the externally oriented speech with its image. In dialogical thinking, the action is directed inside the learner in establishing communication with himself or herself (as another person). The learner's ability to perform an action in the form of dialogical thinking reflects the pathway the action has undergone from its

materialised to its dialogical form. Finally, in the final phase, the action is performed in hidden speech, which Galperin refers to as *acting mentally*. In this phase, artificial fragmentation into individual units is suspended, and the action acquires its natural flow. In this phase, the maximum automation of the action can be achieved.

Galperin successfully defended his candidate dissertation presented in this book in 1938. Zinchenko (2013) considered Galperin's dissertation of primary significance to the cultural-historical theory, as it demonstrated and scientifically proved the process of the development of human consciousness in practical tool-mediated activities (Zinchenko, 2013).

To conclude, the contribution of Piotr Galperin's dissertation to the cultural-historical psychology can be summarised as follows:

First, in addressing the differences between human tool and animal means, Galperin highlighted that animals' means did not present opportunities for new activities, and on the contrary, their natural behaviour determined how the means were used. In humans, tools determined and affected the activities in which they were used. If the *arm was included in the tool-mediated operations*, it complied with the requirements and rejected its own operations. By offering new opportunities of interaction in the surrounding environment, the tool acquired its historical and psychological significance. If the *tool was included in the system of the arm's operations*, it lost its own operations and acquired the functions of an arm by becoming its extension. In this instance, a tool did not present new opportunities for the human and offered only a slight variation of the already existing ones. Galperin concluded that through tool use, a new reality emerged for humans. Such a reality was comprised of the tools' properties and the historically and socially developed ways of working or acting with these tools. The system of tool operations reflected the outcome of the development within social collective production. Human tools encapsulated operations and activities with these tools. Animals' auxiliary means only resembled tools; however, they were employed in manual activities and could not be considered true tools even in their simplest modifications.

Second, Galperin conceptualised the differences between manual and tool-mediated operations in the system of movements that comprise these operations. He highlighted that in manual operations, tools became an extension of the acting subjects' arms. In tool-mediated operations, tools were included in a particular system of social relationships and the subjects' interaction with the object was mediated by the tool. In doing so, the subjects discovered new ways of interacting with the surrounding reality which exceeded natural opportunities. Galperin concluded that by comparing tool-mediated and manual operations, a tool's characteristic features could be identified. These characteristic features, however, were not sufficient to create a clear distinction between a tool and a mean. Only the structure of the tool-mediated activities, the structure of the operations with the tool, could reveal the systemic characteristic features of the tool and uncover the true nature and difference between tools and means. Galperin suggested that *animals' auxiliary means simply extended their natural organs, and therefore, they did not play an essential role in the development of their consciousness*. A tool first appeared in social and not individual production. Therefore, an *animal's mean was separated from a human tool*

by a period of human historical development. Human social production accidentally discovered auxiliary means that were gradually transformed into tools. During this process, the employed natural means acquired their social logic of labour, and from this very moment, the true tools emerged. Therefore, *a tool carries the burden of its social nature that presents itself for humans as an objective reality, similar to other material things*.

Third, Galperin summarised that when mastering the tool (spade), the children engaged *in the four phases: trial and error, monitoring the flow of the activity, persistent interference, and objective regulation.* The *first phase of trial and error* demonstrated the challenge of acting with a tool for younger children. A tool-mediated task was presented for the child, and the suggested tool was included in the activity as a compulsory and essential link. However, the child was unable to use the spade and, instead, largely employed manual skills. In the *second phase*, the child identified (i) favourable positions for the toys in relation to the spade and the (ii) operations needed to lift them out of the pool. These operations divided the whole process into several distinctive tasks; however, the links between them were still missing. The *third phase* was characterised by the presence of links between the tasks; however, these links were limited and not flexible. In the *fourth phase*, the link between the operation and the object's position became flexible, and the child's choice of operation was determined by the situation. These four phases built upon each other: the child by accumulating experience acquired in the first phase through trial and error, started to manage his/her practical activity. From this perspective, the child's mental activities were nothing but external activities that first occurred by chance during changes in situations. Over time, the child began to perform these activities intentionally, and such behaviour made visible how the child's consciousness developed out of the accumulated experience. *The child's consciousness was visible in the ability to select useful operations and adjust them to the conditions of the surrounding reality*. Galperin summarised that (i) the similarities between intellectual and practical activities demonstrated that they were inherently connected; (ii) the relationships between the operations and objects also transformed—the operations used in early practical activities became mental operations that determined the content of future practical activities; and (iii) the transformation of practical to thinking activity reflected the child's growing conscious understanding of the activity.

Fourth, inconsistency in the development of the child's practical activities causes inconsistency in the development of consciousness. In diverse operations, children of various age groups demonstrated different thinking and level of consciousness. In the early phases of mastering the tool, the child's thinking and consciousness were delayed from the practical activity. Thinking, as a theoretical engagement, reflected the child's previous engagement in practical activities. By considering these aspects, Galperin suggested that the role of skills and consciousness could be identified in the process of transformation from manual to tool-mediated operations—the skills' role and significance changed in different activities. Galperin argued against the primary role of skills and consciousness. He concluded that children's consciousness developed during their practical activity by mastering various operations and gradually realising their content, opportunities, and limitations.

Fifth, Galperin concluded that skills did not create new forms of behaviour but stabilised forms of behaviour or activities within which they existed. It was not the accumulation of skills that initiated the child's transfer from means to tools. On the contrary, the child's transfer from manual to tool-mediated operations was initiated by the surrounding social environment. A child engaged in the offered task through the process of meaning-making during verbal interactions with an adult and not by training using old instinctive movements. It was the adult's verbal instruction that revealed the position and meaning of cultural objects. Tool-mediated operations did not emerge but were mastered and realised during the process of developing activities by the child. By engaging in this process, the child developed as a social and acting person.

Finally, Galperin considered human thinking as a particular form of activity that emerged at a certain time during the development of practical activity. It also evolved out of the practical activity and, in doing so, identified practical activity as a foundation for emerging of human thinking. Gradually, human thinking was enriched with experience, content, methods, and directions of further development of the practical activity. In doing so, *human thinking was nothing else but an ideal recreation of human practical activity*.

Galperin summarised the discussion in his dissertation by offering an elegant conclusion: human consciousness develops a capacity to reflect the connections between objects and processes. Through the process of developing understanding about the interconnections in the surrounding world, human consciousness evolves as a homogeneous, unified, and a well-organised structure. Human consciousness does not exist at the beginning of human development; however, it realises and evolves in the process of historical development. It is in the process of generalising ways of interacting practically with objects, human consciousness develops, acquiring its structural and meaningful organisation. The boundaries of human consciousness are constantly expanding and are potentially unlimited. However, these boundaries exist, and they reflect the capacity of human consciousness to generalise the unlimited and never completely examined the subject of science.

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Contents

Chapter 1
Psychological Difference Between Human and Animal Tools

Outline

The chapter starts by considering the psychological difference between human and animal tools. Galperin refers to the Köhler's experiments that demonstrated that apes were able to solve problems by identifying connections, establishing relationships between tools, objects and even creating tools. These experiments demonstrated that animals were able to create tools and engage in tool-mediated activities. Köhler concluded that animals' thinking, and their practical intellectual activities were very similar to humans.

While not denying Köhler's conclusion, Galperin questions whether animals' thinking activity can be considered a simplified version of a human's. To answer this, Galperin suggests examining human and animal tool use to develop understanding of the tools' characteristic features in general and animals' tools in particular.

As a starting point, Galperin adopts an approach suggested by Engels that human tools encapsulate intellect, labour and the process of 'humanisation of apes', while also reflecting a new line in the development of human social consciousness. He suggests that animals use tools accidently which reflects the nature of their activities. Animals' tools or as Galperin defines them 'auxiliary means', cannot be preserved for future use and they do not have defined areas of application. Their functions are not expressed in their shape, are of natural origin and are not employed in the system of social production. He highlights that all features of animals' tools emphasise what these tools are lacking, but they do not provide an explanation about why they are lacking these features. To offer an explanation, Galperin examines the nature of animals' auxiliary means by considering them as intermediate links between animals and the surrounding environment. He argues that animals' means do not present opportunities for new activities, and on the contrary, their natural behaviour determines how the means are used. In humans, tools determine and affect the activities in which they are used. To develop an understanding about how tools affect the

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activities that employ them, the relationships between (i) a mean (tool) and a purpose of the activity and (ii) a mean (tool) and an acting subject should be considered.

While considering *the relationship between a mean and a purpose*, Galperin suggests that such a relationship reflects the mean's technical-rationalistic feature (e.g. how well the mean is suited to achieve the desired purpose). However, neither the relationship to the purpose, or the mean's technical-rationalistic feature offer a foundation to reveal the mean's mediating role. Therefore, a mean's relationship to the desired purpose cannot be essential to examine its mediating function.

To consider the *relationship between a subject and a mean*, Galperin suggests examining the mean's convenience and how well the subject uses the mean to achieve the desired purpose. This examination is required to reveal how the subject masters the mean and its usefulness for the subject's needs. By adopting such an approach however, examination of the mean appears to be downplayed. Therefore, to examine the relationship between the mean and tool, its functions and suitability to achieve the desired purpose should be considered.

It is also important to consider the ways of working with the tool as a system of encapsulated operations. The opportunities of interaction with the tool depends if the surrounding environment is: (i) natural or biological and (ii) human social environment. In both the social and biological environments tools can encapsulate (i) a system of mediated operations developed during social tool-mediated practices, and (ii) a system of manual operations, developed in the process of using a hand as a natural tool.

If the *arm is included in the tool-mediated operations,* it complies with the requirements and rejects its own operations. As the arm and hand hold the tool it is positioned between a human and the environment and a new reality appears. By offering new opportunities of interaction in the surrounding environment, the tool acquires its historical and psychological significance.

If the *tool is included in the system of the arm's operations*, it loses its own operations and acquires the functions of an arm by becoming its extension. In this instance, a tool does not present new opportunities for the human and offers only a slight variation of the already existing ones. Galperin concludes that through tool use, a new reality emerges for humans. Such a reality is comprised of the tools' properties and the historically and socially developed ways of working with these tools. The system of tool operations reflects the outcome of the development within social collective production. Human tools are not only used as intermediate objects, but they are also encapsulate operations and activities with these tools. Therefore, such activities are tool mediated. Animals' auxiliary means only resemble tools; however, they are employed in manual activities and cannot be considered true tools even in their simplest modifications. As an example, Galperin considers how small children learn to master a spoon by gradually transferring from manual to tool-mediated operations.

Psychological Difference Between Human and Animal Tools

The issue of the psychological difference between humans' and so-called animals' 'tools'[1] was revived by Köhler's remarkable experiments on the intelligence of higher apes. These experiments demonstrated that apes were able, to a certain extent, solve problems by identifying connections, establishing relationships between objects and tools and even creating tools to achieve the desired purposes. On the one hand, these experiments greatly enriched our understanding of the animals' psyche, and they reestablished the discontinuity of the evolutionary process in the development of psyche from animals to humans. On the other hand, they made unclear the psychological difference between humans and animals. Previously it was considered that tools were used only by humans and that only humans were able to engage in tool-mediated activities, however, Köhler's experiments proved this to be incorrect. It was not only animals' thinking, but their practical intellectual activity that turned out to be very similar to a human one.

Such a similarity cannot be denied, but the question to be answered is how similar are these tool-mediated activities and what is the significance of this similarity? Is an animals' practical thinking activity similar or can it be considered a simplified version of a human activity? Or, despite visible similarities, are humans' and animals' thinking essentially different? To perform such a comparison conscious use of material tools by humans and animals should be examined and the outcome will largely depend on our understanding of tools in general and in particular animals' 'tools'.

Without doubt human tools essentially not only encapsulate human intellect, labour and the process of "humanisation of apes" (Engels), but also, they reflect a new line in the development of human social consciousness. Animals, however, use 'tools' accidentally and occasionally with their use reflecting the nature of animals' activities with these tools. In many cases, the use of auxiliary means[2] happens in the context of existence of those who employ these means and reflects the true nature of the mean or the tool. Therefore, the main aim of our investigation is to identify the characteristic features that may reflect the true nature of the material means: social or natural.

In comparison with humans' tools, animals' auxiliary means cannot be preserved for later use and they don't have strictly defined areas of application. The functions of animals' auxiliary means are not expressed in their shapes and in most cases, these means are of natural origin. What is most important is that animals' means are not connected with and are not employed in the system of social production. However, all these negative features provide evidence of what animals' 'tools' are lacking, but they do not provide an explanation about why they are lacking these features. The visible features of humans' tools are not sufficient to completely reveal the nature of animals' 'tools'. Bourgeois evolutionist sociologists identify the common origin and explain significant differences between animals' and humans' tools by considering the areas

[1] Animals' 'tools'—in original.

[2] Mean is a broader category which may include tools that have psychological significance for humans and auxiliary means used by animals that don't have such psychological significance.

of application, the complexity and excellence of humans' tools, and their place and role in human society and animals' environment. However, by demonstrating the real essence of animals' 'tools' such differences can be explained from another perspective. To provide a comprehensive explanation, the use of auxiliary means by animals is more of an exception than a rule and our task is to carefully examine the true nature of animals' auxiliary means.

What are animals' auxiliary means? Externally they are intermediate material links used in a meaningful activity and such a feature makes animals' 'tools' similar to humans' tools. The differences, however, should be identified by examining how tools as intermediate material links are used by animals, in the structure of their activities. Tools as such do not determine animals' activity, on the contrary, animals' behaviour determines the nature of the used tools. Therefore, the characteristic features of the animals' 'tools' should be identified by analysing their activities with the 'tools' which are different from human tool-mediated activities.

In general, the use of a material mean affects the structure of human or animal activities which is determined by the relationships between (i) a mean and a purpose of the activity and (ii) a mean and an acting subject. These two relationships should be examined in detail.

Relationship Between a Mean and a Purpose

A mean's primary feature is to achieve a desired purpose which can be expressed in two ways: (i) technically—as a relationship between two material things and (ii) psychologically as a relationship identified by a subject[3] involved in the meaningful activity. The mean's relationship to the purpose reflects its technical-psychological and more precisely a technical-rationalistic feature.

However, in any intermediate object the technical-rationalistic mean's feature is present and, therefore, it cannot be used to distinguish animals' auxiliary means from humans' tools. Several theories inaccurately apply the technical-rationalistic criteria to identify the differences between animals' and humans' tools by considering various stages of a common developmental trajectory (Köhler), psychological (Vygotsky), or social aspects (Plekhanov).

Of course, a mean's relationship to the purpose should be considered, however, this relationship does not provide a baseline to characterise this mean. The mean's purpose encapsulates a wide circle of phenomena, including, for example, the biological purpose. The mean's purpose considers the relationships between two objects and, in doing so, it largely downplays the mean's mediating role. However, a mean may not have its purpose at all and therefore, the mean's relationship to the purpose cannot be considered as determining or the most important.

[3] Subject in the meaning of an acting subject (a person or an animal).

Relationship Between a Subject and a Mean

If an object can be used as a mean to achieve a desired purpose, therefore it can be used by a subject.[4] From the technical-rationalistic perspective, the mean is directly linked to the purpose that needs to be achieved and is determined by this purpose. However, psychologically, in each specific case, it is the subject who connects the applied mean with the desired purpose. The subject applies various means and, in doing so, the subject attributes the limitations of these means. An object is used as a mean by the subject, what type of mean it is and its characteristic features should be identified by examining the relationships between the acting subject and the employed mean.

When examining the relationship between the subject and the mean, it may appear that no psychological relationship exists: a subject (person or animal) just takes the mean in his/her hand. However, it is the convenience[5] and how well the subject uses this mean that should be examined to identify such a relationship. The psychological aspect of the relationship subject—mean, may be revealed (i) by considering the subject's skills or how well the subject masters the mean or, (ii) by considering the usefulness of the mean for the needs of the subject. However, by adopting such an approach, examining the mean as such appears to be downplayed. What becomes clear is that the relationship between the mean and the subject is similar to the relationship between the mean and its purpose (i.e. the need to perform required operations). In such a technical-rationalistic approach, the subject presents himself as a specifically structured object and by considering the relationship between the subject and the mean, we consider the relationships between the two objects.

To examine the relationship between the subject and the tool, the following question comes to the fore: what function does this tool carry? Can this tool be considered a mean to achieve the subject's desired purpose? If the tool does not encapsulate the way of working with it to achieve the desired purpose, the tool is therefore used according to the logic of the acting subject. However, if the tool has been created to achieve the desired purpose, then the subject when using this tool will comply with the objective requirements and the system of operations encapsulated in this tool.

How the mean presents itself and which opportunities are recognised depends on the subject's reality. An animal as a biological creature recognises only biological relationships and forms of existence. Therefore, in the most sophisticated tools an animal can recognise only opportunities for its instinctive behaviour, and they are used as natural objects free from any logic of other applications. However, in humans (who are social in nature) even natural objects are considered as potential tools. Humans perceive both natural and artificial objects by recognising publicly accepted meanings and operations encapsulated in these objects.

To summarise, in different environments—social or biological, a mean can be perceived as a solid centre of two types of operations: (i) a system of mediated operations developed during social tool-mediated practices encapsulated in the tool,

[4] Subject—same meaning as above.

[5] Underlined here and later in the original.

and (ii) a system of manual operations, developed in the process of using an arm as a natural tool.

When a hand holds the tool, one of the above-mentioned systems comes to the fore: either the arm gets included in the system of tool-mediated operations or the tool gets included in the system of the arm's operations. First, if the *arm gets included in the tool-mediated operations,* the arm complies with the requirements of the tool operations and rejects its own operations if it contradicts with the tool's operations. The arm and the hand turn simply into a holder and a mover of the tool and a new reality of a tool positioned between a human and the environment appears. In doing so, the tool acquires its historical and psychological significance.

Second, if the *tool gets included in the system of the arm's operations*, the tool loses its own operations and it acquires the functions of an arm by becoming an extension of the arm: the tool is used as an arm and often a bad arm which can never be perfectly substituted by the tool. Such a tool does not present new opportunities for the human and offers only a slight variation of the already existing opportunities.

Through tool use, a new objective reality presents itself for a human. Such a reality comprises the tools' properties and the historically and socially developed ways of using these tools. The system of tool operations reflects an outcome of development within a society and collective production, which are absent in animals. Therefore, a distinguishing feature of humans that differs from animals is that tools are not only used as intermediate objects, but also as carriers of particular types of activities. Animals' auxiliary means only resemble tools; however, they cannot be considered true tools even in their simplest modifications.

To summarise, the same tools can be used in totally different actions, and the tools' true significance is encapsulated in how these tools are used. Therefore, tools as intermediate objects can be applied into two systems of actions: as true tools that are used only by humans, and as auxiliary means that are applied in animals' activities.

When we are presented with an object which shape clearly informs us about its application, we can define such an object as a tool. The same tool can be used for different purposes: for example, a hammer can be used as a heavy object to hold down sheets of paper to stop them from being blown away by the wind. A natural object, however, can be used as a tool, for example when we use a stone as a hammer to strike a lose nail into the carriage. Whether we act with a specifically designed tool or accidentally find an auxiliary mean will decide how this object is used in the action. Such an understanding is crucial to consider the nature of the auxiliary means used by animals, that are used inconsistently and that are not properly shaped for their use. Our first task is to demonstrate that the tool has its own logic of use and the mean doesn't have such a logic, so both are applied differently in two types of operations: human operations with tools and animal operations with auxiliary means.

These two types of operations can be observed in everyday life. For example, a spoon is one of the first cultural tools that a child has to master. How does a child learn to use the spoon? Learning how to use a spoon is not easy and time-consuming. First, a child attempts to hold the spoon as close as possible to its head. He puts his fingers and even his whole fist on to the spoon's head. The purpose of such an

attempt becomes obvious. Only when the nanny makes the child hold the handle of the spoon and together, they scoop up the porridge, the child with a sharp movement raises the spoon to his mouth. The spoon is not level and most porridge pours out; however, the child is moving in the same way as if he was bringing his fist to his mouth. Functionally, the spoon is no more than an extension of the child's hand and the closer the child's hand is to the spoon's head, the more likely it is to enter the child's mouth. The simple logic of a spoon as a tool is visible when having scooped some porridge, the bottom of the spoon is scratched against the edge of the plate. After that the filled spoon is lifted up vertically to the mouth's level, to establish its horizontal position. Only after such a position has been established, that the child directs the spoon straight to his mouth. This simple logic is not obvious for the child and instead of the movement presented in Photo 1.1, he performs the movement presented in Photo 1.2.[6]

A spoon in the child's hand is not a tool, but a mean, a required substitution for a hand and, as such, a bad substitution. Only after a period of training, a child develops skills for using a spoon: not to move it immediately to the mouth, but at first to lift it up horizontally. For a long time, a child attempts to hold the spoon in his fist at the lowest part of the spoon's handle. It is only when reaching the pre-school age, he masters how to use the spoon while complaining about the inconvenience of holding the spoon's handle in his palm positioned upwards (a usual way to hold a spoon for adults).

Such an example demonstrates the main phases of mastering a tool and not only a spoon; these phases are visible when mastering any new tool. However, such observations seem to be too simplistic. In order to examine the differences between the two types of external mediated activities (manual and tool-mediated), an experiment will be described in the next chapter.

[6] In order to take pictures of the experiment with the available camera, we had to perform our experiments outside in the daylight. In addition, the setting had to be changed: instead of pulling the toys out of the pool, we placed the pool sideways and used it as a table to make the movements of the child with the spoon available for observation. The attached photos are used exclusively to demonstrate the child's operations with the spoon; however, these operations are not included in the empirical data analysed in this study.

Photo 1.1 A child using the spoon properly: the spoon is a tool in the child's hand

Photo 1.2 A child who cannot use a spoon: a spoon in the child's hand is not a tool, but a mean - an inconvenient substitution of a hand

Chapter 2
The Empirical Research

Outline

In this chapter, Galperin provides a detailed description of the empirical research he conducted. Several groups of children, between two and seven years old, participated in the experiment. The children were tasked to lift toys out of the 'pool'—a box without bottom (70 × 50 cm and 60 cm height). There were a variety of toys: a celluloid fish, a frog, swan, a large and small roller (for electricity wiring), a small and large blue wooden cube (7 × 7 cm), a cylinder, a trihedral and tetrahedral pyramid, an iron top, three polished barrels and others. The children's task was to lift the toys out of the pool by using a spade which had a blade sized 9 × 11 cm attached at a right angle to its handle (40 cm). The spade had a specific and simple logic: for a successful action, it had to be lifted up and out of the pool vertically.

The two-year-old children were first to engage in the experiment which demonstrated that they used the spade only as a stick and the spade blade was regarded as an inconvenient addition, not useful for the operations. The children attempted to lift the toys by pressing them against the pool's wall with the spade handle and moving them upwards as if it was an extension of their arm. Galperin summarises the different ways the children (also seen in older groups) held the spade in their experiments: *as a stick, as a reversed stick, as a wand, as a fork, as a teaspoon and as a pinch.* He also explains that lifting the toys out of the pool consisted of three relatively independent tasks: (i) sliding the spade under the toy, (ii) stabilising the toy on the spade blade and (iii) lifting the toy.

Galperin observed, that when the two-year-old children engaged in manual operations, their movements did not correspond with the objective requirements of the tool and the spade functionally merged with their arms. These manual operations were particularly visible at the beginning of the experiment. The children bent their arms as if the spade was an extension of their arms and the blade was their hands, holding the toys. When the toy fell off the spade, this provided evidence that the logic of such an instinctive operation did not correspond with the logic of the tool.

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Such inconsistency was quickly noticed by the children and was eliminated. Further manual operations were visible when (i) the children slightly tilted the spade to their left hands, (ii) they lifted the spade with a quick movement and (iii) they changed their grip on the spade handle. When performing these movements, the children did not realise that the toys were unstable and did not stay on the spade in the same way as if they were holding them. Sliding the spade under the toys was almost impossible for the two-year-old children, they operated with the spade as a stick and the blade was perceived by them as negative and useless. The children realised the need to stabilise the toys, however they did not perceive any attempts to do so. While lifting the children often reached out for the toys by bringing the spade close to their bodies. In summary, the two-year old children engaged in several manual operations which they used interchangeably—more successful operations were replaced by less successful ones. Occasionally, tool-mediated operations were used, however, they were unskilled and, in most cases, ineffective.

The three-year-old children demonstrated good lifting skills: they managed to lift the toys up and out of the pool despite using so-called intermediate operations. For example, the operation of sliding the spade under the toys was not smooth, however the children were able to repeat this operation successfully on multiple occasions. The children repeated other successful operations with the toys (particularly the round ones), for example, dragging them along the pool wall. In summary, three-year-old children differed from two-year-olds in their ability to get the toys onto the spade by sliding it under. Such an ability largely depended on their initial grip complemented by other primitive operations performed in critical moments which happened mostly at the top of the pool. However, sliding the spade under the toys was not managed completely by the three-year-old children as there were large variations in the operations performed. The children were able to carefully slide the blade under the toys, however they often only hit them with the spade. The toys moved onto the blade by springing upwards (most of the toys were light and round) or as a result of the children hitting the bottom of the pool. In doing so, the children established a link between the performed operations and their outcomes rather than understanding the objective relationships between the tool and the target object. Stabilising the tool on the spade blade, did not arise as an independent and necessary task. If the toy's favourable position accidently occurred, it was immediately picked up by the children. They observed, picked up and repeatedly attempted to use operations that appeared to be successful, which were used on various occasions even when they did not suit the situation. Such an approach showed that the successful operations were not realised and consciously understood by the children. The children's understanding, however, was visible in operations they had mastered, for example, in lifting the spade out of the pool. In operations that were less mastered, such as, sliding the spade under the toys or stabilising them on the blade, the children's attempts to repeat the successful operation were not observed. Galperin suggest that this might be because the children did not establish the link between the toy's position and their previous operations. The children did not account for the objective relationships between the conditions of the performed operations in the ones mastered or performed accidently.

The four-year-old children demonstrated mastery of three operations: lifting up—completely; sliding the spade under the toys—on multiple occasions; and stabilising the toys on the blade was visible in their attempts to lean the toys onto the spade handle. However, this operation was only used on occasions. On most occasions the children bent their bodies to maintain the vertical position of the spade, instead of changing their grip. Even when they needed to tilt the spade to stabilise the toy, they maintained this position when lifting the toy out of the pool. To summarise, four-year-old children were able to master the target tool-mediated operations needed to solve the task. At this age, however, operations were mastered by the children differently: lifting up—completely; sliding the spade under the toys varied depending on the context. Some children were able to get the toys onto the blade by sliding it underneath, by putting far too much effort into this movement, and some held the spade tilted. Stabilising the toys on the spade was challenging for the children and this operation demonstrated large variations in performance.

The five-year-old children demonstrated their mastering of the target operations: sliding the spade under the toy, stabilising it and lifting the toy up and out of the pool. The latter was particularly visible in the children's persistent attempts to roll the toys onto the spade handle. Although the children demonstrated their mastery of the target operations, the whole task remained in their 'challenging zone', although at its lower end.

With older children (eight-year-olds), these operations appeared to be too easy and they could not demonstrate the development of target operations. Their skilful movements adequately corresponded to the requirements of the tool and the properties of the toys. The performed operations did not depend on the children's grip; the task to lift the toys out of the pool with the spade was not challenging and therefore not motivating for older children.

The Empirical Research

To examine manual- and tool mediated operations, the following experiment can be conducted. Participants from two different age groups should be exposed to a task which can be solved either manually or by using tools offered by the experimenter. Of course, by using manual- and tool-mediated operations, this task can be solved differently. The older participants quickly master the offered tool and use it with enthusiasm when engaged in the target task which they can solve easily. However, the same task is extremely difficult for the younger participants. The task is positioned at the limits of the participants' capabilities: they are not able to use the tool and are attempting to act both with the tool and without the tool, by using 'natural means'. However, both groups are expected to use the offered tool and by comparing manual and tool-mediated operations, the differences between these operations may be revealed.

The experiment we conducted was set up in the following way: children aged two to seven years old were asked to lift toys out of a pool—a box without a bottom (70

× 50 and 60 cm height). With older children, the experiment was conducted in a different room and a table placed on its side was used as a pool (the same size as the box). The toys, the children were expected to get out of the pool, were of various types: a celluloid fish, a frog, swan, a large and small roller (for electricity wiring), a small and large blue wooden cube (7 × 7 cm), a cylinder, a trihedral and tetrahedral pyramid, an iron top, three polished barrels (a small yellow, a middle green and large blue, all 12 cm in height) and a variety of small polished items (jugs, cast iron kettles, etc.) which are incredibly attractive to children.

Some toys were round that could roll easily, others light and unstable, some relatively heavy and difficult to slide the spade underneath. Finally, the other toys combined several of the previously mentioned qualities. In order to get these toys out of the pool, the children were to engage in different tasks which could be solved by performing different operations with the offered tool (a spade).

For the older children, the depth of the 'pool' was not really an obstacle and by leaning forward, the children could easily reach the bottom of the pool with their hands. However, they were not allowed to take the toys out of the pool with their hands, and such an attempt 'did not count'. If a child was over enthusiastic and took a toy out of the pool with his/her hands it was immediately returned. The children could get the toys out of the pool only by using the spade, which had a blade sized 9 × 11 cm and was attached at a right angle to its handle (40 cm).

Although the spade was initially designed for other experiments, it turned out to be very useful for our purpose, which was to identify the types of operations performed by the children attempting to get the toys out of the pool. The spade (as a tool) had a specific and simple logic: it had to be lifted up and out of the pool vertically (Photo 2.1), otherwise the toy would fall off the spade and back into the pool. Such a simple operation could not be performed by some children and, in that case, the tool-mediated operations were substituted with manual operations (Photo 2.2). In the following, I describe the experiment we performed in detail.[1]

The experiments are conducted in a nursery using a pool, which is a rectangular box without a bottom placed on the floor. The youngest child participants are approximately two years old, and before the start of the experiment, we played with the children, showing them different pictures until they were comfortable with the us (i.e., experimenters).

Lulic D.,[2] one year and two months old, (No 39)—a big, communicative and clever boy is looking into the pool with interest. When I offer him a spade with a long handle to get the toys out of the pool, he turns the spade upwards and attempts to get the toys with the spade handle. He takes his time in an attempt to bring the toys to the pool's wall and lift them up by pressing them to the pool's wall with the spade handle. He only manages, however, to scatter the toys in the pool and the spade's blade is in the way of his operation. 'No…', he exclaims, and pulls the spade out of the pool, puts it aside (with its blade down) and attempts to reach the toys with his

[1] The empirical data was collected with the assistance of the students of Kharkov Saksonov Pedagogical Institute. I thank the students for their help in data collection.

[2] The name of the boy, probably anonymised.

Photo 2.1 A child lifting up the spade vertically - using the spade as a tool

hands. However, his attempt to reach the toys remains unsuccessful and, after a few minutes, he says, 'I need a stick', turns to the spade, takes it by the blade and lowers its handle back into the pool.

Resume.[3] It is visible, that Lulic uses the spade only as a stick, and the spade's blade for him is a disturbing addition and not useful in this operation. He attempts to lift the toys by pressing them against the pool's wall with the spade handle and moving them upwards, as if it was his extended arm without a hand.

For several days, Lulic has observed the experiment with other children. On the day when he is involved in the experiment, he again attempts to lift the toys with the spade handle by holding the spade upside down. I take the spade from him, turn the blade down and say: 'Here, try to use it this way'. Lulic takes the spade handle and drags the spade across the bottom of the pool. The spade blade is tilted, and it only scatters the toys. Lulic says: 'No…' and he puts the spade away.

Having observed Lulic's unsuccessful attempts to lift the toys out the pool, I put the toy on the spade for him. Lulic is lifting up the spade so fast, while performing a sharp movement backwards, that the toy is falling off the spade and back into the pool. He is dragging the spade (with its blade down) across the bottom of the

[3] As in original.

Photo 2.2 A child lifting up a tilted spade - using the spade as a mean

pool, however, the spade is tilted, and his attempts to get the toys on the spade are unsuccessful.

The upper edge of the box (the pool's wall) reaches Lulic's face and we place the boy on a stool and put a toy on the spade for him. Although he is pulling the spade slower than he did previously, the spade's long handle makes him lift his arm upwards, to the side and backwards, making the spade blade tilt and the toy fall off the spade (Fig. 2.1).

Lulic climbs off the stool and proceeds to study pictures. After three minutes, he takes the spade (with its blade down), soon however, he puts it away and attempts to reach the toys with his hands. After several minutes, he takes the spade again and drags the tilted blade across the bottom of the pool. To comfort him, I lift a toy with the spade out of the pool for him and Lulic happily puts the lifted toy in the nearby box and asks me: 'Do it again'. He takes the spade by its handle as 'a stick' and

Fig. 2.1 Lulic lifts his arm upwards, to the side and backwards, making the spade blade tilt and the toy fall off the spade

holding the spade tilted, drags the spade across the bottom of the pool, scattering the toys. After a few minutes, he puts the spade away and climbs into the pool.

The way the children held the spade handle essentially affected how the spade was used (successfully or unsuccessfully), particularly in younger children. Table 2.1 summarises the different ways the children held the spade in our experiments.

By holding the spade 'as a wand' Lulic attempts to get the toys on to the spade, however, similar to his earlier attempts, he does not succeed. I take the toys out of the pool for him, he takes the toys from me and throws them back into the pool, finding this process extremely entertaining.

Lulic takes the spade again, grips it 'as a wand', then he changes his grip to 'as a stick', however his attempt is unsuccessful. He says: 'No, I cannot do it, could you please do it for me?'.

I place the toy on the spade blade for him, he pulls it upwards and backwards, the spade tilts (see Fig. 2.1), the toy falls off and Lulic tries to reach the toy with his hand. I place the toy on the spade again and by holding the spade 'as a wand', by the handle's upper edge, Lulic pulls the spade backwards and upwards and the toy falls off the spade. Lulic passes me the spade and invites me to engage in the process.

Table 2.1 The different ways the children held the spade handle

Photo 2.3 As a stick

Photo 2.4 As a reversed stick

Photo 2.5 As a wand

(continued)

Table 2.1 (continued)

Photo 2.6 As a fork

Photo 2.7 As a teaspoon

Photo 2.8 As a pinch

We both continue playing—I pull the toys out of the pool for him and he throws them back in. He makes several unsuccessful attempts to get the toys on to the tilted spade and lift them up by pulling the spade with a quick swing.

I offer him the spade with the toy on it so that he can hold it in the middle of the spade handle. The toy is close, and he is trying to reach it with his hand. When informed he is not allowed to do so, he lifts the spade upwards and successfully reaches the toy, by holding the middle of the spade handle. We repeat this operation: I lift the spade with the toy for him, he reaches out to the toy and then by holding the spade handle in the middle, he lifts the spade out the pool. Finally, with a sigh of relief, he takes the toy off the spade. Then he asks: 'Could you get the fish and the frog for me?' Having received the desired toys, he throws them back into the pool laughing out loudly.

Resume. It is obvious that the process of getting the toys out of the pool is more complicated than it has been anticipated. Such a process consists of three relatively independent tasks: (i) *inserting the spade under the toy*, (ii) *stabilising the toy on the spade blade* and (iii) *lifting*.[4] Inserting the spade blade under the toy is impossible for Lulic. He does not realise to do so, that he has to keep the front edge of the spade blade close to the bottom of the pool. To achieve this, Lulic has to hold the spade

[4] Italics in original.

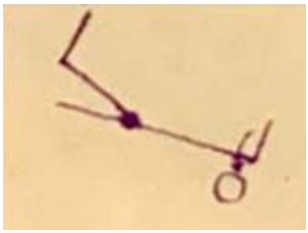

Fig. 2.2 Zina holds the spade handle 'as a stick', lifts it up a bit, bends her arm, the spade tilts and the toy falls off

blade almost parallel to the bottom, however he does quite the opposite, and holds the spade blade at an angle to the bottom as if the spade handle was just a stick without the blade. He realises the need to stabilise the toy on the spade blade after the first violent attempt to lift the spade upwards when the toy rolled off the blade. After that, Lulic's made attempts to lift the spade slowly and carefully, however until I make him the offer of holding the spade handle in the middle, he pulls it to the side and backwards. During such an operation, the spade inevitably tilts, and the toy rolls off the blade.

Zina D. one year and eight months old, (40)[5] engages in the same experiment taking the spade, lowering and lifting it up empty several times. Then, she asks me to get the toys out of the pool for her. I place the toy on the spade blade for her (the spade remains in the pool). Zina holds the spade handle 'as a stick', lifts it up a bit, bends her arm, the spade tilts and the toy falls off (see Figs. 2.2 and 2.4).

I show her how to lift the toys with the spade out of the pool. Zina lowers the spade, makes several scooping movements, without even touching the toys (this is recorded in the protocol as ideological movements). She drags the empty spade against the wall of the pool, pulls it out and repeats the whole sequence. I take the initiative and place a frog on the spade for her. Zina lifts the spade up, however halfway through, she reaches out for the frog with her left hand. She bends her right arm; the spade tilts and the frog falls off the spade. I place the frog and the swan on the spade again. Zina lifts the spade very slowly, I encourage her: 'You are doing well, you can get the toys'. She grips the spade handle with another hand, lifts it up and takes the swan and the frog off the spade. I place another toy on the spade—Zina lifts it up, then the spade catches the wall of the pool and the toy rolls off the spade. We repeat the operation. Now Zina lifts the spade straight up and by moving her hands interchangeably up the spade handle, she reaches the toy.

After a few days we repeat the experiment in the following way: I place the toy on the spade, Zina takes the spade with her right hand and lifts it up by bending her arm. She helps herself with her left hand, the spade tilts and the toy falls off the spade. Zina repeats the operation and comments: 'The toy has fallen off the spade' (Fig. 2.3).

Zina approaches the pool from another side and after several unsuccessful attempts to use the spade, she climbs into the pool. When she is out of the pool, I place the toy on the spade and Zina, by holding the spade 'as a wand', lifts it up by moving

[5] The meaning of the number is unknown.

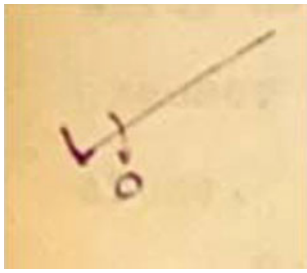

Fig. 2.3 Zina helps herself with her left hand, the spade tilts and the toy falls off the spade

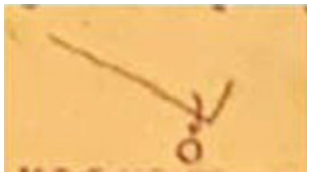

Fig. 2.4 Marusya grips the spade 'as a wand' and pulls it slowly out of the pool. However, because she moves the spade to the side, it tilts, and the toy falls off the spade

her hands interchangeably up the spade handle. Eventually, she takes the toy off the spade. She carefully examines the toy and in one movement she throws the toy and the spade back into the pool.

The wall of the pool is relatively high, we place Zina on a small stool, and she attempts to reach the bottom of the pool with her hand. I offer her the spade and say: 'You can get the toys with the spade now'. Zina grips the spade 'as a stick' first, then changes her grip to 'as a wand' and lifts the spade up by moving her hands interchangeably up the spade handle. Zina is in a hurry; the spade eventually tilts, and the toy falls off the spade. Zina lifts the spade out the pool and inspects the blade. I place another toy on the spade, Zina grips the spade 'as a wand' and lifts it up carefully by moving her hands interchangeably up the spade handle. She reaches for the toy and takes it off the spade. Then she climbs on to the stool, pulls the spade out of the pool and the toy falls off the spade. She climbs off the stool and plays with the toys resting on the table.

After a while Zina returns to the pool, grips the spade 'as a stick', immediately changes her grip to 'as a wand' and by moving her hands up the spade handle, successfully lifts up the toy out of the pool. I place another toy on the spade, Zina grips the spade handle 'as a wand' and although the toy falls off the spade almost immediately, she continues to pull the spade out of the pool. I repeat the operation, Zina lifts the spade slowly, however, the spade tilts and the toy rolls off. Zina summarises: 'There is no toy on the spade' and lowers the spade back into the pool. Next, Zina's attempt to get the toy out of the pool is successful (she uses the same approach), however, her last attempt is unsuccessful, when she pulls the spade upwards and backwards, and the toy rolls off the spade. Zina comments: 'There is no toy on the spade'.

Resume. The experiments with Zina offer interesting considerations. First, Zina performs manual operations with the mean at the beginning of both experimental days. She lifts the spade with the toy by bending her arm as if she was lifting it

with her hand. When holding something in a hand, we don't lift our hand with a stretched-out arm, but we bend our arm at the elbow, bringing the lifted object to the middle of our bodies. In Zina's movement, the spade as a tool functionally merges with her arm.

Second, Zina quickly transfers form these random and unsuccessful operations to more successful operations, such as holding the spade 'as a wand' and pulling the spade out of the pool by moving her hands interchangeably up the handle. It is visible that these operations are more convenient for Zina, however, they do not correspond to the objective requirements of the tool use. Therefore, Zina's operations remain underdeveloped and are used interchangeably with unsuccessful operations.

Such observations in Zina's experiment are also visible in an experiment with another girl, Marusya V. who is 2 years old (No 51). When she comes into the room, she believes I am a doctor and bursts out crying. However, she soon settles down and having placed her on the stool, I demonstrate what she is expected to do, using the spade to get the toys out of the pool several times.

I then offer Marusya the spade and ask her to get the toys out of the pool. She finds inserting the spade under a toy extremely difficult, so I place the toy on the spade for her. She grips the spade 'as a wand', however, she pulls the spade upwards and to the side so fast that the spade tilts and the toy rolls off. She brings the spade close to her face and inspects the blade.

Marusya grips the spade 'as a wand' again and pulls the spade out of the pool slowly. However, because she moves the spade to the side, it tilts, and the toy falls off the spade (see Fig. 2.4).

In the several attempts that follow Marusya lifts the spade with her right hand, holds the spade 'as a wand', and reaches out to the toy with her left hand. To do so, she bends her body forward and, simultaneously, her right hand holding the spade moves down. She attempts to reach the toy with her left hand; however, the spade moves away from her. Marusya bends her right elbow and brings the spade with the toy to her left hand, however, it tilts, and the toy falls off. She repeats this operation six times (see Fig. 2.5).

After six unsuccessful attempts to reach the toy with her left hand, Marusya suddenly changes the pattern of her movements. She grips the spade handle in the middle and lowering her right hand, she lifts it upwards, bringing it closer to her body by moving it to the left. The spade tilts and the toy falls off the spade (see Fig. 2.6).

Fig. 2.5 Marusya bends her right elbow and brings the spade with the toy to her left hand, however, it tilts, and the toy falls off

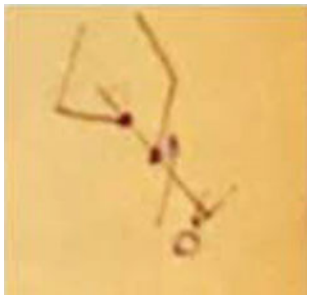

Fig. 2.6 Marusya grips the spade handle in the middle and lowering her right hand, she lifts it upwards, bringing it closer to her body by moving it to the left. The spade tilts and the toy falls off the spade

Fig. 2.7 Yura grips the spade handle at its edge, then in order to lift the toy out of the pool, he has to lift his right hand high up and move it backwards. During such a movement, the spade tilts and the toy rolls off the spade

In order to encourage her, I place a toy on the spade for Marusya. She lifts the spade upwards with her right arm by holding it 'as a wand'. While moving her hand upwards, she tilts the spade and the toy rolls off. She repeats this operation three times.

During her fourth attempt, she lifts the spade with her right arm, then shifts her grip from her right to her left hand and then back to her right hand. Her movements are unstable, and the spade makes a wave-shaped line—'a wiggling lift'—and most toys roll off the spade, however, she manages to catch some with her left hand. In further attempts, she repeats her catching movements, however, the spade swings from side to side and all toys fall down while she is lifting the spade up. After several attempts, she lifts the spade up and out of the pool, turns it upside down and inspects the bottom of the blade as if trying to understand the reason for her unsuccessful attempts.

Twice, she lifts up the spade loaded with toys by holding it 'as a wand' at the top end of the handle. She is holding the toys previously pulled out of the pool in her left hand and therefore, she cannot use her left hand in the following attempts (although she is making a movement with her left hand towards the spade). Similar to her previous attempts, when reaching the upper edge of the pool's walls, she stretches her right hand out, the spade tilts, and the toys fall off.

I take the toys out of her left hand and she engages in lifting up the spade by gripping the handle interchangeably with her right and left hands. However, her movements are rough, and she only manages to pull several toys out of the pool in one out of three attempts.

In the following two attempts, she lifts the spade without changing her grip and in one attempt by changing her grip. In these three attempts Marusya manages to pull several toys out of the pool. When she does not change her grip, her attempts are successful when she holds the spade 'as a wand' at a distance from the top end of the spade handle. Marusya changes her grip only when she realises that she cannot raise her right arm high enough.

In summary, in the experiments with the two-year-old children, manual operations are observed. These manual operations are particularly visible at the beginning of the experiment. A child bends his/her arm that is holding the spade at the elbow as if the spade was an extension of his/her arm and the spade blade was the child's hand, holding the toys. When the toy falls off the spade, this provides evidence that the logic of such an instinctive operation does not correspond to the logic of the tool. Such an inconsistency is quickly noticed by the children and is eliminated. Further manual operations are visible when (i) the children slightly tilt the spade to their left hand, (ii) they lift the spade with a quick movement and (iii) they change their grip on the spade handle. When performing these movements, the children do not realise that the toys are unstable, and they do not stay on the spade in the same way as if they were clenched in a child's hand.

Sliding the spade under the toys is almost impossible for the two-year-old children, moreover, it seems that the need to insert the spade blade under the toy is not obvious for them. The children operate with the spade as a stick and the blade is perceived as a negative element rather than useful to perform an operation. Their intention to slide the spade under the toys is visible in positioning the blade parallel to the bottom of the pool. However, in relation to the toys, the spade is moved randomly and is often dragged across the bottom without even touching the toys.

The children quickly realise the need to stabilise the toy after several unsuccessful attempts to lift the toy on the spade. However, the children do not go any further than starting to move the spade slower. They start lifting the spade with care; however, the children do not make any attempts to stabilise the toys on the blade. On the contrary, the relationship between the position of the spade blade and the toy falling off is not obvious for the children. When the toy falls off the spade, they inspect the empty blade with surprise.

The operations pursued by children of this age group involve (i) lifting up the spade by (ii) bringing the spade close to their bodies. Although inserting the spade under the toy and stabilising it on the blade is very difficult for children, such operations are truly appreciated, and they are engaged in lifting the spade up and out of the pool.

An attempt to reach out for the toy is often observed in two-year-old children, however such an attempt is quickly replaced by a more sophisticated mediated movement—bringing the spade closer to their bodies. We should acknowledge that two-year-old children progress quickly in lifting up toys with the spade during the first experiment; however, they mostly select successful manual operations rather than tool-mediated operations (spade). These tool-mediated operations are unskilled, rough and most often are ineffective. In addition, children use different manual operations interchangeably, and sometimes more successful operations are replaced by less successful ones. Such interchangeable use of manual operations can be explained

by different circumstances, for example, by the children's initial grip of the spade handle. This last aspect is particularly visible in the following experiment, where my description is in relation to the above.

Yura S., two years and four months old (No 37) is standing on a small stool in front of the pool. He attempts to slide the spade under the toys unsuccessfully. He is randomly moving the spade among the toys, holding it in the most inconvenient way. I insert the spade under the toy for him for several attempts.

Yura lifts up the toys in different ways depending on (i) how he grips the spade handle and (ii) what kind of toy he is lifting. In the majority of cases, he grips the spade handle 'as a wand' and when lifting up the spade, his fist, holding the edge of the spade handle, makes a tilted curve which eventually moves backwards. The success of the performed operation depends on the point on the curve in which his arm stops. However, this point, in turn, depends on the position of Yura's grip of the spade handle. If he does not grip the spade handle at the very top but at a lower point, the toy is stabilised on the spade blade (for example, a large cube, a prism and a smaller cube) and Yura is able to lift the toy up and out of the pool successfully. However, if the toy is small and light (for example, a celluloid fish or a frog) and Yura grips the spade handle at its edge, then in order to lift the toy out of the pool, he has to lift his right hand high up and move it backwards. During such a movement, the spade tilts and the toy rolls off the spade. Yura does not manage to catch the falling toy with his left hand (see Fig. 2.7).

Yura grips the spade handle 'as a stick'—sometimes I deliberately direct the spade handle to him to be able to grip it in such a way and sometimes I just place his hand on the spade handle to grip it 'as a stick'. However, by applying such a grip, Yura does not succeed in lifting the toy out of the pool. He lifts the spade up by moving his elbow to shoulder level and inevitably moves it backwards and to the side. In doing so, the spade tilts and the toy falls off.

When we offer a similar task to three-year-old children, considerable 'progress' is observed between their operations with the spade in comparison with two-year-olds. Tanya T, three years old (No 30) requires a long time to engage in the task. To encourage her and simplify the task, I place the toy on the spade blade for her after her several unsuccessful attempts to get the prism and the 'roof' with a large base onto the blade. In her next attempt, she manages to slide the spade blade under the barrel and successfully pulls it out of the pool. The barrel is leaning against the spade handle and it is moved straight upwards. When reaching the edge of the pool wall, Tanya grasps the toy with her left hand. I place several toys on the spade blade for her. She lifts the tilted spade and soon all toys fall off. I place the toys on the spade blade again. Tanya is holding the spade handle 'as a stick' and grips the handle with her palm directed downwards. She manages to lift the spade straight up; the toys remain on the spade and she takes them off the spade with her left hand. By holding the spade 'as a stick', she attempts to get the toys on the spade from the bottom of the pool, however, with no luck.

I place a frog on the spade blade and when lifting the spade upwards, Tanya tilts the spade and the frog falls down (see Fig. 2.8).

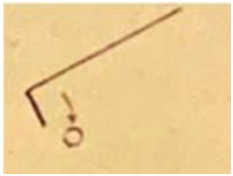

Fig. 2.8 I place a frog on the spade blade and when lifting the spade upwards, Tanya tilts the spade and the frog falls down

Tanya slides the spade under the frog and lifts it up, however since the spade blade is slightly tilted, the frog is unstable, and it rolls off. Tanya inserts the spade blade under the frog again and, by holding the handle upwards, she lifts the frog out of the pool. She makes several attempts to get the fish from the bottom the pool. She hits the fish with the spade, and it springs over the blade. At long last, Tanya manages to get the fish onto the blade, and she pulls it carefully out of the pool.

Tanya slides the spade under a little toy jug several times, however, every time when lifted, it rolls off the spade even at a slightest swing (the jug cannot be stabilised by leaning against the spade handle). Tanya turns her attention to the fish again. First, she attempts to reach it with her hand, however she takes the spade immediately and by holding it as 'a reversed stick', she inserts it under the fish and pulls it out of the pool.

I ask Tanya to get the swan out of the pool. She easily slides the spade under the swan and by holding the spade 'as a fork' lifts it up quickly. However, her movements are fast, and the swan falls off the spade. Tanya turns the spade with the blade directed away from her, it takes a long time to get the swan on the spade, however, after a while she manages to do so and successfully pulls the swan out of the pool.

Tanya asks me to move the barrel, resting at the opposite wall of the pool, closer to her. She slides the spade under the barrel and halfway through the process of lifting it up, the barrel falls off the spade. She repeats the same operation several times, however, the barrel is not stabilised, and it falls off the spade every time when lifted. She leaves the barrel and turns her attention to the toy jug. She slides the spade under the jug and stabilises it by leaning it against the spade handle. Tanya lifts the jug up and out of the pool easily.

Resume. Tanya demonstrates good lifting skills—in most cases she manages to lift the toys up and out of the pool. However, sometimes primitive operations become visible, such as tilting the lifted-up spade. This does not count the cases when she lifts the toys by holding the spade slightly tilted. Tanya manages to slide the spade under the toys—an important operation which was unavailable for two-year-olds. However, when sliding the spade under the toys, Tanya's movements are still rough and are successful with light and round toys in comparison with others. Tanya is unable to stabilise the toys on the spade blade and if the toy accidently appears to lean against the spade handle, she attempts to maintain such a favourable position as a precondition for her successful operation. However, Tanya does not attempt to create such a position deliberately, she makes use of accidental cases and she does not make any attempts to stabilise the toy on the spade blade.

Fig. 2.9 Slava D., three years and ten months old, holding the spade 'as a fork' slides it under a big barrel and rolls it up along the wall of the pool

Fig. 2.10 When reaching the top of the pool wall, Slava moves the spade handle closer to him, the blade moves away from the wall and the toy barrel falls down

Slava D., three years and ten months old (No 32), holding the spade 'as a fork' slides it under a big barrel and rolls it up along the wall of the pool (see Fig. 2.9).

When reaching the top of the pool wall, Slava moves the spade handle closer to him, the blade moves away from the wall and the toy barrel falls down (see Fig. 2.10).

Slava drags the empty spade up along the wall and reaches to the toy barrel lying in the pool with his empty left hand. Then he puts the spade away and proceeds playing with the cards.

I offer Slava to engage in the experiment again. In attempting to get a big blue barrel toy out of the pool he is awkwardly hitting it with the spade blade. After some unsuccessful attempts, he manages to get the barrel on to the spade, rolls it up along the wall and halfway through, reaches out grabbing the toy with his left hand. When making a movement with his left hand, Slava leans the spade handle against the wall of the pool, pushes it, the blade moves away from the wall and the barrel falls down (see Fig. 2.11).

Slava is disappointed and he asks me: "Can you please get the barrel for me?" I slide the spade under the barrel and by slightly leaning it onto the handle, I easily lift the barrel up to the top of the pool. I then return the barrel back to the pool and pass

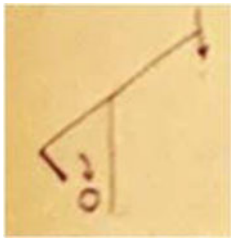

Fig. 2.11 When making a movement with his left hand, Slava leans the spade handle against the wall of the pool, pushes it, the blade moves away from the wall and the barrel falls down

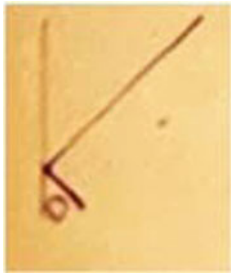

Fig. 2.12 Slava attempts to get the fish from the opposite wall of the pool by holding the spade as a hoe

Slava the empty spade. This time, the boy attempts to get the fish from the opposite wall of the pool by holding the spade as a hoe (see Fig. 2.12).

Slava makes several unsuccessful attempts to get the fish out of the pool and I move it away from the pool's wall for him. By holding the spade 'as a wand', he slides the blade under the fish, lifts it up and grabs the fish. Without changing his grip, he makes another successful attempt to get the frog out of the pool.

Slava changes his grip to 'as a stick', however, he is unable either to slide the spade under the toys, or to lift them up. He proceeds to playing with the cards, however, after a short while he returns to the pool. He slides the spade under a large cone and rolls it up the pool's wall. At the top of the wall, he grabs the cone with his hand. Encouraged by his success, Slava turns to the triangular pyramid in an attempt to get it onto the spade at the bottom of the pool. First, he scratches the sides of the pyramid with the blade, then he gets it onto the spade and although it is sitting well, he lifts the spade by dragging it up along the pool's wall. However, during this operation, the pyramid gets caught in some uneven wooden boards; turning the spade towards him and the pyramid falls off.

Slava slides the spade under the swan and drags it by pressing it against the pool wall (although there is no obvious need to do so). At the top the pool wall, he moves the spade in such a way that the blade moves away from the pool wall and the swan falls off (see Fig. 2.13).

Resume. The so-called intermediate nature of operations is visible in the actions of the three-year-old children. The children use primitive and rough movements to get the toys out of the pool. For example, the operation of sliding the spade under the toys is not smooth, however the children are able to repeat this operation successfully on multiple occasions. The children repeat other successful operations with the toys

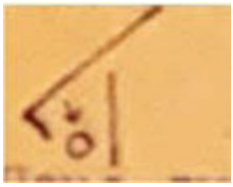

Fig. 2.13 At the top the pool wall, Slava moves the spade in such a way that the blade moves away from the pool wall and the swan falls off

(particularly the round ones), for example, dragging them along the pool wall. Such an operation is useless with toys of other shapes.

Lionya D. is three years and four months old (No 38). He is a happy, blue-eyed boy with red cheeks. First, we engage with the cards, and he asks questions about every card: 'What is this?' He memorises the names of the objects on the cards fast.

Lionya grips the spade quite unusually 'as a reversed stick', however, he slides the blade under the toy jug quickly and by leaning it onto the handle, he successfully pulls it out of the pool.

I ask him: 'Can you do it again?' This time, Lionya is holding the spade 'as a stick' and he attempts to roll the jug up along the pool wall (see Fig. 2.14).

However, the spade catches uneven sections on the wooden boards and the jug falls down. Lionya repeats his attempt by pressing the jug against the pool wall using the spade. He changes his grip to holding the spade 'as a fork' and attempts to roll the jug along the pool wall, however, after a few unsuccessful attempts, he carefully, without moving the spade close to the pool's wall, lifts up the spade and gets the jug.

By holding the spade 'as a reversed stick', Lionya attempts to get the toy jug by sliding the spade under it from different sides positioning the blade at different angles. He grips the spade 'as a stick' and attempts to scoop the jug from the opposite pool wall (see Fig. 2.15).

By holding the spade 'as a fork', Lionya directs his efforts to the large cube. First, he performs scratching movements, then manages to slide the spade under the cube.

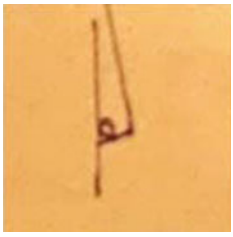

Fig. 2.14 Lionya holding the spade 'as a stick', attempts to roll the jug up along the pool wall

Fig. 2.15 Lionya grips the spade 'as a stick' and attempts to scoop the jug from the opposite pool wall

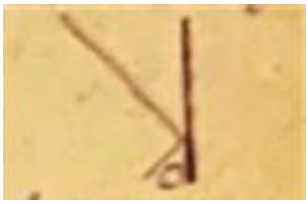

Fig. 2.16 By holding the spade 'as a stick', Lionya attempts to get the frog from the opposite pool wall

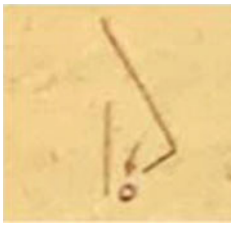

Fig. 2.17 At the top of the pool wall, Lionya moves the spade away from the wall and the frog rolls off

However, instead of lifting it up, he attempts to drag the cube up along the wall. The cube catches the uneven places in the wooden boards, and it falls down. Lionya says: 'I cannot get it'. He slides the spade under a smaller cube and by pulling the spade away from the wall, he lifts it out of the pool.

By holding the spade 'as a stick', he attempts to get the frog from the opposite pool wall (see Fig. 2.16).

After several attempts, Lionya manages to reach the frog with the spade. He drags it closer to him and then, by changing his grip to 'as a reversed stick', he performs several scratching movements on the pool's wall. At last, he manages to slide the spade under the frog, and drags it up along the pool wall. At the top of the pool wall, he moves the spade away from the wall and the frog rolls off (see Fig. 2.17). Lionya repeats this operation six times.

He rolls the green barrel up along the wall and halfway through, he reaches it with his left hand. I say: 'Sorry, you can't do it this way' and throw the barrel back to the pool. The barrel rolls to the pool's opposite wall and stops there. The boy attempts to reach it with the spade.

After a short while Lionya leaves the spade and engages with the cards. I name the objects on the cards and he repeats them after me. Soon he remembers the names of the objects and is able to recall them. We take a break in the experiment.

After the break, we resume our experiment. Lionya is scratching the large cube by attempting to press it against the pool's wall with the spade blade. After a few minutes, he leaves the cube and turns his attention to the green barrel at the opposite wall, brings it closer to him, however, his attention is suddenly caught by a large roller.

At first, Lionya reaches it with the spade, then he slides it under the roller and lifts it up almost to the top of the pool wall by holding it slightly tilted. However, at this point the spade tilts towards the boy and the roller falls off. After several similar attempts, Lionya leaves the spade and proceeds to play with the cards.

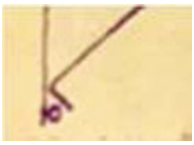

Fig. 2.18 Lionya makes several attempts to turn the large roller sideways, however they are unsuccessful, and he tries to get the roller onto the spade

After a while Lionya comes back to the pool and by gripping the spade 'as a fork', he rolls the large barrel along the pool's wall. He brings the barrel to the top of the wall and grabs it with his empty hand. He repeats the same operation with the middle-sized green barrel.

In an attempt to get the large cube onto the spade, Lionya performs some unsuccessful scratching movements. He says: 'I can't get the cube' (he memorises the names of the figures fast). Then he makes several attempts to turn the large roller sideways, however they are unsuccessful, and he tries to get the roller onto the spade (see Fig. 2.18).

After several unsuccessful attempts, Lionya leaves the large roller and turns his attention to the small one. Lionya is moving the small roller up along the wall by moving his hands interchangeably up along the spade handle.

Lionya is eager to get the prism out of the pool. By holding the spade 'as a fork', he scratches the prism. He tries to get the prism onto the spade, but he is not successful and puts it away. I say: 'Will you try again?' He replies: 'No. I don't really want to' and engages in playing with the toys he had previously pulled out of the pool. 'Here is the fish with a mouth'—he says and runs away to the toilet.

Upon his return, Lionya takes the spade and by holding it 'as a fork', he slides it under the prism and drags it along the wall. Eventually he gets the prism out of the pool. Then he quickly slides the spade under the cone and leans it onto the spade handle. By leaning onto the spade handle, the cone is stabilised on the blade. However, Lionya lifts the spade up by dragging it along the pool's wall which complicates the task (see Fig. 2.19).

However, Lionya's attempt is successful: he carefully moves the spade away from the wall and, by maintaining the cone's leaning position, he gets it out of the pool. He makes several attempts to get the rabbit out, however, it rolls off the blade. The boy directs his efforts to sliding the spade under a little barrel from the pool's opposite

Fig. 2.19 Lionya lifts the spade up by dragging it along the pool's wall which complicates the task

wall. When the spade gets stuck between the pool's wooden boards, he pulls the spade violently in all directions and the handle detaches from the blade. Lionya is unable to release the blade which is stuck between the wooden boards.

Resume: Lionya persistently repeats his unsuccessful ways of operating with the spade. The large roller is standing in the upright position and this is the most beneficial position to slide the spade under it. However, Lionya tries to put it sideways—the position that makes sliding the spade under the roller more complicated. He rolls it up the pool's wall while the spade is tilted away. Such a position is inconvenient and Lionya attempts to combine it with the successful trick he's discovered—leaning the roller onto the handle.

To conclude, Lionya performs rough, but successful attempts to slide the spade under the toys. He masters this movement; however, more primitive unskilled movements are also employed.

In summary, three-year-old children differ from two-year-old children in their ability to get the toys onto the spade by sliding it under the toys. Such an ability largely depends on their initial grip of the handle complemented by other primitive operations performed in critical moments happening mostly at the top of the pool.

However, sliding the spade under the toys is not managed completely by the three-year-old children which is evidenced by the large variations and roughness of the operations performed by the children. The children are able to carefully slide the blade under the toys, however they often only hit them with the spade. The toys move onto the blade by springing upwards (most of the toys are light and round) or as a result of the children hitting the bottom of the pool. In doing so, the children establish a link between the performed operations and their outcomes rather than accounting for the objective relationships between the tool and the target object.

Stabilising the tool on the spade blade, does not arise as an independent and necessary task for the children. If the toy's favourable position accidently occurs (such as rolling onto the handle), it is immediately picked up by the children. The following approach is pursued by the children of this age group—they observe, pick up and repeatedly attempt to use the operations that appear to be successful. However, these operations may be used by children on various occasions even when these operations do not suit the situations that arise. Such an approach shows that the successful operations are not realised and consciously understood by the children.

However, understanding the pursued successful attempts presents itself as a new task that influences children's actions. What is interesting is that children's understanding is visible in the operations they have mastered, for example, in the operation of lifting the spade out of the pool. In the operations that are less mastered, for example, in sliding the spade under the toys or stabilising them on the blade, we do not observe the children's attempts to repeat the successful operation. This might be because the children do not establish the link between the toy's position and their previous operations. The children do not account for the objective relationships between the conditions of the performed operations neither in the ones they master, nor in the ones they perform accidently.

The four-year-old children who participated in our experiment demonstrated better skills in the three target operations. Vladik X., three years and ten months old (No

22) asks me: 'Shall I dig with this spade in this way?' and makes some sliding movements away from him. I suggest: 'Can you try to get the toys out of the pool with this spade?' With careful movements, Vladik slides the spade under the toys at the pool's wall. However, the spade gets stuck in the opening between the bottom and the wooden board and he struggles for a long time to release the spade. I help him to release the spade and he slides it under the barrel. Vladik lifts the spade up at a right angle, however since the barrel is not stabilised, it rolls off the spade halfway through the lift. Vladik attempts to slide the spade under the barrel again. It takes a long time since the spade gets stuck between the bottom and the pool's wall. He manages to get the barrel on the spade in such a way that it leans onto the handle and by maintaining this position, he gets the barrel out of the pool.

Vladik slides the spade under the fish and drags it up the pool wall. The spade gets caught in the opening in the pool's wall; he moves the spade unevenly, and the fish falls off. He slides the spade under the fish again, moves the spade to the middle of the pool and lifts it up properly.

Vladik rolls the mushroom successfully up the wall and, finally, out of the pool. He attempts to reach out to the frog lying in the corner of the pool and he places the spade as a hoe across this area. Sometimes the spade gets stuck in the opening between the wall and the bottom of the pool and he makes some quick movements to release it. I recommend pulling the spade out carefully and finally following my advice, he gets the frog onto the spade. By holding the spade in an upright position and by moving his hands interchangeably up the spade handle very slowly, he rolls the frog up along the wall and out of the pool.

Vladik slides the spade under the large roller very carefully and by monitoring the position of the spade, he slowly lifts it up by moving his hands interchangeably up the spade handle. Then, he carefully slides the spade under a little wide-bottomed toy iron in the pool's corner and moves it to the middle of the pool and lifts it up.

Vladik throws all the toys back into the pool despite me asking him not to do so and starts lifting the toys out of the pool again. The boy is moving fast, and I struggle to write my field notes. This time, he rolls all the toys along the pool's wall—the barrel, roller and fish. When rolling the fish, the spade gets caught between the wooden boards of the wall and it falls off. He says: 'I can't get it' and passes the spade to the children standing nearby. The children are eager to engage with the spade, they struggle to get the spade as well as the toys that have been retrieved from the pool while I am taking notes. I pass the spade back to Vladik.

Vladik carefully slides the spade under the frog and pulls it out by holding the spade at a right angle. He rolls the barrel along the pool's wall, the spade gets stuck in the opening between the boards, he pulls it out and the barrel falls off. Vladik rolls the mushroom up along the wall with care. At the top of the wall, he rolls it onto the spade handle, moves it away from the wall and lifts the mushroom out. He rolls the fish and the large barrel up along the wall. When the spade gets stuck in the opening in the wall, he moves the spade away and lifts the fish up. However, the barrel rolls off the spade and falls back into the pool.

Resume: Vladik has mastered all three operations: lifting up—completely; sliding the spade under the toys is successful on multiple occasions, however, sometimes

he slides the blade with such force that it gets stuck between the wooden boards of the pool. Finally, the operation of stabilising the toys on the blade is visible in his attempts to lean the toys onto the spade handle. However, this operation is only used occasionally.

Tamara K., four years old (No 23) grips the spade 'as a stick' and immediately starts lifting the toys out of the pool saying: 'I am lifting up the swan'. With a fast movement and by leaning the swan onto the spade handle, she lifts it out of the pool.

Tamara attempts to slide the spade under the frog, however she holds the spade tilted and her attempt is unsuccessful. With rough movements, she attempts to get the fish onto the spade, however, it bounces up when hit and finally lands on the blade. Tamara lifts the fish up. By holding the spade 'as a fork', Tamara carefully slides the spade under a small barrel, however, it rolls over the blade several times and Tamara says: 'I don't want to get it out'. Again, holding the spade 'as a stick', she carefully slides the spade under different toys on multiple occasions, however, she holds the spade tilted and the toys roll off. I suggest: 'Can you get the frog for me?' Tamara manages to get the frog onto the spade, however, at the top of the pool wall, her arm moves away, and it falls down. This happens twice (see Fig. 2.20).

Tamara attempts to get the roller out of the pool with rough movements by holding the spade as a tilted hoe (see Fig. 2.21), however, her attempt is unsuccessful. When the spade gets stuck in the opening between the wall and the bottom of the pool, she releases it by pulling it out slowly.

Getting the toys form the corners and the opposite side of the pool is challenging for Tamara as she attempts to reach them with the spade in the most inconvenient way. In addition, Tamara makes only occasional attempts to roll the toys out of the pool's corners (see Fig. 2.22).

At the end of the experiment, her movements become more careful and purposeful. She holds the spade mainly 'as a teaspoon' and rolls the small barrel up along the wall and out of the pool by leaning it onto the spade handle. She also lifts a very

Fig. 2.20 Tamara manages to get the frog onto the spade, however, at the top of the pool wall, her arm moves away, and the frog falls down

Fig. 2.21 Tamara attempts to get the roller out of the pool with rough movements by holding the spade as a tilted hoe, however, her attempt is unsuccessful

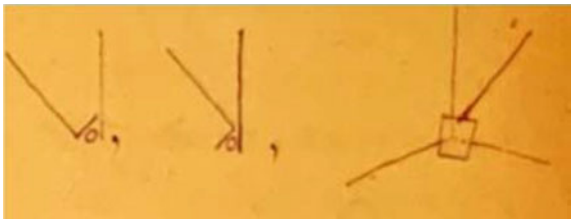

Fig. 2.22 Getting the toys form the corners and the opposite side of the pool is challenging for Tamara as she attempts to reach them with the spade in the most inconvenient way. In addition, Tamara makes only occasional attempts to roll the toys out of the pool's corners

unstable toy jug out of the pool by holding the spade 'as a teaspoon' and rolling the jug up along the pool wall.

Resume: Similar to the experiment with Vladik, Tamara performs the three target operations well. Occasionally she employs some primitive manual operations.

Nina Z. is four years and nine months old (No 42). By holding the spade 'as a fork', she slides it under the frog and the fish and turning her arm with her elbow upwards, she lifts the spade up by holding it vertically. She takes a long time to slide the spade under the large barrel as it keeps rolling over in her attempts to get it onto the blade. Instead, Nina focuses on the middle-sized barrel. After several attempts, she manages to get the barrel onto the spade and lifts it up to the middle of the pool, however, it rolls back and off the spade. Nina slides the spade under the barrel again. This time she directs her efforts to stabilising the barrel by (i) rolling it onto the spade handle and (ii) by slightly tilting the handle. In doing so, she carefully lifts the barrel up and out of the pool.

Nina gets engaged with the big roller for a long period of time by sliding the spade under it and directing her attempts to stabilising the roller. She lifts it up with care since the roller is lying right at the very edge of the blade. With persistent and careful movements over a long time, Nina rolls the mushroom onto the spade handle and pulls it out of the pool. In a similar way, she gets the large barrel on the spade and lifts it up.

Resume: All target operations are visible in Nina's actions. Lifting up the spade is successful even when Nina holds it in the most inconvenient way. However, she does not change her grip. Instead, she bends her body, but maintains a vertical upwards movement of the spade. If she needs to tilt the spade in order to stabilise the toy, she maintains this angle when lifting the spade up and out of the pool.

Nina slides the spade under the toys without effort or any hasty movements. Her spade never gets stuck between the wall and the bottom of the pool. However, the main disadvantage of Nina's sliding operation is that it is disconnected with the follow-up operation of stabilising the toys. This might be because the stabilising operation presents itself as an independent task, which she is able to perform but has not mastered completely.

To summarise, four-year-old children are able to master the target tool-mediated operations needed to solve the task. However, at this age the operations are mastered

by the children differently: lifting up—completely; sliding the spade under the toys varies depending on the context: some children are able to get the toys onto the blade by sliding it under them, some put far too much effort in this movement, and some children hold the spade tilted. Stabilising the toys on the spade is challenging for the children and this operation demonstrates large variations in the children's performance.

As expected, the target operations are well developed with five-year-old children. Vova D. five years and one month old (No 49) is holding the spade 'as a stick'. He slides the spade under the mushroom, rolls it onto the handle and by moving his hands interchangeably up the handle, lifts it up. However, at the very edge of the pool wall, the mushroom accidently falls down.

He slides the spade under the roller. By moving the spade as a hoe, he rolls it onto the handle and lifts it up. During this operation, the roller moves away from the handle twice and both times Vova directs it back onto the handle. At the very edge of the pool wall following a sudden push, the roller falls down.

Vova slides the spade under the barrel, rolls it onto the handle and lifts it up. By holding the spade 'as a fork' and moving his hands up the handle, he lifts the frog and the fish out of the pool. When swapping hands, the spade sometimes tilts, however, Vova monitors the position of the blade to prevent the toys from falling out.

In a similar way, Vova lifts up the middle barrel. During this operation, the barrel rolls away from the handle, however, Vova moves it back onto the handle and successfully lifts it up. He slides the spade under the roller carefully and after several attempts, he rolls it onto the handle. By maintaining the spade in a tilted position, he lifts it up.

Resume: Vova's mastering of the target operations: sliding the spade under the toy, stabilising it and lifting the toy up and out of the pool is particularly visible when the toy rolls away from the handle and Vova persistently rolls it back onto the handle.

In summary, five-year-old children master the sequence of operations required to solve the target task. However, lifting the toys out of the pool is still challenging for them. This task is in their 'challenging zone', although at its lower end. With older children, lifting the toys out of the pool appears to be far too easy and it cannot demonstrate the development of the target operations.

I will now offer some brief notes from the report on the experiment with the eight-year-old boy. He, in fact, disguises the task to get the toys out of the pool and his well-developed tool-mediated operations are particularly visible.

Shura Y. is 8 years and four months old (No 13). By holding the spade 'as a stick' when lifting it up, he first twists his arm with his elbow upwards and outwards. Then he moves his whole body to the right and backwards and leans his left shoulder towards the pool. By performing these movements, he pulls all toys out of the pool fast. The unusual movements of his body contrast with his skilful operations with the spade. By using the spade, he places the large cone and the roller upright first. Then he slides the spade under the toys and lifts them up. He first attempts to bring large and heavy toys in the upright position (by operating with the spade) and then he slides the spade under them and lifts them up. Shura performs all operations (particularly lifting up) so fast that the toys fall off despite his movements being correct.

It is visible that the task does not present any difficulties for Shura. Sometimes he does not succeed, however his skilful movements adequately correspond to the requirements of the tool and the properties of the toys. His operations with the spade (tool) do not depend on his grip and the accidental fall of the toys happens due to his inattentiveness. The task to lift the toys out of the pool with the spade is easy, not motivating for the boy and is obviously below 'his ambitions'. With that, I finish the description of the experiments we conducted and will proceed to the analysis of the empirical data.

Chapter 3
Manual and Tool Mediated Operations

Outline

At the beginning of the chapter, Galperin poses two questions: (i) what are the differences between manual and tool-mediated operations? and (ii) how do tool-mediated operations develop with children?

He starts by considering tool-mediated operations that comprise a system of arm movements with a tool aimed at achieving a desired purpose. Galperin specifies that it is not the arm's movement itself, but the movement with the tool that constitutes a tool-mediated operation. For example, in the experiment described in Chap. 2, a spade was used in a tool-mediated operation to lift the toys out of the pool. How the children slid the spade under the toy and the toy's leaning position on the spade handle were crucial for the success of the activity. On the other hand, the lifting operation and the children's grip on the spade handle were insignificant. Based on such considerations, Galperin concludes that a tool-mediated operation is a system of movements with a tool, transferring target objects from initial to a desired position. Tool-mediated operations are determined by the target task: to perform an activity. Although some hand movements might be useful, it is the child's ability to identify the productive tool movements that is crucial for a successful operation.

Manual operations are defined as a system of hand movements aimed at performing the desired operation with the target object. When a hand acts as a tool, manual operations can be considered as individual cases of tool-mediated operations. *Manual and tool-mediated operations, however, differ in the system of movements that comprise these operations*. For example, Galperin uses empirical data to offer descriptions of how the tool (spade) was used by different aged children. He highlights that in manual operations, tools become an extension of the acting subjects' arms. Tools do not affect the interactions of subjects with the surrounding reality. In tool-mediated operations, tools are included in a particular system of social relationships and the subjects' interaction with the object is mediated by the tool. In doing

P. Y. Galperin et al., *Psychological Significance and Difference Between Tools Use by Humans and Animals*, Cultural Psychology of Education 16,
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so, the subjects discover new ways of interacting with the surrounding reality which exceeds natural opportunities.

Galperin concludes that by comparing tool-mediated and manual operations, a tool's characteristic features can be identified. These characteristic features, however, are not sufficient to create a clear distinction between a tool and a mean. Only the structure of the tool-mediated activities, the structure of the operations with the tool, can reveal the systemic characteristic features of the tool and uncover the true nature and difference between tools and means.

Galperin suggests that earlier experiments of Köhler and Thorndike offered significant difficulties for researchers and theorists, such as Plekhanov, Vygotsky and Vagner, to identify differences between human and animal tools since the empirical data collected were unsuitable. The differences between tools and means become visible when (i) the experiment involves participants' operations with the tool that has its own logic of use and (ii) the employed tool can also be used in manual operations. Galperin argues that in Köhler's experiments, the apes were using tools in manual operations which did not correspond to the publicly accepted operations incapsulated in these tools. In doing so, the apes demonstrated their instinctive consciousness. Galperin suggests that *animals' auxiliary means simply extend their natural organs and, therefore, they do not play an essential role in the development of their consciousness*. These means do not add any new functional opportunities and animals perform their functions with the means considerably worse. Therefore, animals' auxiliary means should not be considered as simple tools, but as their biological opportunities; not as a seed that will evolve into a tool, but as a necessary precondition for the development of tools.

By employing natural opportunities, the process of social production emerges. A tool first appears, however, during such a process and more precisely in social and not individual production. *An animal's mean is separated from a human tool by a period of human historical development*. Human social production accidentally discovered auxiliary means that were gradually transformed into tools. During this process, the employed natural means acquired their social logic of labour and from this very moment the true tools emerged. Therefore, from the very beginning*, a tool carries the burden of its social nature that presents itself for humans as an objective reality, similar to other material things.*

Galperin concludes that material or psychological links do not exist between animals' auxiliary means and human tools. Animals' means and human tools are separated by the existence of human society, developed on the grounds of collective labour. Tools and means do not represent different phases in the development of the same objects; rather, they are objects that belong to two different and independent lines of development. Animals' auxiliary means present only opportunities and do not reveal their essence as tools even in their simplified forms. They are considered as natural preconditions for the emergence of human tools; however, their appearance belongs to another historical reality.

Manual and Tool Mediated Operations

Two main questions arise from the empirical material described in Chap. 2. First, what are the differences between manual and tool-mediated operations? Second, how do tool-mediated operations develop with children?

First, I would like to explain our understanding of tool-mediated operations. These are operations that comprise a system of movements with tools aimed at achieving a desired purpose. Of course, these tools are moved by a person's arm, however, it's not the arm's movement itself, but the movement with the tool that constitutes a tool-mediated operation. In the experiment described in Chap. 2, such a tool-mediated operation was using a spade to lift toys out of a pool. The successful lifting of the toys did not depend significantly on whether the children were holding the spade handle in the upright position or slightly tilted. What was crucial for the successful outcome of the lifting operation was how the children slid the spade under the toys at the pool's bottom. The interchangeable movement of children's hands up the spade handle or the amount of effort put into these movements were not significant. When lifting, it was essential that the target toy was leaning onto the spade handle, however, the children's movements directed to achieve such a leaning position varied and were not essential. To summarise, a tool-mediated operation[1] is a system of movements with a tool, transferring target objects from initial to desired position.

A tool operation can be perceived as an objective category in relation to the acting subject, which has to be mastered over time. Naturally, the movements of the acting subject when mastering the target operation undergo transformations. The same tool operation can be performed by different or with both hands, and these movements can vary considerably during the lifting operation. However, the combination of these operations is determined by the target task (motive)[2]: to perform the tool-mediated activity. During such an activity, some hand movements are more useful than others. For example, the child's grip 'as a wand' or 'as a teaspoon' is more useful than the grip 'as a stick'. Moving the spade as a hoe is beneficial as it may entail that less effort is needed to complete other operations. However, it is not the child's hand movements (for example, by gripping the spade handle or moving the spade as a hoe), but the ability to identify the productive tool movements that is crucial for the successful operation. Until the productive movements with the tool have been identified by the acting subject, his or her hands' movements seem to be essential for the successful operation.

The grip and the hand movements with the tool do not constitute manual operations. Similar to tool-mediated operations and, in contrast to them, manual operations are the system of hand movements as an independent tool aimed at performing the desired operation with the target object. Manual operations can be considered as individual cases of tool-mediated operations, when a hand acts as a tool. Naturally, the operations performed by the hand acting as a tool and tool-mediated operations differ in the system of movements that comprise these operations.

[1] Underlined in the original.

[2] Inserted by the editors.

These differences are visible in the empirical data presented in Chap. 2. The children are tasked with lifting the toys out of the pool using a spade. The essential parts of this task are (i) to slide the blade under the toy and (ii) lift the toy by resting it on the spade blade. Manual operations are clearly visible in younger children and tool-mediated operations are observed in older children. Vladik, a two-year old boy, lifts the spade as high as he can by stretching out his body. While holding the spade, he bends down into the pool, bends his elbow as if the spade blade with the toy on it was his hand holding the toy. The child is acting as if he was using his hand and the spade follows the movements of his body and his limb. These movements contradict the operations incapsulated in the spade. In doing so, the spade gets included in the system of manual operations and becomes a simple extension of Vladik's arm.

Shura is an eight-year-old boy. His hand and whole body are included in the system of tool-mediated operations with the spade. In fact, the boy is making every attempt to maintain the system of tool-mediated operations. Shura grips the spade in an uncomfortable way—'as a stick' and he performs truly acrobatic movements with his whole body to ensure an adequate tool (spade) use. He turns his body to the right and twists his right hand with his elbow upwards, he literary swings around the spade which acts as an axis to his overcomplicated movements.

Even the most detailed description cannot convey such visible differences between the tool use of different aged children. The same tool (spade) is included in different systems of operations and in doing so, it changes its properties, significance and the nature of the situation as a whole. In manual operations, the tool is associated with the acting subject and it becomes an extension of his or her arm. However, in doing so, the tool connected with the arm opposes the acting subject. The tool as a link between the acting subject and the object does not really affect this interaction. However, in another case (with Shura), tool as an intermediate object, becomes included in a particular system of social relationships with the acting subject. The person's interaction with the object is mediated by the employed tool and the person discovers 'new extraordinary opportunities that exceed humans' natural limitations described in the bible' (Marx).

The operation of sliding the spade under the toys makes it visible that the same object may either acquire or lose the characteristics of a tool.[3] At first this is visible in children's unskilled attempts to press the toy with the blade or handle to the pool's wall and in doing so, to lift the toy up. The children act as if their arms were free from their hands and fingers and they were perceived as a stick that could be bent in the middle. An ability to engage in tool-mediated operations is visible in older children. Such an ability first appears in its 'pure state' free from any understanding of the technical affordances of the tool (spade). It is visible in children's unskilled attempts to slide the spade under the toys, by either hitting the toys with the spade or by performing a so-called 'intentional sliding' by moving the spade above the toys. Such an operation looks like an imitation of the adults' sliding operation rather than

[3] When it comes to stabilising the toy, this operation cannot achieve its manual equivalent when using the spade (a spade cannot clench a toy similar to a hand). Such an aspect affects negatively children's operations with the spade which we described in detail above.

children's conscious tool-mediated operation. However, examining the children's naive operations with tools, makes it visible that children do not demonstrate their understanding of the relationship between the target purpose and the tool used to achieve it (such an understanding happens in older children). The tool's potential is revealed through children's growing understanding of the publicly accepted practices incapsulated in the tool that are visible in adult operations with this tool.

To conclude, by comparing tool-mediated and manual operations, we can identify a tool's characteristic features that make it different from a mean. However, the presence of an intermediate object and the operations with this object (revealing its morphological and functional characteristics) are not sufficient to create a clear distinction between a tool and a mean. Even creating a tool, which without doubt happens with animals, cannot create such a distinction. Only the structure of the tool-mediated activity, the structure of the operations with the tool can reveal the systemic characteristic features of the tool. Only tool-mediated activities can really uncover the true nature and the difference between tools and means.

Why hasn't research addressed the difference between tools and means previously? The reason is that such a task might have not been posed previously. Understanding a tool as an intermediate auxiliary object is not sufficient. Some researchers, including Köhler, attempted to demonstrate that animals utilise simple tools, however, they could not recognise the tools' characteristic features. Others, for example Thorndike, postulated that animals did not utilise any tools. In his experiments he selected the tasks and the tools used to solve them excluded any manual operations. The results of these experiments offered significant difficulties for researchers and theorists, such as Plekhanov, Vygotsky and Vagner to identify the differences between human and animal tools. The empirical data collected in the experiments of Köhler and Thorndike could not be used to reveal such differences. This is because the differences between tools and means only become visible if (i) the experiment involves participants' operations with the tool that has its own logic of use and (ii) the employed tool can also be used in manual operations. These two simple aspects were not accounted for in Köhler and Thorndike's experiments. On the one hand in Köhler's experiments, a stick and a rope utilised by chimpanzees were undoubtedly useful to solve the target tasks, however, they could not reveal the characteristic features of manual or tool-mediated operations. Both the stick and the rope could be used in different operations and they did not encapsulate the whole system of operations that had to be managed. On the other hand, when the chimpanzee used a blanket or a shoe (instead of a stick) to reach out to an object, such use was different from the true purpose of these objects. The chimpanzee's operations with these means appeared to be outside of the context of the activities encapsulated in these means and the shoe and the blanket were, in fact, 'neutral' or multifunctional objects.

However, if the nature of different operations is not completely clear for the researcher, this does not imply that the operations performed in the experiments are neutral too. Once the difference between manual and tool-mediated operations has

been identified and described in detail, it becomes obvious that in Köhler's experiments the chimpanzees engaged in typical manual operations[4] with the sticks. Such an engagement was also visible in the chimpanzee's use of a blanket, hat brim, straw and shoes which were tools 'unsuitable for the purpose'. The chimpanzees' employment of these objects certainly demonstrates their mental abilities and consciousness. However, this is the consciousness of manual operations and it does not correspond to the publicly accepted operations encapsulated in these objects. The chimpanzees demonstrated their instinctive consciousness, and I agree with other researchers, that it is limited by seeing the opportunities as a simple extension of an arm. This, of course, should be not be understood as a chimpanzee intended to extend its arm when choosing a long stick. Most probably, it was looking for something long that will allow it to reach out to the target object. However, it is essential that the stick used by the chimpanzee was not only visible but was also an extension of its paw.

Plekhanov agrees with Darwin that the branch (stick) used by the elephant to protect him from flies, can be considered a simple tool (On the Development of Monistic Insight on History, 1906, p. 108). However, even without a detailed description of the operation performed by the elephant, the branch is used as a simple extension of the elephant's trunk. The elephant uses the branch similarly to how he uses his trunk in more accessible parts of his body.

Animals' auxiliary means simply extend their natural organs and, therefore, they do not play an essential role in the development of their consciousness. These means do not add any new functions and the animals perform their functions with the means considerably worse. Even the most multifunctional mean cannot be compared with the multifunctionality of a hand. For example, can a stick be compared with the multifunctionality of a monkey's paw or with an elephant's trunk? However, an arm holding the stick is limited by the opportunities incapsulated in the stick: the arm is getting longer, but it is losing the advantages offered by a hand with fingers. Although it is beneficial to have a longer arm, it loses its other advantageous aspects (i.e. a hand with fingers). Therefore, animals use auxiliary means only in limited cases and, as indicated by Köhler, animals employ auxiliary means only in 'unimportant cases' when there is no need to mobilise all their efforts.

Clearly, we have to consider animals' auxiliary means not as simple tools, but as their biological opportunities; not as a seed that will evolve into a tool, but as a necessary precondition for the development of tools. For example, human larynx can be considered a necessary precondition for human loud speech, however it is not the cause of it. Similarly, the shape of physical bodies of our ancestors—apes was the precondition for the development of 'sine qua non'[5] human development. However, human social culture has been developed out of quite different premises. Engels ingeniously demonstrated that tools appeared in the process of social labour and they developed during this process. By employing natural opportunities, the process of social production achieves a certain level in its development. However, a tool first appears during such a process and more precisely in social and not individual

[4] Manual—by considering the monkey's paw as an arm used as a natural tool.

[5] An essential condition: a thing that is absolutely necessary.

production. An animal's mean is separated from a human tool by a period of human historical development. 'When human labour was not liberated from its instinctive forms' (Marx), the first signs of primitive social production could be identified. Human social production accidentally discovered auxiliary means that were transformed into tools. During this process, the employed natural means acquired their social logic of labour and from this very moment the true tools emerged. Therefore, from the very beginning, a tool carries the burden of its social nature that presents itself for humans as an objective reality, similar to other material things. Of course, the psychological grounds of human tools are completely different from those of animals' auxiliary means.

To conclude, there exist neither material or psychological links between animals' auxiliary means and human tools. Animals' means and human tools are separated by the existence of human society, developed on the grounds of collective labour. Tools and means are similar, but not homologous. They do not represent different phases in the development of the same objects; rather, they are objects that possess some similarities, but belong to two different and independent lines of development. Animals' auxiliary means present only opportunities and do not reveal their essence as tools even in simplified forms. These means can be considered as natural preconditions for the emergence of human tools and their appearance belongs to another historical reality.

Chapter 4
Tool Mediated Operations and the Development of Human Consciousness

Outline

Galperin starts this chapter by considering the operations used by the children in his empirical material. He focuses on examining the psychological significance of the types of operations used and difference between tools and means. The empirical data demonstrates that there is a relationship between the children's age and the types of operations used: older children perform more tool-mediated operations than younger ones. This correlation gives rise to two hypotheses. First, older children are more acquainted with the tool properties and they consciously realise the opportunities for interaction with the tool (spade). The shift in the performed operations and the transfer from the mean to the tool, therefore, is caused by the development of children's consciousness. Second, the development of children's consciousness is not of primary importance and the changes in their operations happen due to acquiring skills through interacting with objects. Therefore, the properties of tools and objects become signals for children's purposeful operations. These changes in operations are caused by the accumulation of experience and the development of more sophisticated connections between elements within the environment and children's reactions.

Despite being different, these hypotheses are similar if it is considered that (i) in the development of children's consciousness the accumulation of experience is of primary significance for developing tool-mediated operations and (ii) the differences between psychological tools and auxiliary means are of less importance. Galperin argues that both perspectives contradict considerations of the importance of children's engagement in tool-mediated operations for developing consciousness. He emphasises that children's engagement in tool-mediated operations should not be considered as a phase following manual operations. Social collective production cannot be considered as an advanced type of animals' activity with or without means.

Galperin emphasises that the characteristics of tool-mediated operations, can be identified by asking the following questions: (i) how are manual and tool-mediated operations connected in child development and (ii) how does a child master various

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tools? He believes that tool mastering and the transfer from manual to tool-mediated operations in children happens gradually, involving transformations, establishing relationships and connections. Galperin examines the empirical data presented in Chap. 2 to identify how the transfer from manual to tool-mediated operations happens in children.

The empirical data demonstrates that children of different age groups engage in *four phases* when mastering the tool (spade).

In the first phase (the phase of trial and error) the children pursue an approach of 'trial and error' by persistently repeating high tempo movements which are mostly unsuccessful. The children experience difficulty using the tool and attempt to adjust their actions to the affordances of the tool. Successful attempts are not recognised quickly and once noticed, they are used occasionally with unsuccessful ones. The children's actions are mostly manual operations which occur as a natural response to changes in the situations and their actions are not consciously realised. Over time, children use successful operations more often, and general improvement in actions is achieved.

In the second phase (the phase of monitoring the flow of activity), the children perform the same operations for considerably longer, through engaging in multiple attempts, and eventually identifying a favourable position for the tool (spade) and the object of their interaction (the toys). Their actions are directed at repeating this favourable position, through slow and careful movements, and are aimed at maintaining the benefits of a successful, albeit accidental opportunity. It appears that the children are waiting for such favourable situations, however, they do not possess skills to create these situations. When the children notice favourable positions which have occurred accidently, they analyse factors that constitute these situations, and this separates the whole activity to 'before' (accidental and unconscious) and 'after' (deliberate and conscious).

The children's actions in the *third phase (the phase of persistent interference)* can be defined as 'good mistakes' and are directed at creating favourable situations by using previously successful operations. Here, the children are not acting blindly (first phase); or waiting for a favourable situation to present itself (second phase) but are deliberately attempting to create favourable situations. Their attempts, however, may not always correspond to the circumstances of a new situation. Although the operations used in the previous phases prevail, the child's consciousness determines the flow of the activity. These are experiences developed in previous phases transformed into ideas initiating further actions, which are different from ones used previously. Previous unsuccessful experiences are particularly visible in children's persistent attempts to achieve the desired purpose, despite the unsuitability of the employed operations. The flow of the activity is accompanied, however, by the children's thinking and conscious evaluations.

The fourth phase (phase of objective regulation) is characterised by children mastering the performed operations. The flow of the activity is controlled by the child which is demonstrated in immediate corrections of occasional deviations from the intended flow. Such an approach highlights that the child's consciousness regulates the activity by considering the properties of the target objects. In doing so, the

child considers the tool's properties that are appropriate for the task's conditions. In summary, this phase is characterised by the child (i) recognising the objective relationships between the features of the surrounding environment and (ii) mastering a skill when performing movements with the tool.

Galperin suggests that although the fourth phase is the last phase visible in the empirical data it is not the last one in the development of human intellectual activity. The children's understanding of the relationships between the object and the tool do not reflect their understanding of the tool's structure. For example, children tasked with creating a tool similar to the spade used in the experiments, spent considerable time studying the tool's dynamic properties. In addition, only children above five years old were able to construct a tool, this task was too difficult for younger children. This experiment highlighted that mastering the tool and understanding its mechanical properties is different for children in various age groups. In addition, mastering the operations in the fourth phase does not reflect children's understanding of the relationships between the object and the tool as they would have been considered by an engineer. However, these relationships are realised by the child as the tools' affordances and limitations when applied in the practical activities. The child's consciousness determines behaviour and reflects the affordances and limitations of the performed operations. Engagement with properties of objects creates links between these operations and the development of the child's consciousness. To summarise, the four phases of the development of actions differ by the role of the child's consciousness.

The 'trial and error' approach used in the *first phase* demonstrates the challenge of acting with a tool for younger children. Even in this first phase, however, a tool-mediated task is already presented for the child and the suggested tool is included in the activity as a compulsory and essential link. However, the child is unable to use the spade and, instead, largely employs manual skills. In the *second phase*, the child identifies (i) favourable positions for the toys in relation to the spade and the (ii) operations needed to lift them out of the pool. These operations divide the whole process into several distinctive tasks, however, the links between them are still missing. The *third phase* is characterised by the presence of links between the tasks; however, these links are limited and not flexible. The natural position of the object (toy) determines how the child interacts with it. Mastering a particular operation determines the position the child attempts to place the object when lifting it out of the pool. In the *fourth phase*, the link between the operation and the object's position becomes flexible and the child's choice of operation is determined by the situation. The four phases identified in the empirical data build upon each other: the child by accumulating experience acquired in the first phase through trial and error, starts to manage his/her practical activity. From this perspective, the child's mental activities are nothing but external activities that first occur by chance during changes in situations. Over time, the child begins to perform these activities intentionally and such behaviour makes visible how the child's consciousness develops out of the accumulated experience. *The child's consciousness is visible in the ability to select useful operations and adjust them to the conditions of the surrounding reality.*

Such an understanding reveals that there is a delay between the development of a child's consciousness and the ability to engage in practical activity. To explain the link between the child's engagement in the practical activity and the development of consciousness the following aspects should be considered.

First, the similarities between intellectual and practical activities demonstrate that they are inherently connected. They also, however, highlight that there is a delay in the development of the child's consciousness and the ability to engage in practical activity. Children's intellectual activities originate accidentally within activities and are identified and used deliberately in later phases. Gradually, relationships between the activity and child undergo transformations to become psychological activity.

Second, the relationships between the operations and objects also transform. Initially, these operations are used accidentally, however, they become determined by the task requirements and the child's thinking about interacting with the target object. In doing so, the child identifies the relationship between the object and the operations used which initiate changes in the object. The operations used in early practical activities become mental operations that determine the content of future practical activities. Therefore, psychologically, the child's thinking moves ahead of the practical activity.

Third, the transformation of practical to thinking activity reflects the growth of the child's conscious understanding of the activity. Activities which have been consciously realised by the child are applied on multiple occasions which signifies the transfer from practical to thinking activity and therefore, movement to the next phase of mastering the tool. By engaging in practical activities with objects through successful and unsuccessful attempts, the child starts to recognise object-tool relationships and, in doing so, transfers to the next phase. In summary, the process of the child's development occurs as if continuously looking back while moving forward, with each phase that follows building upon the previous one.

Galperin identifies the following transformational patterns between the practical activities and the development of the child's consciousness.

First, the four phases identified in the empirical data, may overlap (in particular phases' two and three), however, the subsequent phases do not replace previous ones. These phases reflect the child's gradual understanding of the relationships between the tools and objects. They signify changes in employed operations and not a transformation from one type of operation to another.

Second, the operations used by children in various age groups differ through the role of consciousness. Successful operations occur in younger children accidently and the target task is solved by trial and error, which suggests that consciousness depends on age. Empirical data, however, shows inconsistency in the development of a child's consciousness with different levels demonstrated in various tasks. Galperin concludes that consciousness as an individual capacity does not exist; only individual intellectual operations can be developed and applied. Inconsistency in the development of human consciousness signifies that it can be considered as a type of human psychological activity. Consciousness develops when a child engages in practical activity with material objects. In early phases, the child's consciousness consists of individual operations which are a reflection of situations in which they

are applied. Generalising individual situations and the ability to apply similar operations in various situations demonstrates a thorough understanding of the object and operations. In the absence of the ability to generalise situations of engagement with objects, the child's consciousness consists of various groups of operations which differ in their structure, links, and connections. Such an understanding reflects the inconsistency in the development of the child's consciousness.

Finally, Galperin summarises the analysis of the empirical data by outlining the following aspects:

1. Inconsistency in the development of the child's practical activities causes inconsistency in the development of consciousness.
2. In diverse operations children of various age groups demonstrate different thinking and level of consciousness.
3. In the early phases of mastering the tool, the child's thinking and consciousness are delayed from the practical activity. Thinking, as a theoretical engagement reflects the child's previous engagement in practical activities.

By considering these aspects Galperin suggests that the role of skills and consciousness can be identified in the process of transformation from manual to tool-mediated operations. Contrary to the hypothesis that skills are crucial in the transformation from mean to tool, children do not use trial and error to solve tasks—the way how skills usually develop. Instead, when engaged in practical activities, children's thinking is particularly visible. It is only in the first phase that children master the tool by developing skills through trial and error. In the second phase the method of trial and error is accompanied by the child's thinking which acquires the leading position in the third phase. Although skills are important, their role and significance changes in different activities. In the trial-and-error phase, skill development comprises identifying movements that are beneficial to the present situation. In the following phase of objective regulation, skills are integrated into the activity to ensure its smooth flow. If, however, the suggested task requires mastering an important skill; its importance is not equal in all phases of the performed activity.

In a similar vein, Galperin argues against the primary role of consciousness in children of different age groups. In the initial phase of trial and error, thinking as a type of activity exists in its embryonic form. Even in the second phase—'alertness', practical activity plays the primary role and thinking is of secondary importance. In the third phase of 'persistent interference', thinking begins to dominate the external flow of the activity and it is in the final phase, that thinking completely manages the performed activity.

The experiments of creating a tool (spade) highlight that the development of children's consciousness is delayed in comparison with their practical activity, including its individual operations. *Children's consciousness develops during their practical activity by mastering various operations and gradually realising their content, opportunities and limitations.*

The main disadvantage of the decisive role of skill development and primary role of consciousness development concepts is that they are grounded in abstract relationships between the development of activities in children and their age. In addition,

neither of these concepts consider the complexity and variety of these relationships. These concepts may offer explanations of the differences in the children activities by different levels of skill development and consciousness. Such generalising is not only empirically insolvent, but it does not correspond to the real structure of children's activities. In conclusion, both concepts offer limited opportunities for practical application and are theoretically inconsistent.

Tool Mediated Operations and the Development of Human Consciousness

The second question that emerges from our empirical data considers the sequence and reason for the operations used by the children. This question is closely connected to the psychological significance of (i) the types of used operations and (ii) differences between tools and means. Our empirical data show that there is an interdependency between the level of children's maturation and the types of used operations. Older children perform more tool-mediated operations, than younger children. Such a direct correlation gives rise to the two hypotheses about the reasons of using different operations by children of various age groups.

One hypothesis (Büller, Ensh) claims that when children become older, they become more acquainted with tool properties and therefore, the opportunities of interactions with these tools are realised by children. When children begin to realise the objective relationships between tools and objects that can be manipulated with tools, their practical activities advance. The shift in the child's operations and, correspondingly the transfer from the mean to the tool is caused by the development of the child's consciousness. *Another hypothesis* (belonging to the behaviourists) does not account for the development of the child's consciousness, but it explains these changes as the child's growing acquisition of various skills that involve interactions with objects. Different characteristic features of the spade and the toys become signals for the child's purposeful operations. Therefore, the qualitative change of the operations is caused by the accumulation of experience and the development of more sophisticated connections between the elements of the environment and the child's reactions.

These two hypotheses are totally different; however, they are similar in considering that (i) the accumulation of experience in the development of children's consciousness is of primary significance to the development of tool-mediated operations and (ii) the differences between psychological tools and auxiliary means are of less importance. According to these two hypotheses, when children develop skills, their manual operations become more advanced and they gradually transfer to tool-mediated operations. However, such a perspective totally contradicts our considerations and we insist that children's *engagement in tool-mediated operations is of primary significance for the development of children's consciousness.* We have already mentioned that children engage in tool-mediated operations during social collective activities.

Such an engagement cannot be considered as a phase following children's manual operations. In a similar vein, we cannot consider social collective production as an advanced type of animals' activities with or without means.

Identifying the characteristic features of tool-mediated operations is helpful to develop our understanding of tools and auxiliary means. However, the following questions arise: (i) how are manual and tool-mediated operations connected in the child's development[1] and (ii) how does a child master various tools? Without doubt tool mastering and the child's transfer from manual to tool-mediated operations happens gradually and such a process involves transformations, establishing relationships and connections. These transformations may be explained by both the development of the child's consciousness and their reflections on the previous experience. However, this study would be incomplete if it did not examine the significance of the child's engagement in the tool-mediated operations for mastering these tools. To do so, we need to examine the empirical data described in Chap. 2 to identify (i) how the transfer from manual to tool-mediated operations happens in children and (ii) whether our empirical material is suitable for such investigation.

Careful investigation of the process of mastering the tool (spade) by children of different age groups makes it visible that the children engaged in four phases. The children transferred through these phases when solving the suggested tasks (sliding the spade under the toy, stabilising it and lifting the toy up).[2]

In the first phase, the children pursue an approach of 'trial and error'. The children persistently repeat similar (sometimes with small variations) high tempo movements with the spade and most of them are unsuccessful. The children often shift their grip on the spade handle. It seems that the children experience inconvenience when using the tool and they attempt to adjust their actions to the affordances of the tool. It also seems that by increasing the movement of their hands they attempt to compensate for the immobility of the spade in the operations with the toys. They do not realise quickly the successful attempts and once they are noticed, these attempts are occasionally used together with the unsuccessful ones. With time, the children's successful operations are used more often, and gradual improvements of the children's actions can be represented by a typical zigzag flat and moving downwards curve.

For example, in our youngest children, the operation of lifting up the toy is developed by moving their hands up the spade handle. Before Zina D. masters this operation, she acts in the following way: with her right hand she grips the handle of the

[1] Emphasis in original.

[2] In relation to these phases in the development of the children's practical intellectual activity and I would like to point out the two main aspects that reflect the interconnections between these phases. In this study, these phases are presented as generalising of the empirical data—the process of tools' mastering with children of different age groups. These phases have not been proved in any other investigations and this is beyond the scope of the present study. Therefore, the considerations presented in Chapter 4 draw on the empirical material which illustrates the offered deliberations. This implies that the critical reflections on the development of children's consciousness are based only the collected empirical data and they may be related to understanding how to master operations with tools. Therefore, the offered critical reflections, have to be supplemented by the analysis of the epistemological and ontological grounds of the offered theory. These reflections are presented in Chap. 5 in this study.

spade 'as a stick' and when lifting up the spade, she bends her arm at the elbow. Then, she grips the spade with her left hand and by moving it horizontally, she brings it closer to her, however, the toys fall off the spade. Such an attempt is repeated and finally, she throws away the spade and climbs into the pool. When she returns to the tool (spade), first her movements are similar to her previous attempts. However, Zina accidently grips the spade 'as a wand', moving her right hand straight upwards and the spade covers quite a long vertical distance upwards. As previously, Zina grips the spade handle with her left hand, however, by gripping the spade 'as a wand'. With small movements, she lifts the spade up vertically and eventually out of the pool. Zina takes the toys off the spade with her left hand. In such a way, by accidently gripping the spade 'as a wand' and performing further movements, the successful operation develops. However, when such an operation occurs, it may be replaced by another less successful operation. In addition, the operation is performed with such rough movements that its objective benefits are not realised by the child. In contrast, the child is realising only the operation's convenience (for example, the convenience of the applied grip). This is visible in the movements of another child in the same age group -Marusya B. who in detail repeats the process described above. Due to her lively nature, Marusya is only able to lift the spade as a 'wiggling' lift.

By terming such child's actions as 'trial and error', I would like to offer some reflections on this matter. The child's actions are directed to achieve the desired outcome by persistently attempting to lift some toys out of the pool and moving away other toys. The child changes the grip on the spade handle in an attempt to adjust movements to the requirements of the task. Of course, the child's activity cannot be described as unsuccessful, however, the child is unaware of the properties of the tool and acts 'blindly'. Such behaviour is visible in children of other age groups too. A positive aspect is that the children's actions mostly consist of manual operations which happen as their natural response to the changes in the situations: such as the relations between (i) a hand and a spade, (ii) a spade (as an extension of the hand) and a toy, etc. In summary, the absence of thinking prior to the external activity and the direct interactions with the objects (toys which are presented to the children through their observable properties) characterises the *first phase* of children's mastering new tool-mediated operations.

In the *second phase*, by engaging in multiple attempts, the children perform the same operations for a considerably long time, and therefore, engage in the tool-mediated activity. The children identify a favourable position of the spade or toy which occur accidently, and they further direct their efforts towards using this position. Identifying such a favourable position divides the whole process into two parts: 'before' and 'after' which offer significant differences. In the 'before' part, the children movements are unskilled, fast and involve different ways of acting with the tool. However, once the favourable position of the tool is achieved, the movements of the child become extremely careful and slow. The children consequently use only a few ways of acting with the tool. In summary, children direct their attention at maintaining and using the benefits of a successful, albeit accidental opportunity.

An episode with Tanya T. (the second group of three-year-old children) may serve as an example of such a situation. Tanya is unsuccessfully attempting to reach the red

celluloid fish. She hits the fish with the spade, it bounces back and springs over the blade on several occasions. However, accidently, the fish lands on the spade blade. Tanya stops all her rough movements and by monitoring the position of the fish, very carefully pulls the spade out of the pool.

Of course, the children do not notice all the favourable positions that accidentally occur. However, they notice the advantageous situations, the benefits of which are already familiar to the children from their previous experience. It seems that the children are waiting for the special situations, although they do not possess the required skills to create such situations. The children's skills are simplistic, and their activity is divided into phases which correspond to the gradual development of understanding of tool-mediated operations. In creating such an understanding, the development of the child's consciousness is visible. On the one hand, the child's consciousness is separated from the performed activity and, on the other hand, it is included in the performed activity and considerably influences its flow. Such interference of the child's consciousness is insignificant: the children cannot create favourable situations, rather they carefully observe the flow of the action to identify the accidently occurring favourable situations.

In this phase, the children's development has a double nature. On the one hand, the simplistic 'natural' activity prevails which is reflected in their multiple attempts to perform the action. However, in such circumstances the pursued attempts do not determine the flow and the outcome of the activity. On the contrary, such naturalistic behaviour only supplies favourable situations which are consciously analysed by children and when recognised, they become turning points in the flow of the performed activity. It may seem that the child's consciousness does not play an important part in the flow of the performed multiple unsuccessful attempts. However, when children recognise the favourable situations, the flow of the activity changes and they direct efforts at taking advantage of these positions. Based on these considerations, the *first phase* in the development of an activity can be termed as *the phase of trial and error* and the *second phase* (in which the child's consciousness plays a significant role) can be termed as *the phase of monitoring of the flow of the activity.*

In the third phase, children's interactions with the object is characterised by their active attempts to create favourable situations by using previously successful operations. The children are not acting blindly as in the first phase; they are not waiting until the favourable situation presents itself, as it happens in the second phase, but the children attempt to deliberately create a favourable situation. However, their attempts do not always correspond to the circumstances of the present situation. The children attempt to reconstruct the operations that were used previously, which are not always the best operations in a new situation and in many cases are useless.

The third phase is characterised by the actions that can be described as 'good mistakes', which exemplifies how children do not account for the situation's environmental conditions. Slava D. (a three year old boy) by the end of the experiment is lifting the toys in the following way: once he has succeeded by rolling the cone up the pool wall, he starts using this approach with other toys: (i) to get the pyramid which can be easily stabilised on the spade blade, however, when pulled up the along wall, it catches the wooden boards and (ii) the celluloid swan which slides back and

forth on the spade blade when lifted up. Similar operations are particularly visible in the actions of Lionya D. from the same age group. For example, a large roller is stabilised on its round base and this is the best position to slide the spade under it. However, Lionya turns the roller sideways, rolls it onto the spade blade until it rolls over. Several times the roller appears in the upright position by standing on its base, however Lionya persistently turns it sideways and after considerable efforts, he manages to lift the roller by leaning it onto the spade handle. Lionya attempts to roll all toys up the pool wall even those that do not need such an operation, such as a fish, a swan, a small cube—which sit well on the spade blade. He even unsuccessfully rolls up toys along the wall that are totally unsuitable for this operation: a large cube and a prism catch the wooden boards with their corners. Finally, Lionya starts dragging the front part of the spade blade up along the wall while the spade is leaning towards the middle of the pool. The large red cone is resting on the blade, leaning onto the spade handle and such an operation reflects the boy's thinking.

Although the operations used in the previous phases still prevail, in this phase, the child's consciousness determines the flow of the external activity. However, the experience developed in previous phases transformed into ideas, initiates the child's further actions which are different from ones used previously. At the same time, the child's previous experience of imperfect operations imposes certain limitations on the performed activity. This is particularly visible in the children's persistent attempts to achieve the desired purpose, despite the obvious unsuitability of the employed operations. Even when one operation does not work, the children may focus on another, which similar to the previous one, may have very limited application. The external flow of the action is accompanied by the children's thinking and such a characteristic feature may be used to define this phase: *the phase of persistent interference.*

The fourth phase differs from the previous phases by the child's mastering of the performed operations. The flow of the activity and, in particular, the child's swift corrections of occasional deviations from the intended flow evidence that children's consciousness regulates the activity by considering the properties of the object they interact with. The child does not lift the spade until the rolling toy has been stabilised on the blade by leaning it onto the handle. When lifting up the spade, the child maintains a slight tilt that ensures the toy's leaning position. The child does not attempt to get the toy from the pool's opposite wall, by using the spade as a hoe. When the toys roll to the corner, the child slides the spade under the toy by positioning the blade parallel to the bottom of the pool (see Fig. 4.1).

In doing so, the child accounts for the main rule: the tool's properties have to be appropriate for the task's conditions. The connection between the child's arm and the spade becomes flexible as the arm and the whole body attempts to adjust to the required movements of the tool. At this stage, how the child grips the spade handle is not decisive. The child adjusts his movements with the spade in relation to the position of the toys in the pool. The child attempts to adjust the tool's position and such a movement in most cases is required to solve the target task. In general, this phase is characterised by (i) the child accounting for the objective relationships between the features of the surrounding environment and (ii) mastering the skills

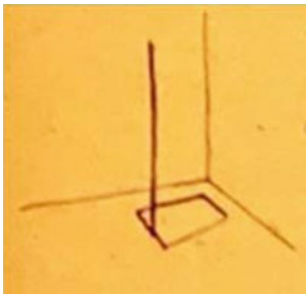

Fig. 4.1 The blade of the spade is positioned parallel to the pool's floor

when performing the movements with the tool. Therefore, this phase can be termed as the *phase of objective regulation.*

The fourth phase is the last one visible in our empirical material. However, there are reasons to believe that this is not the last phase in the development of human intellectual practical activity. In addition, the children's understanding of the objective relationships needed to perform the target task,[3] does not reflect their understanding of the mechanistic relationships present. This is evident in the following observations.

After the initial lifting of the toys out of the pool, we conducted another experiment in which the children were to create a tool similar to the spade they used. Only five to ten-year-old children participated in these experiments, since the task (to construct a spade) was far too difficult for younger children. The children were first asked to lift the toys out of the pool two or three times, which was easy for the children as they quickly learned to master the spade (as with the example of the eight-year-old boy). Then, we offered the children various materials: thick aluminium wire, blades with drilled holes, sticks and ropes. The children were to use these materials to create a similar spade to lift the toys out of the pool. These experiments revealed interesting observations demonstrating how children developed their understanding of the structure of the tool they had mastered. It was visible that there was a time gap between the children's ability to master operations with the tool and their ability to create a tool by considering the its dynamic properties. This was similar to the time needed for two and five-year old children to develop their ability to manage tool-mediated operations. This time gap also provides evidence that children's understanding of the spade's mechanical properties (which is crucial for their ability to use it) and its mastering happens differently in various age groups.

However, the relationship between the properties of the spade and the properties of the toys to be lifted out of the pool are not similar to the relationship between the properties of the spade's individual parts. These two groups of properties are interrelated and understanding the tool's properties is impossible without understanding the properties of its parts. The development of the child's understanding of the properties of the tool as a whole and the properties of its parts does not happen simultaneously. This suggests that the objective relationships that the child starts to consider in the fourth phase are not completely realised by the child. These

[3] Our task in the original, referring to the task of lifting the toys out of the pool.

objective relationships are not considered by the child as mechanical relationships as they would have been considered by an engineer. However, these relationships are realised by the child as the tools' affordances and limitations in the practical activities. Clearly the fourth phase is not the last phase in the development of the child's activities. The child's consciousness determines behaviour and reflects the affordances and limitations of the performed operations. The properties of the objects the child engages with creates links between these operations. By engaging in these operations, the child's consciousness undergoes developmental changes.

To summarise, from the child's first unsuccessful attempts until the complete mastering of the tool, the four phases in the development of actions can be identified, which differ with the role of consciousness.

In the *first phase*, we observe the approach of 'trial and error' which demonstrates that acting with a tool is too difficult for younger children. However, such a difficulty is not the child's psychological resistance but a particular attitude to the action. In this first phase a tool-mediated task is already presented to the child and the tool (forced to use, imposed and technically inconvenient) is included in the child's activity as a compulsory and essential link. In the suggested task, the child does not only need to reach the toy, but to do this with the spade. However, the child is unable to use the spade and, instead, the skills that he masters well—manual skills are largely employed.

In the *second phase*, the child identifies the position of the toy in relation to the spade. In doing so, the child identifies the stages to go through in order to lift the toy out of the pool. These stages divide the whole process into four distinctive tasks, however, the links between each one and the operations to solve them are still missing.

The *third phase* is characterised by the presence of such links between tasks; however, these links are limited and therefore not flexible. Here, the natural position of the object (toy) determines how the child interacts with it. Alongside this, mastering a particular operation determines the position the child attempts to place the object when lifting it out of the pool.

It is only in the *fourth phase*, that the link between the operation and the objects' position becomes flexible and the child's choice of operation is determined by the structure of the present situation.

When developing the child's intellectual practical activity, each phase builds upon the previous one. In the first phase, useful operations identified by trial and error form the child's conscious regulation within the next phase. In doing so, by accumulating experience, the child consciously starts to determine and manage practical activity. From this perspective, mental activities are nothing else but external activities, that first occur unexpectedly during sudden changes in real situations. Over time, the child begins to perform these activities intentionally as if using a mental plan. The sequence of the activities performed by the children of different age groups when mastering a tool, makes visible how the child's consciousness develops out of the accumulated experience. The child's consciousness becomes visible in the ability to select useful operations and adjust them to the conditions of the surrounding reality.

However, such an understanding reveals that there is a delay between the development of consciousness and the child's ability to engage in a practical activity. This is an extremely important aspect, however when taken in isolation and out of the context, it may be over generalised and cause confusion. To identify the significance of the link between the child's consciousness and the ability to engage in a practical activity, we have to consider three aspects.

First, the similarities between the intellectual and practical activities are evidence that these activities were not only connected in the past, but this connection remains and exists in the present. However, these similarities are also evidence of the delay in the development of the child's psychological consciousness from the ability to engage in the practical activity. Analysis of the practical and intellectual activities demonstrate that intellectual activities (ways of thinking) do not resemble the elements of practical activities where they originate. These intellectual activities originate within accidental activities and changes in the surrounding reality, they are identified and used deliberately by the children. Initially, these activities occur accidently, however, later they are performed deliberately. Externally, these activities remain similar, however internally the relationships between the activity and the person change to become the person's psychological activity.

Second, the relationships between the operations and the objects used change as well. Initially, these operations are caused by accidental changes in the objects, however, they become determined by the requirements of the task and the child's thinking about the interactions with the objects. In doing so, the operations are independent from the objects they are directed towards. Dependency between the objects and the operations performed with them is now established: the operations initiate changes in the object. By remembering operations used in early practical activities, mental operations now determine the content of future practical activities. If externally, the child's thinking is lagging behind practical activity, psychologically, thinking goes ahead of the practical activity.

Third, the transformation of the practical to thinking activity reflects the child's growing conscious understanding of the activity. Only activities which have been consciously realised by the child are applied on multiple occasions. Therefore, the opportunities for conscious understanding is an important condition for the child's transfer from practical to thinking activity and the transfer to the next phase of mastering the tool. In the world of complex relationships between objects, by engaging in practical activities with them and by experiencing successful and unsuccessful attempts, the child starts to recognise these relationships and, in doing so, overcomes any limitations and transfers to the next phase. Therefore, the process of the child's development occurs as if continuously looking back and each following phase in the development builds upon the previous one (Piaget, Vygotsky, Shtern).

However, in order not to develop false understanding of the origin and continuously increasing role of child's consciousness, we have to focus on two transformation patterns of the practical activities the children engaged in our experiments.

First, our empirical data demonstrates that the phases mentioned above may sometimes overlap (in particular phases two and three), however, we did not observe that subsequent phases replaced previous ones. For example, we did not observe the third

Fig. 4.2 The boy is pulling up the spade by dragging it along the pool's wall. The large red cone is leaning against the spade's handle

phase replaced by the fourth, despite the proximity of these phases. They seem only to differ through the development of children's gradual understanding of relationships between the tools and objects they interact with. These changes are reflected by the transformation of operations used; however, these relate only to one operation type and do not cause transformations from one to another.

Lionya's persistent use of one operation can exemplify his understanding of the relationship between the objects and the tool (spade). He pulls objects up the pool wall that are unsuitable for this operation: a large cube, a prism and a pyramid which get caught in the gaps between the boards (the pool's walls). His attempts are often unsuccessful and because of his failures, he modifies his operation, dragging only the front side of the spade up along the wall while the large red cone leaning on the handle (Fig. 4.2).

Lionya transformed his initial operation by adopting such an approach, however the new operation cannot be described as rationalistic as the toy on the spade is round and rolling it up the pool wall would be much more convenient. However, Lionya continues dragging the spade along the wall and, in doing so, the spade inevitably gets stuck in the gaps between the boards. Lionya's logic is transparent and unsophisticated: the toys are getting caught in the gaps between the boards, so he moves them away from the wall. However, he continues dragging the spade up along the wall and it gets caught in the gaps between the boards. Lionya does not really understand why this happens and does not realise the disadvantages of this operation. Numerous unsuccessful attempts do not enhance Lionya's understanding of the relationships between the tool (spade), the objects (the toys and the pool's wall) and the changes needed to improve the operation. Finally, Lionya simply moves the spade away from the pool's wall and proceeds to another operation.

At each phase our observations demonstrate, however, that operations may be mastered by the children, if not completely, but to a high degree of proficiency. Such proficiency may be achieved by mastering the types of behaviour specific to each operation.

Our two-year-old children quickly master lifting the spade; however, this occurs by trial and error and the action reflects the limitations of this approach. The child achieves the desired outcome by using different operations interchangeably. These operations or types of activities do not transform from one to another but appear

subsequently in children of different age and level of development. For operation transformation to happen, children's consciousness should undergo transformation.

Second, I would like to emphasise the point which was already highlighted in Chap. 2. When describing the children's practical activities in the second group, the role of consciousness was different in the various operations used. In the two youngest groups lifting happened by persistently applying previously successful operations. For the younger children sliding the spade effectively under the toy occurred by accident and the need to stabilise the toy on the blade did not arise. Therefore, the task was solved by trial and error.

Inconsistency in the involvement of children's consciousness in different tasks is paradoxical. It may be suggested that children's consciousness in different age groups manifests differently when solving tasks and does not undergo any changes. However, our empirical data shows the opposite: the same child demonstrates different levels of thinking which reflects the different levels of development.

I would like to offer some explanations for the described above. We presented three different tasks and the choice of tasks could not be influenced by the children. It seemed that the child's consciousness did not change during the experiment. However, we observed quite the opposite and the development of the child's consciousness can be explained by its inconsistency. When the task is changed, the child's consciousness changes too. Therefore, the outcome of the task and the child's thinking depends on the content and it changes when engaged in different tasks.

If we analyse the children's thinking, which changes in different tasks, the inconsistency in the development of consciousness becomes even more visible. When the tasks difficulty was increased, the children's thinking became less sophisticated. We considered why children who demonstrated advanced thinking when solving one type of task, applied less sophisticated thinking when solving another? Why didn't the children use the intellectual capacities that they already had?

To answer this, we put forward three possible suggestions:

1. The child's consciousness is unstable, and it changes depending on the type of task.
2. Children do not think in one way (universal consciousness) and it varies in different tasks.
3. Consciousness does not exist. In various tasks, only individual intellectual operations can be developed and applied.

However, only the third suggestion seems viable and such a suggestion rejects the existence of consciousness as an individual capacity.[4] The inconsistency of human consciousness signifies that it can be considered as a type of human psychological activity.

Therefore, we will consider the inconsistency of human consciousness in the following way: when engaging in different tasks, the child's theoretical thinking varies. The development of the child's consciousness and practical activity is characterised by its inconsistency. Consciousness develops when the child engages in the

[4] Underlined in original.

practical activity with material objects and it cannot be separated from this activity. In its early phases, the child's consciousness consists of individual operations that reflect the conditions of situations in which they are applied. Normally, these operations have few areas of application. Generalising individual situations and the child's ability to transfer actions between situations demonstrates a thorough understanding of the object and operations, which generally happens much later in children. In the absence of an ability to generalise the situations of engagement with objects, the child's consciousness consists of various groups of operations which differ in their structure, links, and connections. Such an understanding reflects the inconsistency in the development of the child's consciousness, and it offers an approach to understanding the child's thinking.

In the following, I will summarise the analysis of our empirical data by outlining the significant aspects in the process of a child mastering a tool.

1. Inconsistency in the development of a child's activities. In different aged children practical activities vary; even within different operations performed in the same age group. The child's thinking and consciousness, termed as 'intellectual practical activity', reveals similar differences.
2. There are no connections between the ways of thinking children develop. The ways of thinking that children demonstrate in different operations are not linked together and do not transform into each other. Children of different age groups can perform different operations and this ability gradually develops in older children.
3. In the early phases of mastering the tool, children's thinking is delayed from the practical activity. Thinking, as a theoretical engagement reflects previous practical activity.[5]

These aspects are crucial for understanding the examined phenomenon. By considering these aspects, we can identify the role of skills and thinking in the process of transformation from manual to tool-mediated operations which are visible in children of different age groups.

Contrary to the hypothesis that skills are crucial in the transformation from mean to tool, our findings demonstrate that the children did not use trial and error to solve the task, the way how skills usually develop. On the contrary, in three of the four types of activities performed by the children of various age groups, their thinking was particularly visible. It was only in the first phase that children mastered the tool by developing skills through trial and error. In the second phase the method of trial and error was accompanied by thinking which, by the third phase, acquired the leading position.

Of course, skills are important in older children too. The five to ten-year old children who participated in the creating spades experiments, were asked several times to lift the toys from the pool. Although such an operation did not present any

[5] However, the practical activity, by transforming into thinking, makes the next step in mastering the situation. The child's practical activity is not only managed by its thinking, but such an activity precisely reflects the child's thinking and creates a unity of the two. By reflecting the previously happened practical activity, the child's thinking influences and is integrated in the child's present activity.

difficulties for the children in this age group, the time required was reduced with every new attempt while the ability to perform improved. Without doubt, such an improvement occurred because children's skills developed and improved with every new attempt to lift the toys out of the pool.

However, the role and the significance of skills changes in the different type of activities which employ these skills. In the trial and error phase, skill development comprises identifying movements that are beneficial in the present situation. In the following phase of objective regulation, the skills are integrated into the activity to ensure a smooth flow of its units. If, however, the suggested task requires mastering an important skill; its importance is not equal in all phases of the performed activity.

Similar arguments can be put forward against the hypothesis concerning a crucial role of thinking or consciousness. This is because thinking and consciousness differ in children of various age groups. In the phase of a trial and error, thinking as a type of activity exists in its embryotic form, which is different from the practical activity. Even in the second phase, 'alertness', thinking is only secondary in relation to the practical activity, which plays the primary role. It is only in the phase of 'persistent interference', that thinking begins to dominate the external flow of the activity and it is in the fourth phase, that thinking completely manages the performed activity.

The experiments of creating a spade show how late (in comparison with the period of practically mastering the tool), children develop their true understanding of the tool's properties. These experiments highlight that the development of children's consciousness is delayed in comparison with their practical activity, including its individual operations. Children's consciousness develops in their practical activity by mastering its operations and gradually realising its content, opportunities and limitations. Therefore, it would be wrong to consider children's thinking or consciousness of primary importance. In particular, there are no reasons to believe that the children's consciousness is of primary importance in the early phases of their development, when the transformation from means to tools occurs. On the contrary, the children's thinking and their consciousness develops in later phases.

The main disadvantage of both concepts (the decisive role of skill development or transformation of thinking) is that they are grounded in abstract relationships between the development of activities in children and their age. In addition, neither of these concepts consider the complexity and variety of these relationships. These concepts may offer explanations that all forms of children behaviour have one beginning and the differences in the forms of children activities can be explained by different levels of skill development and thinking (consciousness). Such generalising is not only empirically insolvent, but it does not correspond to the real structure of children's activities. It is also impossible to employ such an approach in practice. By emphasising the theoretical inconsistency of the above-mentioned concepts, I finish my considerations in this Chapter.

Chapter 5
Human Consciousness as a Reflection of Human Practical Activity

Outline

In this chapter Galperin discusses the role of skills in the development of new forms of behaviour. He starts by considering the concept that suggests that a skill is a decisive factor in the development of new forms of behaviour. Here, he defines skill as a way of developing new physiological movements which initiates a new type of behaviour. He argues that this skill definition can be understood as a combination of individually acquired and independent inborn activities. Therefore, depending on the conditions, a skill can enhance the development of individual forms of behaviour.

Galperin adds that a skill consists of the development of individual movements, which initially, have to be extracted from other complex movements. In order to create a skill by using mechanisms of unconditioned reflexes, individual movements have to be repeated and reinforced a specific and the sequential flow of these movements has to be maintained. Galperin argues that adopting this approach limits a skill's role in developing new forms of behaviour.

In order to develop individual movements, they have to be extracted from their natural flow and recombined in a new way. Galperin explains that such an approach should also be developed as a skill. The initial phase in developing a skill is adopting and maintaining natural situations that cause an unconditioned response.

In summary, the *first condition* of skill development is that natural situations, in which individual actions occur, should be maintained. The *second condition* is that in a newly developed skill the combination of individual actions should be changed and rearranged to create a new sequence of actions. Therefore, the appearance of new forms of behaviour is determined by changes in the surrounding environment. It is the sequence of the actions and the relationships between them that should undergo changes while individual actions that constitute a skill should remain unchanged. In nature, individual actions can be rearranged in a new way when the situations change, however, these changes undermine the first condition of skill development.

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When changes in the surrounding environment occur in nature, an animal adapts its behaviour by using the degrees of freedom present. In doing so, an animal adapts to the new conditions of the environment and a new variation of the existing form of behaviour appears. Therefore, new external conditions initiate transformations in the existing forms of behaviour and lead to the appearance of new forms of behaviour. New forms of animal behaviour can also emerge as a response to bodily changes, however, only animals that manage to adapt to new environmental conditions survive. In both cases, the gradual development of new forms of behaviour does not happen through the addition of new elements, but through the development of one form and regression of other forms of behaviour. Both ways of developing new forms of behaviour aim to improve adaptation to the environment, thus enhancing further development. It is not individual skills, but variations in species and the process of natural selection that initiates new forms of behaviour.

Humans can extract individual components from their natural connections to enhance new forms of behaviour, through changing the environment during the labour process. By adopting such an approach, first, a new form of behaviour remains on the external plane and is not consciously realised by a subject. Second, the new form of behaviour never develops through mastering skills and is only possible in individual subjects. For example, it might be possible to train young children to use the spade, however, mastering the use of the spade will never lead to a child teaching another child as the theoretical significance of such an activity will never be realised. Galperin concludes that explaining the appearance of new forms of behaviour through skills' training leads to neglecting the main conditions of skill development and its characteristic features.

This argument is supported by the second feature of training which is combining previously mastered individual actions to develop new skills. Such an approach to skill development aims not to create but only to master already existing activity. In other words, skill development is only possible in the context of an already created activity; a skill does not represent this activity but offers a way to perform it by the acting subject.

Galperin proceeds to discussing the issue of intended and unintended training. He explains that new forms of behaviour can be developed by accident which he terms as unintended training. Such training is not realised and therefore remains unconscious to the acting subjects. On the contrary, intended training can only happen in human social environments which differ from animal environments. In addition, intended training always presupposes an ideal image which has to be (re)created in reality. Unintended training cannot happen in nature as new forms of behaviour are unknown to animals and therefore, they do not exist.

Skills, as a way of mastering activity, develop on the foundations of old ones. Therefore, *skills do not create new forms of behaviour, but are present in created forms of behaviour connecting individual parts.* Hence, skills can be considered as physiological mechanisms consisting of a sequence of nervous impulses and responsive muscle contractions. *Skills do not create new forms of behaviour but stabilise forms of behaviour or activities within which they exist.* Galperin argues that skill development is not creative, but rather a conservative way of developing new forms

of behaviour. He adds if the theory of skill accumulation to develop new forms of behaviour was true, animals would have many opportunities to develop new forms of behaviour by utilising ready-made inborn and unconditioned skills. In an animal's biological development, however, the opposite trend is observed and human evolution from apes was due to the absence of unconditioned instinctive forms of behaviour.

As skills do not develop new forms of behaviour, it is not the accumulation of skills in a growing child that initiates the transfer from means to tools. On the contrary, the child's transfer from manual to tool-mediated operations is initiated by the surrounding social environment. Therefore, the development of new forms of behaviour cannot be explained by skill development in children.

It is visible in the experiments described in Chap. 2 that mastering a new form of behaviour did not happen through the accumulation of skills, but by mastering an already created form of behaviour. During the process of mastering a psychological tool and its transfer into a sign, the so-called ideological tool movements had to be mastered by the children: sliding the spade under the toy, stabilising and lifting it. These ideological movements coincide with the naive or 'magical' phase, identified by Vygotsky, Leontiev and Luria and this phase is of a particular significance.

A child engages in the offered task through the process of meaning-making during verbal interactions with an adult and not by training using old instinctive movements. It is the adult's verbal instruction that reveals the position and meaning of cultural objects. The meaning may still be unclear for the child; however, it is included in the system of objective tool-mediated relationships that has to be mastered and is reflected in actions. It is concluded that tool-mediated operations do not emerge but are mastered and realised during the process of developing activities by the child. By engaging in this process, the child develops as a social and acting person. Human tool-mediated activities have to be developed in children and do not emerge by themselves.

Besides the theory of skills, the theory of intellectual development offers an explanation of children's transfer from means to tools in the development of consciousness. This theory emphasises the importance of mental development and is similar to the theory of skills in considering the subject's practical activity as a secondary phenomenon, presenting itself as a new sequence of old actions. This new sequence of actions, however, appears through consciously realising new objective relationships and not by recombining the already developed skills. A new activity (which according to the theory of skills has to be developed in a specific environment) cannot be developed naturally; rather it is developed in human consciousness through considering the properties of objects and tools used. Therefore, the ability of human consciousness to reveal ways of acting with objects and tools by considering their properties is important. It is not the development of practical activity that initiates human ability to think, on the contrary, it is the human consciousness that determines practical activity. Human practical activity is important for the development of human consciousness by offering 'raw materials': posing new problems and introducing new objects with various properties. It is human consciousness, however, that reveals new relationships between objects and identifies new ways of acting. Human consciousness identifies

only the features of the surrounding world that an acting subject can directly engage with and influence.

During such interactions, new relationships between objects can be established. Old connections are deconstructed, and new forms of activities are reconstructed, determining the amount, direction and meaning of new relationships identified in the target objects. These new relationships cannot be identified by the acting subject through thinking only. For example, success in hunting first and foremost depends on whether the hunter is in possession of guns and does not only depend on the hunter's intention to kill as many animals as possible and by recognising the animals' habits and ways of life. Even by identifying the relationships between objects, ways of interacting with these objects can only be identified during practical engagement.

Galperin argues that the limitation of the intellectual theory of behaviour development is that it reduces thinking to simple perception and does not consider it as a type of activity. Thus, perception can be understood either as an observation of external objects and activities. In doing so, the intellectual theory of behaviour presents perception as a completely passive action, where human thinking loses its content and its independent proactive nature. The intellectual theory explains thinking as a process of reflection of reality. Therefore, such a theory rejects a theoretical approach and, in doing so, rejects itself as a theory.

Galperin believes that the development of human thinking should be considered as a transformation from manual to tool-mediated operations. This approach is supported by his findings which he summarises as follows.

Human thinking solves tasks that arise in the process of practical activity by employing means that were previously used. Therefore, human thinking is a particular type of activity that emerges during the development of practical activity. It also evolves out of this activity; thus, practical activity is a foundation for emerging human thinking. Gradually, human thinking is enriched with experience, content, methods and directions of further development of the practical activity. In doing so, *human thinking, is nothing else but an ideal recreation of human practical activity*.

The purpose, opportunity and further development of human thinking depends on the structure of the practical activity which initiates the whole trajectory of practical interactions. Thinking opens new opportunities for the practical activity which can lead to further development. Therefore, thinking does not only initiate development of present forms of behaviour, but also a person's understanding of this behaviour. Human thinking develops and improves practical activities, and only when a tool-mediated activity becomes a reality does the need to use tools arise, posing new thinking tasks.

Based on the analysis of the empirical data in Chap. 2, Galperin highlights that a change in consciousness is initiated by a child's transfer from manual operations to tool-mediated operations. Therefore, a child's consciousness does not initiate a transfer from manual to tool-mediated operations. A child's transfer to tool-mediated operations happens during the mastering of publicly accepted ways of acting with these tools which initiates transformations in the child's consciousness. These changes highlight the transfer of the child's consciousness to its social, tool-

and language-mediated unlimited line of development and away from its biological line of development limited by its relationships with the natural environment.

In adopting such an explanation, human consciousness loses its limitations and develops a capacity to reflect the connections between objects and processes. Through the process of developing an understanding of these interconnections within the surrounding world, human consciousness evolves as a homogeneous, unified and well-organised structure.

Galperin summarises that human consciousness realises and evolves in the process of historical development and does not exist at the beginning of development. Human consciousness develops in the process of generalising ways of interacting practically with objects, acquiring its structural and meaningful organisation. The boundaries of human consciousness are constantly expanding and are potentially unlimited. These boundaries, however, reflect the capacity of human consciousness to generalise the current understanding of the unlimited and never completely examined subject of science.

Human Consciousness as a Reflection of Human Practical Activity

First, I will consider the concept that suggests that a skill is a decisive factor in the development of new forms of behaviour. To begin, a skill is (i) a way of developing new movements (physiological in nature) and (ii) a new type of behaviour initiated by these developed movements. These two skill definitions are interconnected in the following way. The physiological grounds of skill development concerns establishing connections between the processes in our central nervous system. By adopting such an understanding, a skill can be considered as a type of activity that originates in individual experience and consists of individual and previously mastered forms of activities. Therefore, the skill system is rooted in inborn activities that constitute animals' 'capital[1]'. Correspondingly, a skill, as a new form of behaviour is a combination of individual acquired and independent inborn activities.

Whether a skill can enhance the development of new forms of behaviour, depends on the conditions of the situation which are crucial and should be discussed in detail.

In a mastered skill, individual sequential movements can be identified. Therefore, to develop a skill, the flow of these individual movements should be developed. Initially, these movements are not interconnected and can also be parts of other complex movements from which these individual movements have to be extracted. Let us consider a simple case of developing a skill by combining individual acquired and independent inborn movements. In order to combine these movements to create a skill by using the mechanisms of unconditioned reflexes, we need to (i) continuously repeat the individual movements and reinforce each one in a specific way and (ii) maintain the sequential flow of these movements to create a skill. A close

[1] In the meaning animals' features.

analysis highlights that these two conditions impose limitations on skill development that downplay the skill's role in the development of new forms of behaviour.

The first requirement in skill development is that the movements that constitute the skill are caused and reinforced in a specific way. In addition, the causes and how these movements are reinforced belong to the animals' natural environment. A person can extract individual movements from their natural flow and recombine them in a new skill. However, such a human way of acting should also be developed as a skill (such an approach may offer an explanation of human transfer from a mean to tool) and before a skill is developed, so-called natural ways of acting can be employed. In such natural conditions, a stimulus that causes an unconditioned reaction develops the whole situation in which the response is reinforced. To summarise, maintaining the stimuli and reinforcing the desired responses ensures recreation of such situations in the future and enhances skill development.

The *first condition* of skill development is that natural situations, in which individual actions occur, should be maintained. The *second condition* is that the combination of individual actions should be considerably changed and rearranged to create a new sequence of actions in a newly developed skill. The fact that the individual actions are connected to each other indicate that the parts of the environment that act as stimuli are also connected to each other. Since specific sequence of unconditioned activities is required to cause animal's behaviour in a particular environment, a new sequence of these unconditioned activities is required to develop a skill. An animal is naturally connected with its environment and its activities (which are unconditioned) reflect the structure of the surrounding environment. Therefore, the appearance of new forms of behaviour is determined by the changes in the surrounding environment.[2]

To develop a skill, individual actions that constitute this skill should remain unchanged, however the sequence of the actions and the relationships between them should undergo changes. These individual actions, as with mosaic stones, should be pulled apart from their natural connections and rearranged in a new way, different from their original natural connections. However, how can these actions be rearranged in nature? Clearly, the changes in the relationships between the individual actions applied in naturalistic situations are possible when changes occur in these situations. However, the changes in the naturalistic situations undermine the first condition of skill development.

In summary, a situation initiating new skill development cannot occur if individual situations of actions remain the same; however, changes in the individual situations of actions may cause the development of a new skill. Clearly, in natural conditions the two necessary conditions for skill development could not be realised and a new form of behaviour (skill) cannot appear by itself.

An animal which has adapted to its environment, does not change its behaviour until the environment changes. When changes in the surrounding environment occur, the animal's behaviour alters in two ways. One possible way of adapting to new environmental conditions is by using degrees of freedom that can be found in any form of behaviour. By using degrees of freedom, an animal can adapt to the new

[2] Underlined in the original.

conditions of the environment and a new variation of the existing form of behaviour appears. However, such a variation originating in the degrees of freedom is different from its initial form of behaviour, similar to where two overlapping circles have a common and individual areas. New external conditions initiate gradual changes in existing forms of behaviour which undergo several transformations and lead to a new form of behaviour.

Another way to develop new forms of behaviour is connected to physical changes in animals' and the new behaviour reflects these new bodily changes. However, only the animals which adapt to the new environmental conditions survive.

In both cases, the gradual development of new forms of behaviour does not happen through the addition of new elements (although they are visible in the new forms of behaviour), but through further development of one form and regression of the other forms of behaviour. These two ways of developing new forms of behaviour aim to improve adaptation to the environment which serves as a measure of natural selection, enhancing further development. Natural selection is possible because variations in the forms of behaviour are determined by the anatomic-physiological structure of an animal. It is variations in species and natural selection which initiate new forms of behaviour and not an individual skill.

Through deliberately changing the environment during the labour process, it is only humans that can extract individual components from their natural connections, allowing for the development of new forms of behaviour. Such mechanistic ways of developing new forms of behaviour is possible only when it is consciously organised by humans engaged in social labour. However, during training, two characteristics of a skill become particularly visible. *First,* a new form of behaviour, which can be achieved through training remains on the external plane and is never consciously realised by a subject. *Second*, such a new form of behaviour never develops through mastering skills and is only possible in individual subjects.

If a person creates such artificial conditions, in which individual actions can be performed in a different order to develop a new activity, this sequence will not be consciously realised by a subject. What is realised by the subject is only the individual components of the activity; its start (as a stimulus) and the end (as a reinforced reflex). In doing so, the new form of behaviour developed as a skill, remains unrealised by the person. For example, in the circus when trained sea lions engage in playing with a ball, the true biological significance of such an activity for them remains in getting a fish, which is accomplished in an unusual way. Playing with the ball never becomes the sea lions' true activity that is consciously realised by them. This activity remains external with accompanying results and as a ball game it exists only for humans—a trainer or the audience. However, such a primitive animal activity provides a baseline for the skill development. The developed skill is limited by its 'blindness' in relation to everything that naturally follows such activity. A sea lion that has mastered the ball game can exemplify such a behaviour for another sea lion, although the first sea lion will never engage in teaching the ball game to another sea lion. Despite the sea lion's ability to engage in playing with the ball, it remains an animal positioned outside of the system of human relationships involving motivation and opportunities for training. The sea lion is an object and never a subject of training; the relationships

between the teacher and the student are not interrelated in training and cannot be reversed.

It might be possible to train our youngest children to use the spade. A child who has mastered the process of lifting the toys out of the pool, however, will never create the situation of teaching another child and above all, consider the theoretical significance of such an activity. Similar to an animal, the child's operations with the spade might be developed during training, however, the child will never become a trainer himself. Through developing skills, it might be possible to develop human-like actions, but an animal cannot become a human. However, a transfer from a mean to a tool signifies the transfer from animal to human activities. Therefore, to explain the appearance of new forms of behaviour through skills' training means to neglect the main conditions of skill development and its characteristic features.

Such an argument is supported by the second feature of training. This feature concerns the following: the main aim of training is to develop in the subject (human or animal) a form of behaviour which has been previously identified in the trainer's imagination and realised during the process of training. In this case, a new skill is developed by combining individual actions. However, by following such an approach to skill training aims to develop already existing activity, which has to be mastered. Therefore, the process of skill development aims not to create, but only to master the already created activity. Similar to creating a mosaic: a plan does not represent the final picture, but only a way to create it. A skill is only possible in the context of an already created activity and strictly speaking, it does not represent this activity, but offers a way to perform it by the acting subject.

However, if a new activity has to be developed by creating a particular environment, can such an activity be developed by accident? Of course, it can. Unintended and natural training often happens, which confuses researchers concerning the mental abilities of animals. However, the conditions of such unintended training remain similar to the conditions of intended training. As with intended training, unintended training is limited by the combination of the two conditions presented above. In addition, the intended training can happen only in human social environments, which differ from animal environments. The intended training always has an image, which may not be realised by the trainer, but it is presented for the trained subject as a combination of external conditions to be (re)created. Unintended training cannot appear in nature because training is a method to develop new forms of behaviour and new forms of behaviour are unknown for animals and therefore, they do not exist.

We have defined a skill as mastering a new activity which develops on the foundations of an old one. However, now we observe that the skill does not create new forms of behaviour, but only manifests itself in the person's behaviour. Therefore, skills are always present in the created forms of behaviour as mechanisms that connect their individual parts. Correspondingly, skills can be considered as physiological mechanisms that create the sequence of nervous impulses and responsive muscle contractions.

Similar forms of behaviour can be performed by using different activities and visa verse, the same activities with small deviations can be employed in different forms of

behaviour. There are complex relationships between human behaviour and its physiological mechanisms. Such an understanding contradicts the conclusion of Watson who believes that human behaviour should be considered as a complex response to the external environment. Therefore, in persons with similar physiology, the speed and stability of skill development, its flexibility and capacity to be transferred to new activities and situations are determined not by the skill itself, but the properties of the new form of behaviour in which the skill is used.

A skill does not create new forms of behaviour, it only stabilises such forms of behaviour within which it exists. In nature, a skill develops within instinctive forms of behaviour and by ensuring the excellence of individual movements, it establishes these unconditioned forms of behaviour.

Therefore, skill development is not creative, but rather a conservative way to develop new forms of behaviour. This is evidenced by a simple fact that less variety is observed in animal's behaviour, with more unconditioned inborn forms of behaviour present. If the theory of skill accumulation to develop new forms of behaviour was true, then we could expect just the opposite: the animal would have many opportunities to develop new forms of behaviour by utilising its ready-made inborn and unconditioned skills. However, in an animal's biological development we observe quite the opposite trend. Without doubt, human evolution from apes happened due to the redundancy of unconditioned instinctive forms of behaviour.

A skill does not develop new forms of behaviour and it does not ensure their transfer from inborn, unconditioned to qualitatively new behaviour. Therefore, it is not the accumulation of skills in a growing child that initiates the transfer from means to tools. On the contrary, the child's transfer from manual to tool-mediated operations is initiated by the surrounding social environment. Therefore, the development of new forms of behaviour cannot be explained by skill development in children.

We have already mentioned in the experiments described above that mastering a new form of behaviour did not happen as a result of an accumulation of skills, but an already created form of behaviour had to be mastered by the child. The most prominent movements of this new form of behaviour we called as 'ideological'. They were visible in all three operations that constituted the offered task: sliding the spade under the toy, stabilising and lifting it. The child performed the ideological movements that were adequate for the target tool, but these movements were still disconnected from the object they interacted with. Such movements can be described as ideas of movements, expressed on the external plane, but that are not consciously realised. These are pure movements, free from their real content. Examples of such movements are modelling or copying tool-mediated activities of adults. Such modelling signifies the child's acceptance of these activities and their eventual mastering. By performing these activities, the child confirms that the newly copied activity has been noticed and accepted. Although the activity has not been consciously realised by the child, he/she is ready to engage in mastering it. These ideological movements coincide with the naive or 'magical' phase, identified by Vygotsky, Leontiev and Luria. This phase occurs during mediation—the process of mastering a psychological tool and its transfer into a sign. The discussion presented here indicates that we consider this matter of a particular significance.

An animal develops a new form of behaviour as a result of training and this form consists of a new sequence of old instinctive movements. However, a child engages in the offered task in a totally different way. It is a word of an adult and not the instinctive need, that introduces the target task and this oral instruction reveals the position and meaning of the cultural objects. The meaning may still be unclear for the child; however, it is included in the system of objective tool-mediated relationships. The operations mastered by the child are visible in his/her actions. These are mainly manual operations, however, the target task, the object he/she engages with and the performed activity are tool mediated. Tool-mediated operations do not emerge, but they are mastered and realised during the process of developing activities by the child.[3] During this process, the child develops as a social and acting person.

Lulic D. (two years old)—our first child who participated in the experiments, clearly demonstrated manual operations. However, from the very start of the experiment, he behaved as a little human. When given a spade, he positioned it with the blade upwards and his intention was to use it as a stick. The meanings and affordances of this tool were unknown to him; he did not recognise the spade as a tool, but rather as a simple stick. However, one approach was to use the spade as it was given to him—as a stick—and another was to deliberately convert the spade into the stick despite its obvious inconvenience. Lulic recognised the spade as a simple and undifferentiated tool that could be used similar to the natural functions of his arm. However, he recognised the spade as a tool with its stable and objective meaning—a tool that could be used in the system of performed operations. After several unsuccessful attempts to climb into the pool, he attempted to lift the toys with the spade turned upside down by using it as a stick.

The child uses the spade mostly as an extension of his arm; however, the spade is employed as a tool. The development in children happens through mastering various tools. The presence of manual operations in children offers important evidence of the existence of two types of operations. However, this does not mean that all children activities are instinctive and in the early phases of their development, children can be compared with animals. A more comprehensive analysis shows that natural and animal-like activities occur only when human activities have not been developed in children. However, these human activities do not emerge by themselves, but they are always integrated through human relationships even if the latter are not clearly identified. Manual operations may be used by children in their tool-mediated activities and therefore, the experience acquired when using manual operations, is gradually integrated into the tool-mediated operations.

Another theory we need to consider offers an explanation which contradicts the theory of skills. This theory explains the child transfer from means to tools by the development of his/her consciousness. Although the theory of skills identifies the changes in the external environment as crucial, the theory of the child consciousness emphasises the importance of mental development. Both theories are different from our considerations (about the crucial role of the system of objective relationships present in the practical activity). However, these theories are similar in

[3] Underlined in the original.

considering the subject's practical activity as a secondary phenomenon and which presents itself as a new sequence of old actions. However, this new sequence of actions appears not by recombining the already developed skills, but by consciously realising new objective relationships. By adopting such an approach, the theory of the primary role of human consciousness overcomes the limitation of the theory of skills. A new activity which according to the theory of skills has to be developed as a skill in the specific surrounding environment, cannot be developed naturally; rather it is developed in human consciousness by considering the properties of the objects and tools used in this activity.

By adopting such an approach, the ability of human consciousness to reveal ways of acting with objects and tools by considering their properties is important. This theory considers not human ability as such, but the relationship between consciousness and the practical activity as part of the external reality. We would like to emphasise that it is not the development of practical activity that initiates human ability to think, on the contrary, it is the human consciousness that determines practical activity. Human practical activity is important for the development of human consciousness by offering so-called raw materials: it poses new problems and introduces new objects with various properties. However, it is human consciousness that reveals new relationships between objects and identifies new ways of acting.

It may seem that the system of objective relationships introduced in our theory may be perceived as a need to study individual objects and the relationships between them. However, this is not true. Even if these relationships are present in the object, this does not mean that they are consciously realised by the acting subject. Any object encapsulates numerous properties and relationships, and only a small part of these properties is consciously realised by the acting subject. However, the subject's actions depend on the object's properties and relationships. What determines such a selectiveness within our consciousness? Clearly, human consciousness identifies only the features of the surrounding world that an acting subject can directly engage with and influence. For example, various chemical compounds in meat, fruit, grains, and plant roots create the baseline for their use as food. However, human consciousness (as a hunter-gatherer) does not take into consideration these chemical compounds, but other features of animals and plants. The type of human practical activity determines the identified relationships and interconnections between objects in the surrounding world. Similarly, as a person identifies objects of their activities, these objects initiate the already developed and not new forms of activity.

However, such a premise is incorrect when the objective relationships are yet to be discovered and they do not exist. This is exactly the case of the relationships between the tool and the object of interaction. These relationships are established after the subject has engaged with the selected tool. A round pebble on the seashore can become a great bullet for the canon, however in the absence of the canon, the pebble is useless. Can the pebble offer an idea to be used as a canon's bullet? For an animal that does not use guns, the pebble does not present any advantages to be used for these purposes. Only the subject that engages in throwing stones and, in particular, uses some tools for doing so, can evaluate ballistic qualities of the pebble. The relationships that are identified between the objects depend on the subjects'

activity with these objects. New connections between the objects can be identified in well-known activities. However, these new connections cause deconstruction of old connections and initiate reconstruction of new forms of activities that determine the amount, direction and meaning of new relationships identified in the target objects. For example, depending on the internal structure of the activity, its purposes and technical means, two different systems of operations may be employed: (i) manual and (ii) tool-mediated operations. These systems of operations offer completely different opportunities.

If we agree with the suggestion introduced above that the relationships between objects can be identified only through thinking, then the acting person would engage in considering both the existing relationships, and potential opportunities. Success in hunting does not only depend on the hunter's intention to kill as many animals as possible and not by recognising the animals' habits and ways of life, but first and foremost it depends on whether the hunter is in possession of modern guns or whether he uses old bow and arrows or even a harpoon. Even by identifying the relationships between the objects, the ways of interactions with these objects can be identified only during practical engagement.

Abstract thinking is not only incapable of creating new forms of practical activity, but it always loses its indifferent nature when engaged in the activity. Every time when there is a need to engage in a concrete thinking process, abstract thinking loses its abstract grounds and turns into a theoretical performance of the intended action. In other words, every time when thinking meets objects, it loses its theoretical grounds and turns into a specific theoretical activity embedded into individual practical activity.

The greatest limitation of the intellectual theory of behaviour development is that it does not consider thinking as a type of activity and, in doing so, reduces thinking to simple perception. However, perception as such is a specific activity and by adopting the approach offered by the intellectual theory of behaviour development, perception can be understood either as an observation of external objects and activities or as a reflection of a physiological nature of human consciousness.

By adopting the primary role of human consciousness, the intellectual theory of behaviour presents perception as a completely passive action: human thinking loses its content and its independent proactive nature. The intellectual theory explains thinking as a process of reflection of reality. Such a theory rejects a theoretical approach as such and, in doing so, it rejects itself as a theory.

Our approach explains the development of thinking[4] as a transformation from manual to tool-mediated operations and such an approach is supported by the findings emerged in the analyses of our empirical data.

These findings can be summarised as follows. Human thinking solves the tasks that arise in the process of practical activity by employing means that were previously employed in the other activities. Therefore, thinking is a particular form of human activity and it emerges at a certain time during the development of practical activity. It also evolves out of the practical activity and in doing so, identifies practical activity

[4] Thinking is used in the meaning of consciousness.

as a foundation for emerging of human thinking. Gradually, human thinking acquires experience, content, methods and directions of further development of the practical activity. In doing so, human thinking, is nothing else but an ideal recreation of human practical activity.

Naturally, the purposes, opportunities and further development of human thinking depends on the structure of the practical activity which initiates thinking and accompanies the whole trajectory of human practical interactions. Thinking opens new opportunities for the practical activity and by implementing these opportunities, it develops further. Therefore, thinking does not only initiate the development of the present forms of behaviour, but also the person's understanding of these forms of behaviour.

Such considerations are also true for animals. Animals' thinking is fixated in present forms of instinctive behaviour, even when behaviour is complex and includes various (intermediate) material means. The way Köhler's apes engaged in the offered tasks demonstrated limitations of their practical activity. The apes were often confused by simple mechanical obstacles but also found ways to overcome these obstacles in other situations. Their behaviour can be explained by the conditions of their existence in their natural environment. Human thinking in general and animals' thinking in particular fixates and develops further practical activities. The need to use tools does not arise until the tool-mediated activity becomes a reality, posing new tasks for thinking.

Having analysed the empirical data presented in Chap. 2 we found out that a child engages in tool-mediated activities from an early age and occasionally uses manual operations because of underdeveloped tool-mediated operations. The child's consciousness does not initiate his/her transfer from manual to tool-mediated operations. On the contrary, the child's transfer from manual operations to tool-mediated operations initiates changes in consciousness. The child's transfer to tool-mediated operations happens during his mastering of publicly accepted ways of acting with these tools and such engagement initiates transformations in the child's consciousness. These transformational changes highlight the transfer of the child's consciousness from its biological line of development limited by its relationships with the natural environment to its social, tool- and language-mediated unlimited line of development. Truly, such development is unlimited similar to endless opportunities offered by human tool-mediated activity.

In this trajectory of social–historical development, similar to human labour changing natural environment into a society, human consciousness loses its limitations and develops a capacity to reflect the connections between objects and processes. Through the process of developing understanding about the interconnections in the surrounding world, human consciousness evolves as a homogeneous, unified and a well-organised structure.

Human consciousness does not exist at the beginning of human development; however, it realises and evolves in the process of historical development. It is in the process of generalising ways of interacting practically with objects, human consciousness develops, acquiring its structural and meaningful organisation. The boundaries of human consciousness are constantly expanding and are potentially

unlimited. However, these boundaries exist, and they reflect the capacity of human consciousness to generalise the unlimited and never completely examined the subject of science.

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Extra Supplementary Material: The Original Document of P. Y. Galperin's Dissertation Psychological Significance and Difference Between Tools Use by Humans and Animals

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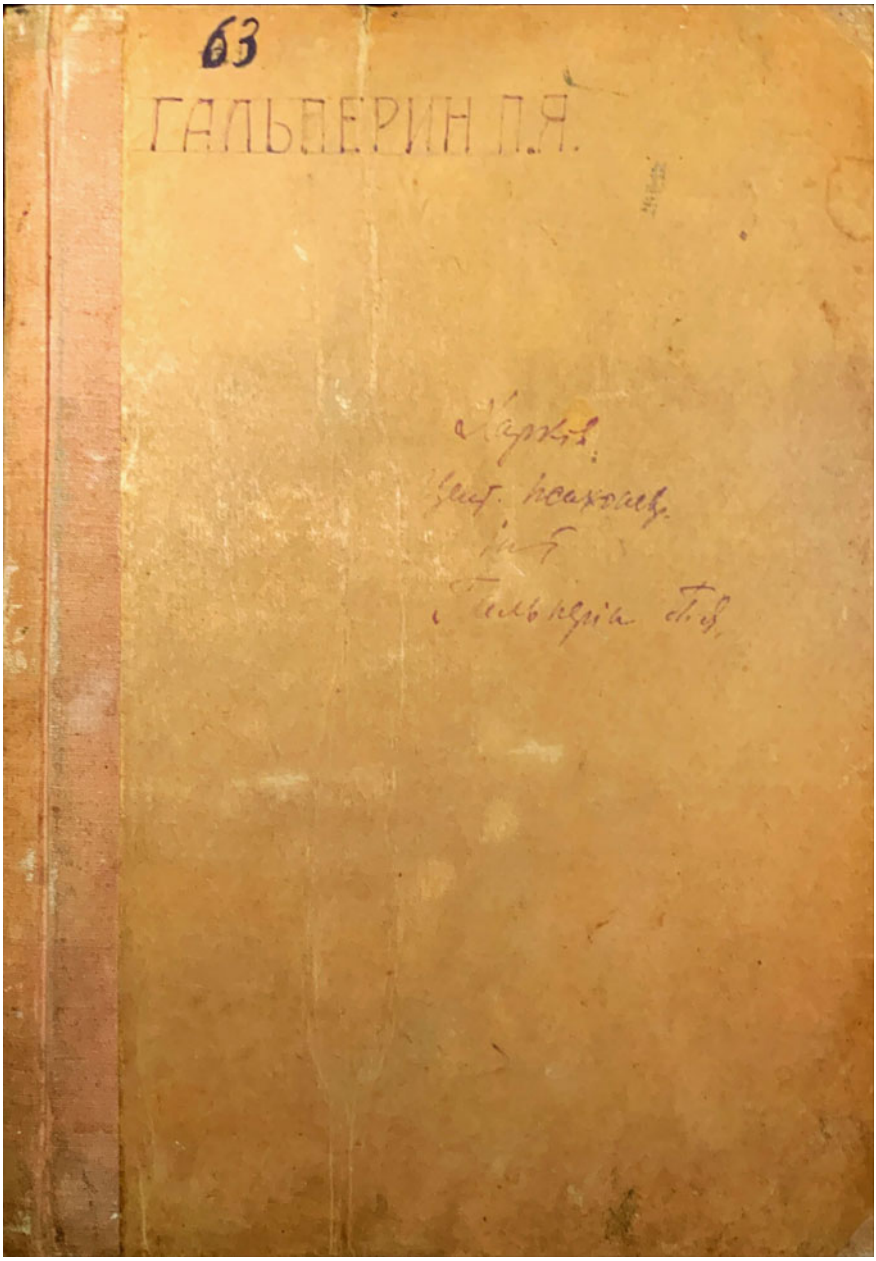
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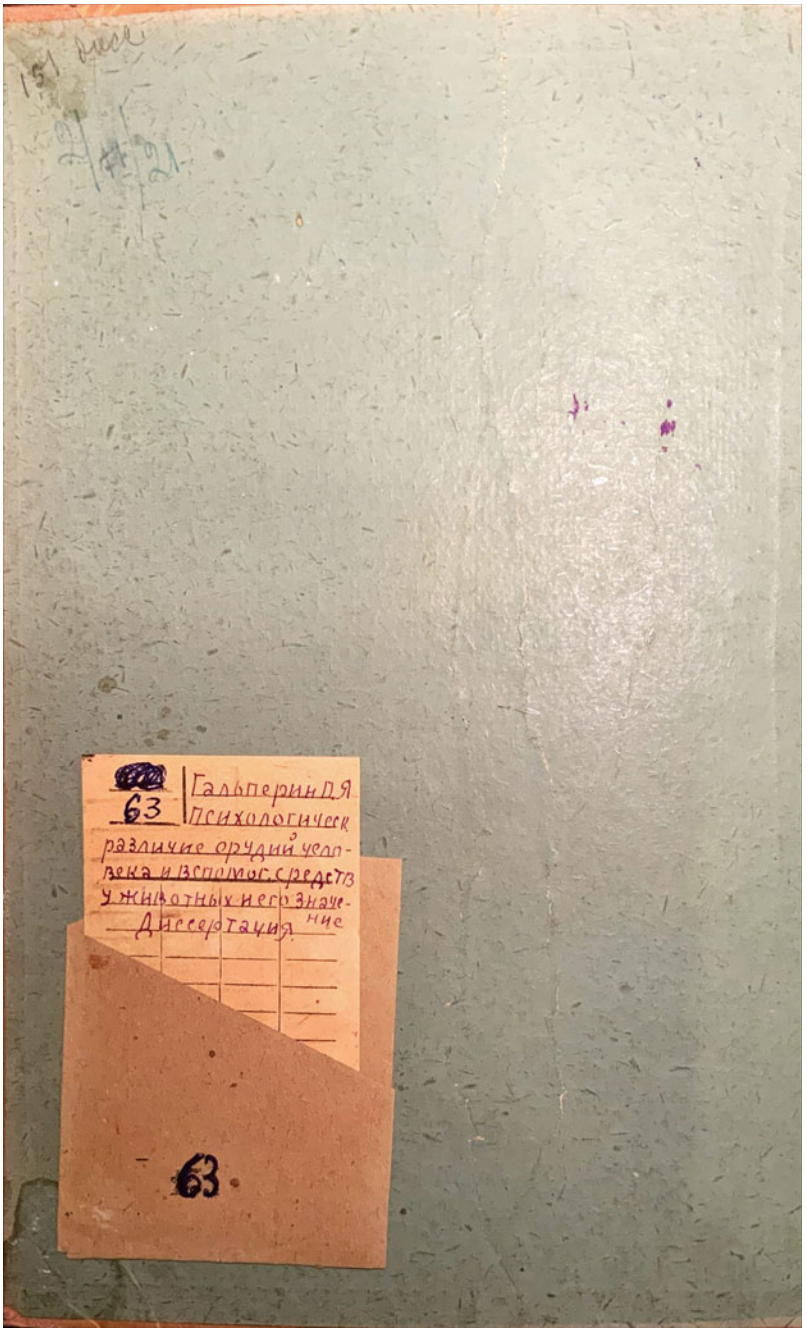
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ПСИХОЛОГИЧЕСКОЕ РАЗЛИЧИЕ ОРУДИЙ ЧЕЛОВЕКА И ВСПОМОГАТЕЛЬНЫХ СРЕДСТВ У ЖИВОТНЫХ И ЕГО ЗНАЧЕНИЕ.

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Замечательные опыты Келера над интеллектом высших обезьян снова оживили вопрос о психологическом различии орудий человека и т.н. " орудий" животных . Они окончательно установили тот факт ,что высшие животные в известных границах решают задачи , устанавливая связи и соотношения вещей, используют для достижения цели предметы в качестве орудий и даже иногда изготовляют последние. Эти опыты во многом обогатили наше понимание психики животных , они действительно восстановили для нас непрерывность психической эволюции от животного мира к человеку. Но в то же время они во многих отношениях стерли четкую психологическую грань между человеком и животными . Было принято думать ,что орудие составляет отличительную особенность человека, что только человеку свойственна опосредствованная деятельность ,- но теперь в столь общей форме это должно быть признано несостоятельным Не только мышление ,но и " практическая интеллектуальная деятельность " животных оказались поразительно сходны с человеческими.

Отрицать это сходство невозможно и вопрос заключается лишь в том,как далеко оно заходит и каково его истинное значение. Только ли подобна " практическая интеллектуальная деятельность " животных человеческой или в самом деле человечна по своей основе ,представляет ли собой мышление животных только упрощенную форму и лишь количественно отличается от мышления человека

или ,несмотря на внешнее сходство ,между ними остаются глубокие внутренние различия ?Разумное употребление материальных средств составляет основу этого сравнения и решение вопроса зависит от того, как будет понято орудие вообще и " орудия" животных в частности.

Бесспорные орудия , орудия человека суть не только показатель интеллекта ; за ними стоит труд ,процесс " очеловечивания обезьяны " / Энгельс /, новая линия развития общественного сознания человека. Наоборот ,употребление " орудии" животными является для них случайным эпизодом и особенно демонстративно обнаруживает характерные черты животной деятельности . Применение вспомогательных средств в отдельных случаях включено в общий контекст существования того,кто ими действует , и , собственно , это определяет настоящую природу орудия .Поэтому ближайший вопрос нашего исследования будет заключаться в том,можно ли найти четкий признак ,позволяющий в отдельном спорном применении материального средства установить его действительную природу , общественную - в одном случае , естественную ,биологическую - в другом.

По сравнению с подлинными орудиями ,вспомогательные средства животных обладают рядом отрицательных черт : они не заготавливаются впрок и не имеют постоянного рабочего назначения ; их функция не закреплена в их форме и почти всегда они представляют собой естественные вещи ; наконец, и это главное , они не связаны с системой общественного производства . Но все эти минус-признаки говорят о том,чего лишены орудия животных, но не о том почему они этого лишены и что все таки они собой представляют . Эти видимые признаки ,которыми так отличаются орудия человека, недостаточны ,чтобы решить вопрос о подлинной природе " орудий " животных . Вели-

чайшие различия в распространении ,сложности и совершенстве орудий ,их месте и роли ~~орудия~~ в человеческом обществе и в среде животных буржуазно эволюционистская социология, ~~при~~ принимающая общность их происхождения, считает следствием количественных различий в совершенстве и распространении самих орудий ; и конечно ,только полжительный показ того,что же представляют собои по сути " орудия" животных,может сообщить этим различиям иное,более принципиальное значение .Верно, вспомогательные средства составляют у животных скорои исключение ,чем правило . Но мы должны подвергнуть изучение именно эти исключения и показать, почему они являются такими исключениями . Наша задача заключается,следовательно, в том,чтобы положительно раскрыть ,что представляет собои в действительности вспомогательные средства животных .

Что же представляют собою эти вспомогательные средства? Внешне они выступают ,как промежуточные материальные звенья целесообразной деятельности.Но,это скорее роднит их с орудиями человека,чем отличает от последних .Видимо,такое отличие нужно искать не столько во внешнем положении,сколько в способе использования промежуточной вещи, в строении квазиорудийной деятельности животных в целом: Не орудие характеризует деятельность животного , а наоборот ,поведение животного определяет действительный характер применяемых им "орудий". Характеристику "орудии" животных мы должны получить из особенностей их "орудийной" деятельности , в отличие от орудийнои деятельности человека.

В чем бы не состояло это отличие ,но внедрение в деятельность материального средства при всех условиях не проходит безразлично .Будь то животное или человек,но с введением этого звена ,самое строение деятельности начинает определяться отношениями между : средством и целью - с одной стороны, средством и суо"ектом - с другой .Эти отношения и должны быть подвергнуты

анализу.

Отношение между средством и целью.

Всякое средство служит " для " достижения известной цели и какая то мера целесообразности составляет его первую и общую характеристику. Это отношение целесообразности выступает двояко : во I-х , как известное соотношение двух вещей , т.е. технически , и во 2-х , психологически ,поскольку это отношение должно быть обнаружено и установлено суб"ектом и служит показателем его разумной деятельности . Отношение к цели является технико-психологическим ,точнее /и вернее / - технико-рационалистическим признаком средства.

Этот признак совершенно обязателен для всякого использования промежуточных вещей - и поэтому он не может служить для различения вспомогательных средств животных от орудий человека. Наоборот , можно было бы сказать, что исключительное пользование технико-рационалистическим критерием является скрытой ,но истинной причиной большинства ошибочных теорий ,ищущих этого различия не в самих " орудиях " , а в связанных с ними дополнительных психологических /Выготский / или общественных / Плеханов / моментах ,или же , наоборот, усматривающих в этих различиях лишь отдельные ступени внутри общей линии развития / Келер/.

Отношение к цели обязательно для средства ,но не специфично для него . Понятие целесообразности обнимает гораздо более широкий круг явлений / включая,например , и биологическую целесообразность /. Оно обозначает собственно непосредственное отношение двух вещей и , таким образом , скорее стирает ,чем подчеркивает характерно опосредствующую роль средства . С другой стороны , средство может быть и нецелесообразным . Очевидно,вещь становится средством не только через

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отношение к цели, но прежде всего в какой то другой связи.

Отношение между суб"ектом и средством.

Действительно , если предмет служит " средством для " достижения цели, то он является таким средством только "для суб"екта ". С технико-рационалистической точки зрения средство прямо соприкасается с целью и определяется ею ,но психологически ,то -есть в действительности каждого отдельного случая своего применения , средство связывается с целью лишь через суб"екта. Благодаря суб"екту вещь становится средством, от него же получает она ,как средство , все свои ограничения. И то обстоятельство ,что данная вещь является средством , и то,каким средством она является - это должно получить раз"ясне ние из второго основного отношения промежуточной вещи, из ее отношения к суб"екту.

Когда мы подходим к отношению суб"екта и орудия"без "предубеждения ", непосредственно , то сначала кажется ,что оно вообще не составляет психологической проблемы : человек (или животное) попросту берет рукою вещь, служащую средством; дальше речь может итти о том,что орудие удобно или неудобно, а человек освоился с ним или еще им не овладел. Психологическая сторона вопроса об отношении суб"екта и орудия сводится , казалось бы , к вопросу о навыке - с одной стороны, о целесообразности устройства орудия / по отношению к суб"екту/ - с другой . Таким образом при этом " непосредственном " подходе к вопросу вся его специфичность пропадает .Но зато ясно,что такое разложение его есть результат рассмотрения суб"екта и средства по образцу отношения средства и цели: как двух вещей, соединяемых для выполнения известных операций, - результат технико- рационалистического рассмотрения, при котором суб"ект выступает только ,как особым образом

устроенное тело. Видимо, этот " непосредственный" подход к вопросу состоит на самом деле в подмене суб"екта -организмом, и отношения суб"екта к средству - отношением двух предметов.

В подлинном отношении суб"екта и орудия на передний план выдвигается следующий вопрос:что представляет собой эта вещь-средство для того,кто к ней подходит , кто за нее берется? Если для него это-вещь, в которой не фиксировано способа действования ею / в направлении известной цели /, то естественно, что вещь получит логику такого действия в процессе действия от самого суб"екта . Если же , напротив, это-вещь, сделанная для определенной цели, требующая специальных способов употребления , то очевидно суб"ект , перед которым она выступает таким образом и который ради этих орудийных свойств к ней обращается , подчинится этим об"ективным требованиям , этой системе операций,фиксированных за орудием .

Как выступает средство перед суб"ектом,какие возможности действия усматривает в нем суб"ект - это зависит от действительности , к которой он сам принадлежит . Животное,биологический суб"ект , для которого существуют лишь биологические отношения и формы деятельности его вида, даже в самом специфическом орудии может увидеть и увидит только эти инстинктивные возможности ; орудие будет для него естественным предметом, лишенным логики самостоятельного действия. Наоборот, человек, суб"ект общественный , даже естественные вещи рассматривает как суррогаты орудий ,потому дчто для него вещи всегда выступают в том или ином значении , фиксированном в операциях общественного пользования ими.

Итак, в зависимости от того, к какой среде принадлежит суб"ект - общественной или естественной-и средство выступает перед ним , как твердый центр одной из двух больших групп операции : одна из них представляет собой систему орудийных

операций, фиксированных за орудием в процессе общественного труда,

Другая - систему ручных операций, сложившихся в процессе действия рукой, как натуральным орудием .

Когда рука берется за орудие, реализуется одна из этих двух систем и происходит следующее : или рука включается в систему орудийных операций , или орудие включается в систему операций руки.

В первом случае, рука подчиняется требованиям орудийных приемов и отказывается от своих в той мере , в какой они противоречат орудийным ; рука превращается в держатель и двигатель орудия - и перед нами возникает орудие , как новая действительность , встающая между человеком и природой , орудие во всем историческом и психологическом своем значении.

Во втором случае орудие теряет свою специфическую логику, им действуют так , как действуют самой рукой- оно становится простым удлинением руки и поэтому всегда плохой рукой, которую оно никогда не сможет заменить . В этом случае оно не открывает для суб"екта никаких новых возможностей и представляет собой только незначительную вариацию уже наличных .

Фиксированный способ применения , который выступает перед человеком, как новая об"ективная действительность орудия наряду с его естественными свойствами , вернее, как настоящее значение этих вещных свойств, представляет собой общественный способ его применения . Система орудийных операций является продуктом общества, общественного производства , которого у животных нет. Поэтому орудие в качестве не только промежуточной вещи, но в качестве носителя определенного типа деятельности, является специфическим отличием человека. Вспомога-

тельные средства животных лишь похожи на орудия ,но не представляют собой орудий даже в зачатке.

Таким образом , действия одной и той же вещью могут быть кардинально различны .Но , вместе с тем становятся кардинально различны и сами эти вещи в качестве орудий,подлинное бытие которых заключается в их применении Мы будем ,поэтому различать в дальнейшем , в зависимости от того , в какую систему действенных приемов включена промежуточная вещь:

Орудие в собственном смысле слова ,присущее только человеку , и

вспомогательные средства ,которые встречаются также в деятельности животных .

Когда перед нами находится вещь, форма которой ясно говорит о ее употреблении , мы можем сказать условно, имея в виду это употребление ,что она представляет собой такое-то орудие. Однако ,орудие может иногда применяться , как неспецифическое средство ;так ,например , я пользуюсь молотком в качестве тяжести ,которой я придавливаю листки бумаги ,чтобы их не разнес ветер. С другой стороны сырая природная вещь может быть использована ,как орудие- и становится настоящим орудием- в том случае, например , когда мы превращаем в молоток придорожный камень,чтобы заколотить выскочившийиз телеги гвоздь. Имеем ли мы перед собой орудие или случайно вынужденное вспомогательное средство - это в отдельном случае можно решить только потому ,как применяется используемая вещь в самом процессе деятельности . Для решения вопроса о природе вспомогательных средств у животных ,столь не постоянных по своему употреблению и столь не оформленных по своему внешнему

Фото №1

виду, этот признак имеет особое значение.И наша первая задача будет заключаться в том,чтобы показать ,что орудие,обладающее собственной логикой действия , и средства,имеющие его , действительно различно применяются ,что существует два четко различных типа операции для орудия человека и случайного вспомогательного средства животного.

Элементарные наблюдения этого рода ,вероятно ,приходилось делать каждому уже в повседневном обиходе . Так, например , ложка - одно из первых орудий культуры ,которым приходится овладевать современному ребенку. Как научается ребенок пользоваться ложкой ?Это оказывается вовсе не простой вещью и дается ему далеко не сразу .Прежде всего ребенок стремится захватить ложку как можно ближе к рабочему концу. Он не стесняясь кладет пальцами в ее углубление лишь бы часть, которой непосредственно орудует,по - возможности сливалась с кулачком . Целесообразность этого намерения становится тотчас очевидной .После того как няня заставляет его взяться за ручку ложки и они вместе зачерпывают кашку ,ребенок резким движением поднимает ложку ко рту, косо снизу вверх - и большая часть содержимого выливается. Ребенок действует так ,как если бы он подносил ко рту свой кулачек. Ложка с функциональной стороны является не более чем продолжением его руки и конец ее тем верней попадает в рот ,чем ближе он к самой руке. Простая " орудийная логика" ложки она особенно ясно выступает ,когда зачерпнув жидкость ,обтирают донышко ложки о край тарелки - требует ,что бы наполненная ложка ,все время находясь в горизонтальном положении , была сначала поднята вертикально до уровня рта и только после этого по прямой на ребенка и в рот. Эта простая логика не выступает перед ребенком и вместо движения(фото №1)

x) Относительно этого см. примечание на странице 17.

Фото №2

он делает: (см. фото № 2)

Ложка в его руке- еще не орудие , а средство ,вынужденное замещение руки и , как таковое ,плохое замещение.Лишь после довольно длительного обучения ребенок усваивает основные орудийные приемы пользования ложкой: не прямо в рот ,но сначала вверх и все время строго горизонтально. Но еще долго впоследствии он пытается взять ложку/кулачком/ ниже верхнего широкого конца ручки и,уже будучи старшим дошкольником ,именно вполне овладев этим не хитрым орудием он жалуется на неудобство обычного приема взрослых /держать ложку "пером", с ладонью повернутой кверху/ .

В этом примере прозрачно выступают основные этапы , которые ,вероятно,можно было бы найти в каждом случае овладения совершенно новым орудием. Однако, в целом такие наблюдения слишком беглы.Для того,чтобы подробнее и основательнее ознакомиться с различием двух кардинальных типов внешнеопосредствованной деятельности нужно прибегнуть к эксперименту,описанию которого посвящается следующая глава.

II.

Принцип эксперимента позволяющего обнаружить в относительно чистом и четком виде ручные и орудийные операции, заключается в следующем .Две группы испытуемых получают задание ,которое можно выполнить и непосредственно рукой, и с помощью заранее выбранного экспериментатором орудия; но, конечно ,соответственно по разному. Группы по возрасту подбираются так, что для одной из них, старшей, задача не представляет затруднений ; испытуемые этой группы быстро овладевают орудием и с удовольствием пользуются им. Для

представителей второй, младшей группы данная задача составляет верхнюю границу трудности ; они не умеют пользоваться орудием и пытаются действовать , с ним или без него , " естественными средствами" . Однако, согласно инструкций ,обе группы работают только с помощью указанного орудия , и в этом невольном для себя сопоставлении обнаруживают отличие ручных и орудийных операций.

Наши опыты были поставлены следующим образом.Дети в возрасте от 2-х до 7 лет доставали из бассейна разные игрушки . Бассейн представлял собой ящик без дна (70х 50 см. ,высотой 60 см.); опыты со старшими детьми проводились в другом помещении ,где бассейн приблизительно тех же размеров изображал перевернутый на бок стол. Игрушки были самые различные : целлулоидные рыбка ,лягушка и лебедь ,большой и маленький ролик (для проводки электричества/, маленький кубик и большой деревянный синий куб/ 7х7 см./ ,такие же большие цилиндр ,трехгранная и четырехгранная пирамида ,железный волчок, три полированные бочешки : маленькая желтая,средняя зеленая и большая синяя /12 см. высоты / и множество мелких лакированных бирюлек /кувшины ,чугунчики и т.д. /, чрезвычайно привлекавших малышей.

Одни игрушки были круглые и легко скатывающиеся ,другие легкие и неустойчивые ,третьи относительно тяжелые и поддевать их было неудобно ,наконец ,четвертые соединяли в себе несколько этих достоинств. В связи со свойствами орудия , применявшегося для доставания ,они составляли ряд заданий ,при выполнении которых развертывались те или иные системы операций.

Для старших детей глубина " бассейна " не представляла препятствия и наклонившись они могли свободно коснуться дна

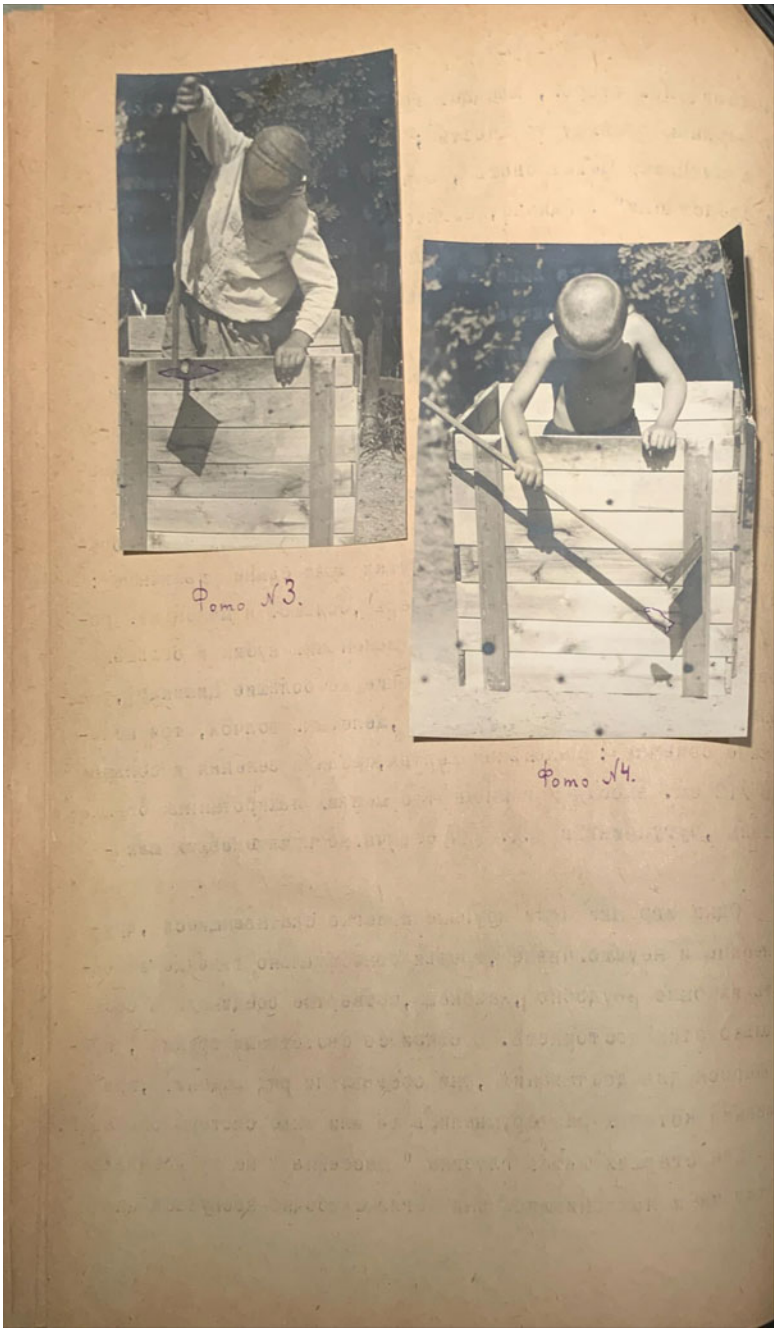
Фото №3.
Фото №4.

рукой. Но доставать рукой запрещалось ,это " не считалось" и если в увлечении ребенок вытаскивал вещь непосредственно рукой, она тут же возвращалась обратно в бассейн. Доставать нужно было только с помощью лопатки у которой лопасть /9 х II см. / загибалась под прямым углом к ручке /40см./

Первоначально эта лопатка была придумана для опытов совсем другого рода ,но оказалась удивительно пригодной именно для нашей цели /выявления разных систем операций /. Это орудие обладает простой,но четкой и своеобразной логикой :оно требует чтобы лопатку вынимали из бассейна " лицом" - вертикально /фото №3/, иначе вещь ,поддетая на лопасть ,спадает обратно в бассейн. Это простое условие многими детьми все-таки не выполнялось и тогда место орудийных операций заступали ручные операции /фото № 4/, наблюдение которых составляло основное задание эксперимента.

Переходим к описанию самих опытов x/

Младшую группу наших испытуемых составляют дети около двух лет; опыты проводились в детских яслях; бассейн представлял собой четырехугольный ящик без дна, стоявший на полу ; перед тем как приступить к опытам мы играли с детьми, показывая разные картинки ,пока они не начинали чувствовать себя вполне свободно.

Люлик Д. I,II/№39/ - толстый живой, общительный и очень понятливый мальчуган .Он с интересом заглядывает в ящик и когда я подаю ему лопатку с длинной ручкой, предлагая достать игрушки ,он перевертывает лопату лопастью вверх и пробует доставать вещи рукоятью. Довольно долго и настойчиво он пытается подогнать вещи к стенке и поднять ,прижав их к стенке

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x/ В собирании части экспериментального материала большую помощь оказала мне студентка Харьковского Педагогическ. Ин-та т.Т.Е.Саксонова,которой я выражаю здесь искреннюю благодарность.

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палкой. Но он только расшыривает игрушки , а кроме того лопасть сверху мешает ему. " Не -ет " произносит он ,вынимает лопату ,ставит ее на лопасть в стороне и лезет в бассейн ручками. До вещей он дотянуться не может и после нескольких минут напрасных усилий произносит : " паком" /палкой /, поворачивается к лопатке ,снова берет ее у лопасти и опускает в бассейн рукоятью.

Резюме. Очевидно, Л.пользуется лопатой только как палкой ,лопасть для него-мешающее добавление,лишенное полезного значения в данной операции ; он пытается поднять игрушки ,прижав их к стенке ,у которой стоит, и двигая вещи по ней палкой ,как если бы это было удлиненное предплечье без кисти.

В опыте через несколько дней , в течении которых Люлик несколько раз присутствовал при экспериментах с другими детьми ,он ведет себя следующим образом . Сначала он снова берет лопатку лопастью вверх и пытается поддеть игрушки рукояткой. Я беру у него лопату опускаю лопастью вниз и говорю :"вот так".Он берет за рукоять и три раза проводит по дну ,при чем лопасть стоит косо и только разгоняет вещи; Люлик произносит:" не-ет" и оставляет лопату.

Видя безнадежность поддевания , я кладу игрушку на лопатку - и Люлик так резко дергает ручку вверх и назад, что лопата взлетает и игрушка падает в ящик. Сам начинает возить лопатой /лопасть внизу /по дну ящика ,но лопасть стоит косо и ничего не получается.

Край ящика подходит Люлику под самое лицо и мы ставим его на детский стульчик ,накладываем игрушку на лопатку и хотя он тянет ее теперь не столь резко,но длинная рукоятка заставляет его отводить руку кверху , в сторону и назад,

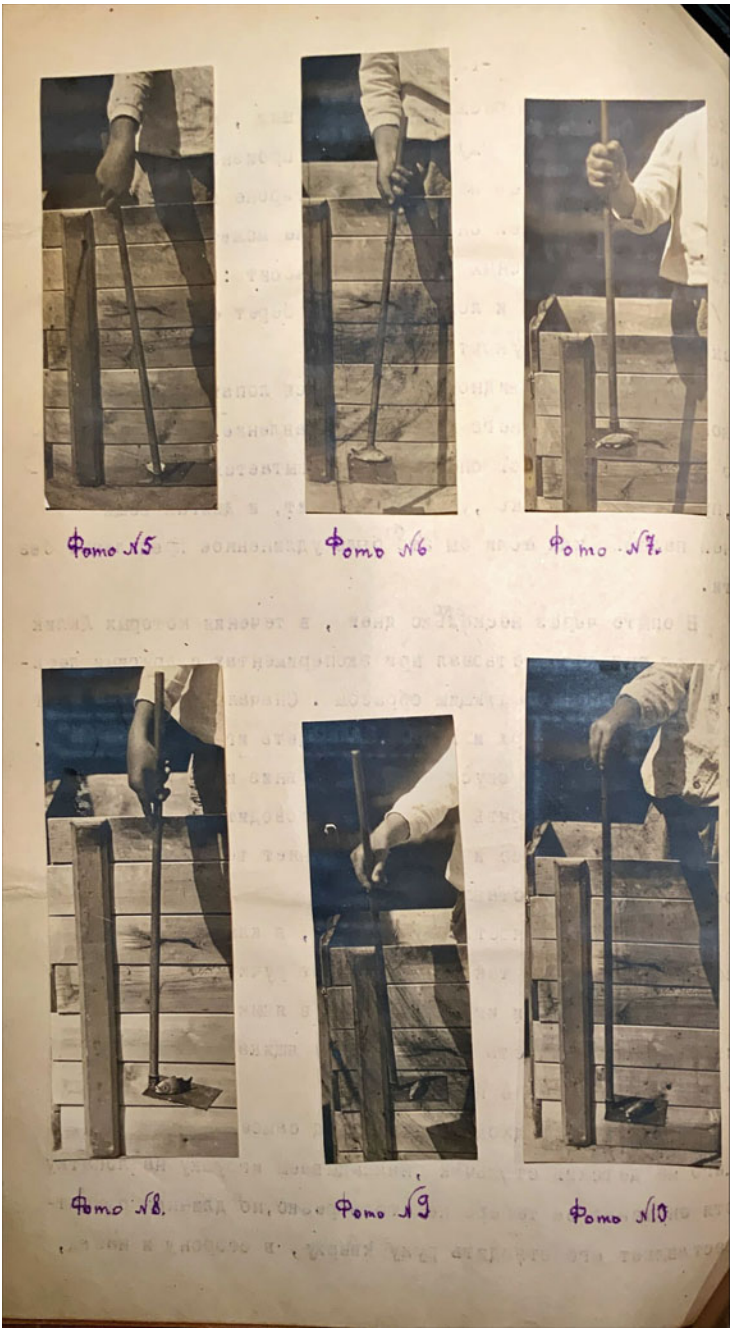
Фото №5
Фото №6
Фото №7.
Фото №8.
Фото №9
Фото №10

лопасть наклоняется ,игрушка падает : 78

Он слезает со стула и идет рассматривать картинки. Через 3 минуты снова берет лопату /лопастью вниз/,повозившись безрезультатно ,откладывает ее в сторону и лезет в ящик руками,берет лопату и держа лопасть косо возит ею по дну. Чтобы утешить его, я поднимаю ему на лопатке игрушки и он с удовольствием бросает их в ящик и просит " давай еще". Берет лопату за рукоять " как палку"x/ и держа лопасть косо/ ко дну бассейна/ некоторое время водит ею разбрасывая игрушки , потом оставляет лопату и лезет в бассейн сам.

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x/ Способ захвата и держания рукояти затрудняет или наоборот облегчает пользование лопаткой и поэтому играет довольно значительную роль - особенно у младших испытуемых- в успехе или неудаче всей деятельности .

Привожу основные типы держания рукоятки ,краткими обозначениями которых пользуюсь при описании экспериментов :

" ПАЛКОЙ (см. фото №5)	"ОБРАТНОЙ ПАЛКОЙ" (см. фото №6)	" ЖЕЗЛОМ" (см. фото №7)
"ВИЛКОЙ" (см. фото №8)	"ЧАЙНОЙ ЛОЖЕЧКОЙ" (См. фото №9)	"ЩЕПОТЬЮ" (См. фото №10)

-I5-

Снова берется за лопату и держит ее / за ручку/ "жезлом," но результат тот же :поддевание решительно не удается. Я снова достаю ему вещи лопатой , а он берет их и бросает в бассейн, чем очень доволен.

Захватывает лопату " жезлом" ,затем меняет прием на "палку" но ничего не получается и говорит " нет, не мею / не умею / ,давай дядя".

Кладу ему игрушки на лопатку - он тянет вверх и назад, лопатка наклоняется /как показано выше/ игрушка падает и он тянется к ней рукой. Снова кладу игрушку на лопату - держа ручку " жезлом " у верхнего края, он снова тянет назад и вверх, игрушка падает и Л. передает лопату мне, приглашая поработать.

Мы играем - я достаю , а он бросает - затем снова повторяются беспомощные попытки поддеть игрушки косо стоящей лопастью и вынимание с чрезмерным размахом.

Тогда я подаю ему лопатку с игрушкой ,подняв ее так, чтобы он смог взять рукоять за середину. Так как игрушка близка, он тянется к ней рукой, а когда это запрещается ,берет за середину ручки поднимает кверху и наконец благополучно достает игрушку. Это в точности повторяется второй раз: я подношу лопату с игрушкой,он тянется к ней непосредственно ,потом берется за середину палки достает игрушку и с облегчением вздыхает.Потом просит : " дай ибку,дай гушку /рыбку,лягушку/ и смеясь бросает их в бассейн .

Résumé.Ясно,что процесс доставления оказывается сложней, чем мы предполагали,и состоит у трех относительно самостоятельных заданий :помимо поднимания ,выступает еще поддевание вещей лопастью и укрепление их на ней. Поддева-

ние вообще недоступно Люлику ,он совершенно не учитывает ,что для этого необходимо передний край лопасти вести плотно по дну оассеина держа лопасть почти параллельно полу - он напротив держит лопасть на боку и косо под значительным углом к полу ,как если бы рукоять лопатки была палкой без всякой лопасти. Задача закрепления встает пред ним лишь в той мере , в какой после первого рывка ,от которого игрушка скатывается ,он начинает поднимать более осторожно ; но до тех пор,пока я не даю ему взяться за середину рукоятки ,он каждый раз отводит руку далеко в сторону и назад , так что лопасть наклоняется и игрушки падают - зато они подходят к нему таким образом,как если бы он захватил их с полу непосредственно рукой.

Зина Д. I.8 /40/ Ев " разыгрывают " и предлагают достать игрушки из бассеина /лопатой /. Зина берет лопату опускает и поднимает ее пустою- несколько раз ,потом жалобно просит достать ей игрушки. Я кладу игрушку на лопасть /лопатка стоит в бассеине/ Зина берет рукоять как " палку" и, немного приподняв ,сгибает руку в локте,лопата наклоняется ,игрушка падает /см.фото и примечание /:  Я показываю как нужно доставать лопатой -Зина опускает лопату, делает захватывающие движения - ничего не захватывая и даже не зацепляя /"идеологические движения " - отметка в протоколе / тянет по стене бассеина пустую лопату. Это повторяется 2 раза. Я кладу на лопату лягушку .Зина тянет ее вверх ,но с половины дороги начинает тянуться к лягушке свободной левой рукой,правая рука при этом сгибается,лопатка наклоняется и лягушка падает. Снова кладу на лопатку лягушку и лебедя.Зина поднимает ее так медленно ,что я поощряю ее : достань ,достань. Она перехватывает другой рукой ручку лопаты , затем поднимает ее и берет

лебедя. Кладу еще раз игрушки на лопатку - Зина поднимает, цепляет за стенку бассейна ,игрушки падают. повторяем - теперь Зина поднимает лопату лиртом ,перебирая ручками по рукояти лопатки и снимает игрушки.

Следующий опыт / через несколько дней/ протекает так: Я кладу игрушку на лопатку,Зина берет ее правой рукой поднимает сгибает руку в локте ,потом еще помогает левой рукой, лопата принимает косое положение и вещь вываливается. Еще раз - повторяется тоже и З. констатирует " упала". Заходит с другой стороны и после попытки орудовать лопатой лезет ногами в ящик. Накладываю игрушки, теперь она захватывает рукоятку " жезлом" поднимает ,перехватывает левой рукой и правой снимает игрушку. Рассматривает ее и бросает вместе с лопатой в ящик.

х/ примечание к стр. 9 .

Для того,чтобы заснять основные моменты эксперимента с помощью фото-аппарата ,который имелся в нашем распоряжении, мы должны были вынести опыты в сад на яркий солнечный свет и несколько изменить обстановку : вместо того,чтобы вылавливать игрушку из бассейна ,мы поставили самого испытуемого в бассейн; далее, перевернув бассейн на бок, мы использовали его в качестве стола для заснятия операции с ложкой. Прилагаемые фото имеют исключительно демонстрационное значение, заснятые в них операции не включены в состав экспериментального материала работы.

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Край бассейна несколько высок ей, ее ставят на маленький стульчик и она сразу лезет руки в ящик. " Ну ,доставай" говорю я и подаю лопату . Зина берет ее сначала как " палку" меняет прием на " жезл " и начинает поднимать, перебирая руками по рукоятке ; но она торопится , лопата переворачивается ,игрушка падает - Зина вынимает лопату лифтом и ощупывает лопасть .Снова берет " жезлом" и перебирая руками осторожно поднимает лопату лифтом и снимает игрушку. Становится на стульчик тянет лопату вверх, но вещи падают и она слезает со стульчика идет играть с игрушками, лежащими на столе.

Возвращается к бассейну ,берет лопату " палкой " ,сейчас же сменяет прием, захватывает " жезлом" и , перебирая руками ,правильно вынимает игрушку - кладу еще одну игрушку, она сразу берет лопатку жезлом и хотя игрушка почти тотчас скатывается,она продолжает тянуть лопатку. Повторяю опыт, Зина осторожно поднимает , перебирая правой и левой рукой , но лопатка все таки перекидывается и игрушка падает - "нету" констатирует Зина и опускает лопату. Следующий раз она удачно вынимает игрушку пользуясь тем же приемом , а последняя проба кончается неудачно - она тянет лопату вверх - назад ,игрушка падает и Зина отмечает : " нету" .

Résumé .Опыты с Зиной интересны в нескольких отношениях . Во-первых , вначале обоих опытов выступает в наиболее ясном виде ручная операция со средством: лопатку с лежащей на ней игрушкой Зина поднимает, сгибая руку в локте - так она поступила бы , если бы захватила игрушку рукой : захватив вещь пальцами мы не поднимаем ее на вытянутой руке, а сгибаем руку в локте, приближая вещь к средней линии тела ; лопата явно спаивается в одно целое с рукой.

Вовторых,Зина довольно быстро оставляет эти ручные операции и находит такие приемы - держание " жезлом" и вынимание перехватыванием , - которые сами по себе являются наиболее удачными. Но характерней всего для Зины, то ,что у нее эти приемы выступают скорей в качестве наиболее удобных /для руки./ в некоторых частных положениях ,чем со стороны ее своего наибольшего соответствия об"ективным трсованиям орудия. Поэтому эти приемы остаются у нее крайне грубыми и перемежаются с гораздо менее целесообразными.

Все эти особенности хорошо выступают и у следующей нашей испытуемой .

Маруся В. 2,0 /№ 5I / .Когда ее вводят в кабинет , она принимает меня за врача и громко плачет ; но постепенно она "разыгрывается" и,поставив ее на детский стульчик ,я подаю ей лопату / с длинной ручкой/ и предлагаю достать игрушки /предварительно ,разыгрывая,я много раз доставал игрушки лопаткой/.

Поддевание для нее совершенно недоступно и в дальнейшем я все время накладываю ей игрушки на лопату . Маруся захватывает ручку " жезлом" ,но дергает - так резко и так отводит ее в сторону ,что лопата наклоняется ,и игрушки падают. Она вынимает лопату и осматривает допасть .

Снова захватывает " жезлом " , вынимает медленно , но опять отводить вытянутую вверх руку в сторону , лопата наклоняется и вещи падают:

В следующий раз несколько приподняв лопату правой рукой / держит " жезлом"/,она тянется за игрушками левой рукой ; при этом она наклоняется всем корпусом и правая рука с лопатой уходит вниз - она тянется к вещи левой рукой и этим же общим движением отодвигает ее от себя. Тог-

да Маруся сгибает правый локоть и приближает лопасть с игрушками к левой руке - лопата принимает наклонное положение и вещи выпадают .Это повторяется 6 раз подряд.

На седьмой раз ,после безрезультатных попыток дотянуться левой рукой до игрушек ,она вдруг меняет направление ,захватывает левой рукой рукоять ниже середины и, опустив правую руку ,поднимает лопату выше и несколько к себе , влево- лопата снова наклоняется и вещи сваливаются .

Чтобы поощрить ее , я кладу на лопатку по несколько игрушек. Три раза сряду она поднимает лопату одной правой рукой/ держа " жезлом"/; отведя ручку кверху и все таки еще недостаточно приблизив игрушки, она начинает подгибать лопату - лопасть становится в косое положение и игрушки падают.

На четвертый раз она приподнимает лопату правой рукой, перехватывает ее левой , а затем снова правой; делает это очень грубо, так что лопата описывает волнообразную линию вверх - " виляющий лифт" - и большая часть игрушек падает ; однако, часть она все-таки успевает подхватить . Этот прием перехватывания она повторяет еще раз, но теперь с такими боковыми качаниями ,что все вещи спадают по дороге - она вынимает лопату ,переворачивает ее и осматривает лопасть снизу ,как бы ища в ней причину неудачи.

Следующие два раза она вынимает лопату ,нагруженную игрушками , держа ее " жезлом " у самого верха .В левой руке она крепко сжимает игрушки ,добытые прежде и поэтому не может пустить ее вход хотя и пытается это сделать /де-

лает движения левой рукой навстречу лопатке / Как всегда у самого верха /когда правая рука вытянута до отказа/ лопата начинает подгибаться к горизонтали и вещи выпадают.

Я освобождаю ее левую руку от игрушек и она начинает в. нимать лопату с перехватыванием; перехватывание по прежнему грубо и только 1 раз из трех ей удается достать часть наложенных на лопасть игрушек.

Дальнейшие 2 раза она поднимает лопату без перехвата и один раз с перехватыванием ,все три раза с частичным успехом /она достает игрушки и без перехватывания если захватывает рукоять лопатки " жезлом" и не у самого верха /. Маруся пытается освободить без перехватывания и обращается к нему лишь после того,как прямое движение правой руки вверх оказывается недостаточным.

Итак, у двухлеток мы очень часто находим , особенно вначале эксперимента , ручные операции в их чистом виде . Ребенок сгибает в локте руку,в которой держит лопатку . так, как если бы лопатка была просты продолжением руки, а лопасть - кистью ,которая держит лежащие на ней игрушки. Падение игрушки об"ективно свидетельствует о том,что логика этой инстинктивной операции не соответствует логике орудия. Это несоответствие достаточно громко заявляет о себе и быстро устраняется ; в дальнейшем ручные операции выступают гораздо более скрыто в виде незначительных наклонов лопасти навстречу левой руке и слишком резкого под"ема или перехватывания ,неучитывающих закрепления и заботящих , что вещь на лопасти не держится так же ,как игрушка в зажимающей ее кисти.

Поддевание на лопату почти совершенно не дается этим малышам ; видимо сама задача подсунуть тонкую лопасть под нижний край вещи вообще не встает перед ними. РЕБЕНОК

орудует лопатой, как палкой, и лопасть все время выступает скорее, как помеха. Прогресс в поддевании обычно ограничивается тем, что лопасть принимает постепенно более параллельное полу положение, однако, по отношению к вещам она двигается еще самым случайным образом и очень часто проходит над ними, совсем не задевая их.

Необходимость укрепить игрушку на лопатке также выступает только после неудачи; но так как здесь отношения гораздо ясней, то недостатки быстро выправляются. Впрочем, это не идет дальше простого замедления и осторожности при вынимании и каких нибудь специальных мероприятий для закрепления игрушки на лопасти дети обычно не предпринимают. Наоборот явное отсутствие связи между падением вещи и ее положением на лопатке явственно выдает недоуменное оглядывание поднятой пустой лопасти.

Операции в области которых собственно развертывается деятельность ребенка этого возраста - это поднимание /путем приложения к себе/. Здесь для него раскрываются некоторые действительно положительные возможности и в то время как поддевание и укрепление являются для него скорее досадным препятствием, поднимание доставляет ему подлинное удовольствие.

Еще очень нередко проскальзывает здесь примитивное доставание путем движения к вещи, но оно довольно легко уступает более высокой и опосредствованной форме, приближения вещи к себе. Нужно отдать справедливость этим малышам, в поднимании лопаткой они быстро, иногда на протяжении одного опыта, достигают довольно значительного совершенства. Но пожалуй характерным для них остается все таки то обстоя-

тельство ,что в результате положительных и отрицательных опытов у них отбираются скорее удачные ручные приемы, чем известные орудийные операции ,которые поэтому большею частью сохраняют такую грубость ,что дают только незначительную часть своего полезного эффекта. А кроме того ,эти ручные приемы легко сменяют друг друга и более целесообразные нередко уступают место менее целесообразным в зависимости от случайных обстоятельств / в частности , от способа первоначального захвата ручки/.

Последнее обстоятельство очень демонстративно выступает в следующем протоколе. / Привожу только относящуюся к данному вопросу часть/.

Юра С. 2; 4÷ I6 /Прот. №37/ Юра стоит на маленьком стульчике перед бассейном . Поддевание ему решительно не дается, он беспорядочно сует лопастью между вещами, держа лопату самым неподходящим образом ; поддеваю игрушки на лопатку всегда я сам.

Поднимание идет у Юры различно , в зависимости от того ,как он вначале захватит лопату и с какой вещью имеет дело. В подавляющем большинстве случаев он берет рукоять "жезлом " и тогда его кулачек ,держащий конец ручки,описывает слегка наклонную кривую, явно загибающуюся на вершине назад: Теперь все зависит от того в какой точке этой кривой остановится рука, а это в свою очередь от того ,на каком уровне возьмется Юра за ручку лопаты. Если Юра захватил рукоять не у самого края, а где нибудь пониже и вещь не слишком подвижна / большой куб, призма , оклеенный бумагой кубик/ ,он благополучно достает их . Если же вещь мала и легка /целлулоидная рыбка и лягушка / , а Юра взялся за самый конец деревка лопатки ,то для того чтобы достаточно поднять

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лопасть,он высоко поднимает правую руку и отводит ее назад - лопасть наклоняется и большею частью игрушка сваливается , так как он не успевает подхватить ее другой рукой :

Но если он захватывает рукоять " палки"
- иногда я нарочно подсовываю ему деревко таким образом или просто кладу его руку так на рукоять лопатки - то независимо от вещи внимание всегда кончается неудачей : лишь в меру своих естественных возможностей, приблизительно до уровня плеча, локоть руки ,держащей лопатку идет вверх , а затем неизбежно отклоняется назад и в сторону,лопатка принимает все более горизонтальное положение и вещь вываливается.

Когда мы предлагаем ту же самую задачу детям в возрасте около 3 лет ,сразу становится заметна качественная разница ,значительный "прогресс " по сравнению с вдухлетками . Я приведу снова только несколько наиболее типичных протоколов.

Таня Т. 3,0 ÷ 18 /№30/ ее приходится довольно долго " разыгрывать " ,а затем чтобы облегчить задачу и поощрить ее, я накладываю игрушку на лопасть ,она долго и неудачно пыталась подцепить призму / " крышу"/ с широким основанием. Дальше она сама поддевает бочонок и благополучно досывает его из бассейна - бочонок облокотился на рукоять ,лопата идет правильно вверх и у края Таня подхватывает игрушку левой рукой.

Я накладываю несколько игрушек- Таня поднимает лопату с таким наклоном ,что все они спадают. Снова накладываю

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игрушки. Таня держит рукоять " обратной палкой " / ладонь к переди и от себя кисть вывернута к низу/ , и все-таки поднимает лопату строго вертикально, игрушки не падают и она их снимает левой рукой. Продолжая так же неудобно держать лопату ,она пытается сама поддеть мелкие игрушки ,но безуспешно.

Я кладу лягушку на лопасть - поднимая лопату, Таня наклоняет ее : и лягушка падает. Она сама поддевает ее на лопасть и поднимает ,но так как лопатка все время находится под небольшим наклоном ,то лягушка скользит и наконец спадает. Таня снова поддевает ее и теперь держа рукоять в строго вертикальном положении , благополучно вынимает лягушку.

Ей долго не удается поддеть рыбку, которая от удара лопаты все время перескакивает через лопасть ; наконец она заполучает ее на лопатку и осторожно вынимает .

Маленький и круглый бирюлечный кувшинчик она несколько раз поддевает на лопату ,но при поднимании он каждый раз скатывается от незначительных раскачиваний лопатки /он не закрепляется облокачиванием на ручку/ .Снова обращается к рыбке,сначала тянется к ней невооруженной рукой,но сейчас же берет лопатку и держа ее / неудобным приемом / " обратной палки " поддевает рыбку и правильно ее поднимает .

" Достань лебедя" ,советую я. Она легко поддевает его /держит лопату " вилкой" / быстро поднимает ,но от резкого движения игрушка падает .Таня повертывает лопату лопастью от себя, долго охотится за лебедем ,наконец поддевает и поднимает.

Она просит пододвинуть ей бочку ,лежащую у противоположной стены бассейна ; пододвигаю. Она поддевает ее,

подымает и на полпути не закрепленная бочка скатывается. Так повторяется несколько раз : бочка не закрепляется и во время поднимания спадает.

Таня оставляет бочку переходит к бирюлечному кувшинчику ,поддевает его ,он накатывается на рукоять и она успешно его достает.

Résumé. Поднимание у Т. уже вполне оформилось ; лишь иногда здесь проскальзывают более примитивные операции в виде наклонения уже поднятой лопаты/ к их числу разумеется нельзя отнести те случаи, когда лопата с самого начала поднимается вертикально,но в несколько косом положении / .Тане уже доступно поддевание - важный шаг по сравнению с нашими предыдущими испытуемыми ; правда, оно еще очень грубо и поэтому осуществляется только в отношении вещей легких и с круглыми боками , которые так сказать сами идут ему навстречу .Активная операция закрепления еще остается недоступной для Тани. Если вещь накатится на рукоять,она всегда пытается сохранить это благоприятное положение - и это условие будущих успехов , - но пока она не пытается создать его умышленно ,она использует случайное закрепление,но сама не закрепляет.

Слава Д. 3; 0 ± 10/ №32/ .Слава держит лопату"вилкой" быстро поддевает большую бочку и катит ее по стенке бассейна : на верхней половине пути лопата принимает более горизонтальное положение лопасть отходит от стенки и бочка падает :

Слава делает несколько " идеологических" движений доставания по стенке /без вещи /, а затем тянется в бассейн свободной левой рукой. Бросает лопату ,идет играть в картинки.

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Предлагаю взяться за доставание . Он охотится за большой синей бочкой , неловко ударяя ее по боку лопастью. Наконец поддевает ,катит ее по стенке и на полпути пытается подхватить свободной левой рукой; при этом он облокачивает деревянно лопатки о край бассейна и нажимает на рукоять - лопасть снова отходит от стенки и бочка падает:

" Ты достань" говорит он мне плаксиво .Я поддеваю бочку и,чуть облокотив на ручку, лихо поднимаю ее высоко вверх,потом обратно вниз перед его глазами и подаю ему пустую лопатку. Он пытается достать рыбку от противоположной стенки бассейна действуя" с а п о й ":

; это продолжается довольно долго и безуспешно , поэтому я подгоняю игрушку ближе.

Слава держит лопату " жезлом" ; он быстро поддевает рыбу ,правильным лифтом поднимает ее и вынимает;не меняя руки он обращается к лягушке и вытаскивает также и ее.

Но затем он меняет руку, держит лопату " палкой" и уже ни поддеть ,ни достать ему больше ничего не удается. Он идет играть с картинками и через некоторое время возвращается к бассейну. Поддевает большой красивый конус и катит его по стенке бассейна до верху ,где подхватывает левой рукой. Обрадованный успехом ,он обращается к трехгранной пирамиде,пытаясь поддеть , царапает ее по сторонам лопастью ,наконец поддевает и ,хотя пирамида хорошо лежит на лопатке ,он также тянет ее по стенке бассейна ,причем пирамида цепляется за выступы отдельных досок и на полпути ,от поворота лопаты в сторону руки , сваливается.

Слава поддевает лебедя и опять принимается волочить его между стенкой и лопатой /хотя в этом нет никакой на-

добности/; в верхней половине пути он поднимает лопату из бассейна так, что лопасть первая отходит от стенки и вещь выпадает :

Résumé. Ясно выступает промежуточный характер операций : в поднимании часто проскальзывают примитивные формы, поддевание еще очень грубо, но уже неограниченно ; следует отметить навязчивое повторение приемов / тянуть по стенке / которые были удачны в одних случаях / круглые вещи /, но излишни и просто нецелесообразны в других.

Леня Д. 3; 0 ÷ 4 / №38/ Леня - краснощекий , веселый малыш с синими глазами .

Мы рассматриваем с ним картинки и о каждой он спрашивает " это что " . Он довольно быстро запоминает названия.

Берет ручку лопаты необычным образом / " обратной палкой "/, но довольно быстро поддевает маленький бирюлечный кувшинчик и, накатив его на ручку, благополучно достает .

А ну , еще раз, предлагаю я. Теперь он держит лопату "палкой" и пытается катить кувшинчик между лопаткой и стенкой бассейна , но лопата цепляется за выступ досок и бирюлька падает. Он повторяет попытки , прижимая кувшинчик к стенке краем лопаты. Затем он меняет положение и теперь держит рукоять " вилкой". Несколько раз пытается катить по стенке и после неудачи , осторожно, не облокачивая, поднимает лифтом и достает кувшинчик.

Держа лопатку в положении " обратной палки ", Леня пытается достать бирюлечный кувшинчик , поддевая его разными сторонами лопасти и держа эту лопасть под разными углами. Он перехватывает рукоять прямой " палкой " и пытается подцепить горшечек от противоположной стенки так:

Держа лопату " вилкой " он обращается к большому кубу и упорно крепко царапает его, затем ему удается

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поддеть его на лопасть,но /вместо того чтобы прямо поднять /, он пытается волочить его по стенке - куб цепляется за выступающие доски и сваливается.

" Не достану " говорит он, поддевает маленький кубик и, отведя лопату от стенки ,поднимает и достает .

Держа лопату " палкой " , он пытается загрести лягушку ,лежащую у противоположной стенки: ;в конце концов он зацепляет ее , пододвигает ближе к себе и затем, переидя на " обратную палку " ,некоторое время царапает ее по стенке. Наконец ему удается поддеть лягушку и пытается волочить ее по стенке. В верхней половине бассейна он отводит лопату и лягушка падает . Это повторяется раз 6.

Зеленую бочку он катит вдоль стенки и подхватывает другой рукой. " Э-э , так нельзя" - говорю я и бросаю бочку в бассейн. Она откатывается к противоположной стенке и Л. пытается достать ее " сапой".

Бросает лопату и идет смотреть картинки. Я повторяю их названия ,он их быстро усваивает и дальше правильно называет сам. Отдых.

Мы снова беремся за доставание .Леня царапает большой куб,пытаясь прижать его острием лопасти к стенке. Оставляет его . Берется за зеленую бочку у противоположного края бассейна и правильно продвигает ее к себе, но здесь переходит к большому ролику.

Сначала Леня пытается подцепить его лопастью за за шейку ,потом поддевает его налопасть и поднимает с небольшим наклоном почти до верху ,но здесь лопата наклоняет-/к себе/ и ролик падает. После нескольких подобных проб он

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бросает лопату и идет к картинкам. Играет с картинками.

Держа лопату " вилкой" он катит большую бочку по стенке и благополучно доходит до верхней части бассейна , где подхватывает ее рукой. Тоже повторяется и с средней зеленой бочкой.

Снова скребет большой куб ,но безуспешно."Куб не достается " говорит он /он быстро усваивает мои названия / Большой ролик, ,стоящий на головке ,он настойчиво / в нескольких приемов / пытается перевернуть на бок и когда после этого ролик откатывается он пытается достать его "сапой" :  конечно , безуспешно и бросает его.

Маленький ролик ему удается выкатить лопатой по стенке, при чем ручку лопаты он правильно перебирает руками по мере ее под"ема.

Лопата " вилкой", царапает призму, никак не умея ее поддеть ; бросает лопату.

" Попробуй достать" ."Не хочу попробывать " говорит он и начинает играть с уже вынутыми игрушками ./Вот рыба с ротом "/. Бежит в уборную.

Вернувшись , с удовольствием берется за лопату . Держит ее " вилкой " ,поддевает призму и боком волочит ее по стенке/что только затрудняет /; вытаскивает. Затем быстро поддевает конус и облокачивает его на рукоять . Конус лежит на лопасти с опорой на ручку, однако Леня поднимает лопату ведя передним краем лопасти по стенке бассейна/что совершенно излишне и только затрудняет дело/ :  однако, операция кончается благополучно: у верхней трети бассейна Леня осторожно отводит лопату от стенки и ,сохраняя облокачивание ,вынимает игрушку.

Долгое время он охотится за " кроликом " / как он

называет большой ролик ,но последний все время перекатывается через лопасть .

Пытается поддеть " сапой" маленькую бочечку от противоположной стенки бассейна.

Когда лопата попадает под доски бассейна он беспорядочно дергает ручку во все стороны,так что лопасть часто спадает. До конца опыта он не научается правильно освобождать лопату от ущемления .

Résumé : настойчивое возвращение к приемам раз оказавшимся удачными, здесь выступает еще ясней :большой ролик стоит на округлой головке - это самое удобное положение ,чтобы поддеть и поднять его - но Леня упорно переворачивает его на бок, при чем ролик становится гораздо менее доступен и для поддевания и для доставания /хотя бы и путем выкатывания по стенке /; он ведет по стенке бассейна передний край лопасти,причем вся лопата ,на которой лежит большой конус, опирающийся на рукоять ,отклонена от этой стенки - это уже совсем бескорыстная и довольно дорогая дань идее /катить по стенке/ , при чем интересно, что попавшееся ему удачное положение - облокачивание на ручку - он не выпускает и пытается просто сочленить его с своим излюбленным приемом.

В остальном все тоже : грубое ,но действенное поддевание ,овладение подниманием ,иногда проскальзывание более примитивных приемов .

В целом трехлетки отличаются от двухлеток следующими чертами : поднимание почти у всех уже вполне оформилось ; о том,что оно недавнее приобретение свидетельствует зависимость его в отдельных случаях от первоначального захвата рукоятки и нередко , особенно в критические моменты и в моменты спешки / у самого верха бассейна ,например/

проскальзывающие более примитивные операции.

Поддевание также доступно этому уровню ,но дети еще далеко не овладели им до конца. Об этом говорит и большая вариация поддевания у разных испытуемых и самый характер операции , ее грубость . Дети поддевают ,но реже всего они пытаются достигнуть этого путем осторожного подсовывания тонкой лопасти под нижний край вещи. Напротив ,они с силой ударяют по ее боковой стороне сплошь и рядом очень далеко от ее нижнего края и игрушка оказывается на лопасти или потому ,что будучи легкой или круглой,она подскакивает от удара или потому,что один из них случайно приходится под дно. Таким образом и здесь мы имеем скорее установление общей связи между известным приемом и его результатом ,чем собственно учет об"ективных отношений между орудием и предметом.

Что касается закрепления игрушки на лопасти ,то эта операция еще не встает, как самостоятельная задача, однако, случайно возникшее благоприятное положение немедленно используется # сознательно,сказал бы я, если бы это сознание означало не больше ,чем непосредственное усмотрение преимущества случайно возникшего изменения .Это частный случай характерной особенности этой группы испытуемых : они явно следят, подбирают и стараются пустить в ход приемы,оказавшиеся удачными. Применение их в далеко не соответствующих случаях -эти своего рода " хорошие " ошибки - показывают ,что понимание этих приемов у самих детей далеко отстает от активности в их применении.

Но зато понимание выступает действительно новым фактором ,который правда на первых порах дает себя знать, главным образом ,своими недостатками .Но что особенно интересно : оно дает себя знать как раз в отношении ,то операции

которой дети уже вполне овладели - в поднимании ; гораздо меньше он проявляется в поддевании , которым еще только овладевают , а в закреплении , которое остается задачей оудущего , мы не находим в приведенных случаях попытки активно воспроизвести удачную ситуацию , видимо потому ,что даже связь между таким положением и вызывающими его приемами остается неуловленной / уже не говоря об учете об"ективных отношений , которые здесь еще менее доступны чем даже в операциях ,которыми дети овладели и где этот учет все-таки остается далеко не полным/ .

Переходим к группе наших испытуемых ,которым около 4-х лет. Естественно , у них мы находим дальнейшее усовершенствование по всем трем основным операциям.

Владик Х. 3; IO/ №22/ " Этой лопаткой что нужно - вот так копать?". спрашивает он , делая лопастью поддевающие движения от себя. " Достань ею игрушки" ,предлагаю я. Владик осторожно поддевает игрушки , лежащие у стенки бассейна ,но попадает в щель между стеной и полом и никак не может освободить лопаты,; я помогаю ему. Он поддевает бочку и вынимает ее правильным лифтом ,но так как бочка не укреплена ,она на полдороге скатывается. Долго ему не удается поддевание / все попадает под щель между стенкой и полом / , затем он накатывает бочку так,что она опирается на палку и сохраняя это положение вынимает .

поддевает рыбку и сначала волочит ее по стенке, лопата цепляет за щели, идет рывками и в конце концев рыбка падает . Он снова поддевает ее , отводит лопату на середину бассейна и правильно поднимает .

Грибок он благополучно выкатывает по стенке бассейна.

Долго охотится за лягушкой / она лежит в углу / и

все время то ставит лопату " сашкой" поперек угла, то поддевает под стенку бассейна и сильно дергает. Я советую осторожней и он начинает спокойней вынимать лопату из под края бассейна. Наконец он осторожно поддевает лягушку и очень медленно, держа лопату строго вертикально, поднимает ее, перебирая по рукоятке руками; * зеленую бочку выкатывает по стенке.

Большой ролик он так осторожно поддевает, что он остается стоять у края лопасти, и тщательно следя за положением лопаты, он медленно достает его перебирая по рукоятке.

Маленький бирюлечный чугунчик с широким дном, находящийся в углу бассейна, он осторожно поддевает, отводит лопату на середину бассейна и лифтом вынимает .

Затем он сбрасывает все игрушки в бассейн /несмотря на мою просьбу подождать - я не успеваю все записывать / и снова принимается доставать . Но теперь он катит все вещи по стенке - бочку ,ролик , рыбку, - лопата цепляет за щели между досками и рыбка падает ." Я не могу доставать " говорит он и передает лопату подошедшим в это время другим детям / Дети с азартом ловят , вырывая друг у друга лопату и добываемые игрушки ,пока я записываю . Затем я снова передаю лопату Владику/.

Осторожно поддевает и правильным лифтом достает лягушку . Бочку катит по стенке, лопата застревает в щели ,он ее выдергивает и бочка падает.

Грибок осторожно катить по стене, в верхней половине пути накатывает его на рукоять ,отводит от стенки и вынимает . Рыбу и большую бочку катит по стенке .Второй раз рыбу волочит по стенке , а когда лопата застревает, он

осторожно отводит ее от стены и поднимает рыбку лопатой . Это повторяется еще раз .

Бочку катит по стенке , но она выкатывается сбоку и падает .

Résumé: Владик уже овладел всеми тремя операциями: доставанием- полностью ; поддевание выступает у него , в своем настоящем виде ,однако, он нередко подсовывает лопасть с такой силой , что она заходит под доски бассейна. Наконец , уже вполне выражена операция закрепления путем облокачивания на рукоять ,однако к ней он прибегает лишь изредка.

Тамара К. 4; I+I3/№23/ Берет лопату " палкой " и немедленно приступает к доставанию." Лебедя достаю " говорит она , поддевает лебедя резкими движениями и , облокотив на рукоять , поднимает .

Пытается поддеть лягушку ,но держит лопасть боком и наискось ; неудается . Резкими движениями она охотится за рыбкой , та подскакивает от удара на лопату и Тамара ее поднимает.

Теперь она держит лопату " вилкой " и осторожно поддевает маленькую бочку, но та все время перекатывается и через 5 минут Тамара заявляет " не хочу доставать " .

" Ну достань лягушку " предлагаю я. Тамара держит лопату " палкой "и осторожно сапой поддевает разные вещи, но лопасть стоит косо и все скатывается.

Ей удается поддеть лягушку ,но у верхнего края бассейна рука отклоняется и лягушка падает; это повторяется дважды .

Затем Тамара переходит к ролику , пытается грубо поддеть его , держа лопасть сапкой и косо :

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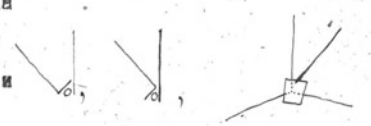
никак не удается . Когда лопата попадает шид в щель под стенку,она осторожно , не дергая освобождает ее.

Добывания вещей из углов и от противоположной стороны дается Тамаре очень трудно она беспорядочно сует туда лопату самым неподходящим образом : и выкатывает игрушки далеко не всегда и всегда случайно.



В конце опыта ее движения становятся более осторожны и целесообразны , она держит лопату преимущественно " чайно ложечкой " и таким образом она поддевает маленькую бочку и поднимает ее , предварительно чуть облокотив на рукоять .

Последним она достает очень неустойчивый и круглый бирюлечный кувшинчик , держа лопату " чайно ложечкой " и катя игрушку по стенке бассейна.

Résumé: Здесь можно отметить в общем тоже , что и в предыдущем случае: наличие всех трех основных операций , иногда проскальзывание более примитивных и даже ручных .

Нина З. 4,0 + 9/ №42 / Держа лопату " вилкой," Нина сразу осторожно поддевает рыбку и лягушку и,выворачивая руку локтем кверху,поднимает лопатку правильным лифтом.

Она очень долго возится с большой бочкой,пытаясь закрепить ее на лопасти , но та все перекатывается и Нина переходит к средней бочке . Здесь после долгих усилий ей удается установить бочку на лопатке и поднять до середины , но тут бочка откатывается и падает . Нина снова долго поддевает и закрепляет ее , наконец , ей удается накатать бочку на рукоять с бокового края лопасти и, слегка наклонив на ручку , Нина осторожно чистым лифтом поднимает и-

игрушку.

Также долго возится она с большим роликом ,пока подденает и устанавливает его на лопатке , затем очень осторожно - ролик стоит на краю лопатки - поднимает его вертикально .

Очень долго и настойчиво осторожными движениями накатывает грибок на ручку и , сохраняя должный наклон, чисто достает . Так же осторожно поддевает она большую бочку и укрепив поднимает .

Résumé: у Нины все операции получают наибольшую выразительность . Поднимание достигает своего совершенства ; даже тогда ,когда Нина берется неудобным образом за рукоятку и не меняет этого положения ,она всячески изгибается сама ,но сохраняет правильное вертикальное движение лопаты ; если для закрепления нужно придать лопате некоторый наклон, она его сохраняет и при поднимании всей лопаты лифтом .

Поддевание происходит без прежней силы и порывистости , у нее не бывает ,чтобы лопата заклинилась под край бассейна и пожалуй единственный недостаток этой операции заключается в том,что она выступает еще как обособленное звено , что оно не спаяно еще непосредственно с операцией последующего закрепления . Может быть это обусловлено тем, что именно закрепление / особенно ясно у Нины / выступает в качестве самостоятельной ,отдельно выполняемой задачи, задачи , которой она овладела в принципе ,но еще не целиком освоила .

Таким образом в среднем около 4 лет дети овладевают всеми основными орудийными операциями ,которые входят в состав нашей задачи . Но разные операции в этом возрасте

освоены еще в не одинаковой степени : поднимание - полностью ; поддевание намечено в своем настоящем виде /подсовывание лопасти под нижний край вещи/, но часто обнаруживает ряд шероховатостей / слишком сильно ,не всегда правильно держится лопасть /; закрепление представляет наибольшие трудности и наибольшие вариации , это та операция ,которою сооственно овладевают на данном уровне развития.

Как и следовало ожидать на следующей ступени , через год мы обычно встречаем уже вполне сложившиеся операции всех трех порядков.

Так, Вова Д. 5; I+ 28 / № 49/ . Держит лопату "палкой",осторожно поддевает прибок ,накатывает его на ручку и перебирая по неиф руками чистым лифтом поднимает / у самого края вещь случайно падает/.

Также -"сапкой " поддевает ролик ,накатывает его на рукоять и поднимает . На пути ролик дважды откатывается и он дважды на ходу снова накатывает его на ручку (у самого верха от случайного толчка ролик выпадает).

Он поддевает бочку, облокачивает ее на рукоять, достает.

Держит лопату " жезлом с вилкой," перебирая руками по рукоятке поднимает лягушку и рыбку, при чем от быстрого перехватывания лопатка иногда наклоняется ;но Вова пристально следит за лопастью и непозволяет игрушкам скатиться.

Таким же образом поднимает среднюю бочку. На пути она откатывается от ручки и он снова облокачивает ее и благополучно вынимает . Осторожно поддевает ролик ,после долгих попыток накатывает его на палку и держа лопатку

в этом наклоне / для прочности / вертикально поднимает ее вверх.

Résumé: Мастерское владение всеми приемами / и поднимании , и закреплении/,особенно ясно выступает в тех случаях ,когда неустойчивая игрушка на ходу откатывается и уверенно снова накатывается Вовой на рукоятку.

Итак пятилетки вполне овладевают той серией орудийных операций ,которых требует пред"являемая нами задача. Однако, для них эта задача еще представляет известные трудности , лежит в"зоне трудности" ,хотя и у нижней ее границы. На более старших возрастах она становится для большинства чрезмерно легкой и уже не показательной .

Я ограничусь поэтому краткой выпиской из протокола одного восьмилетнего мальчика, у которого несколько пренебрежительное отношение к задаче и законченность орудийных операций выступают особенно наглядно.

Шура Ю. 8,4 /№ I3/ Он держит лопату " палкой" за конец ручки и поэтому поднимая идеальным лифтом ,вынужден сначала выворачивать руку локтем вверх и кнаружи , а затем поворачиваясь всем туловищем вправо и назад к лопате и в тоже время наклоняться левым плечом к ящику. Тем не менее он очень быстро и уверенно вынимает таким образом все вещи, при чем вычурные изгибы его тела и правой руки находятся в каком то разительном контрасте со строгой прямолинейностью движений лопаты. Большой конус и ролик он сначала ставит / лопатой/ на их основание ,потом поддевает и достает.

Повторяем . Большие и тяжелые вещи он старается сначала чуть приподнять /лопатой / и затем поддеть на лопасть. Он выполняет теперь все операции / особенно поднимания / так быстро , что несмотря на правильность движений вещи иногда от

резких рывков сваливаются.

Очевидно , наша задача во всех ее подразделениях уже не представляет для Шуры никакой трудности . И у него бывают неудачи,но совершенство выполняемых движений их соответствие об"ективным требованиям орудия и свойствам доеываемых предметов , независимость орудийных операций от способа первоначального захвата лопатки - все это говорит о том,что случайные падения игрушек являются результатом просто недостаточно внимательного отношения к заданию. Оно ниже " уровня " притязаний " испытуемого.

На этом мы закончим изложение материала и обратимся к его анализу.

Ш.

Экспериментальный материал ,приведенный выше, ставит перед нами два основных вопроса:

О различии ручных и орудийных операций ;

О последовательности и причине в развитии и смене операции.

Прежде всего мы можем теперь несколько точнее обозначить то,что мы называем орудийными операциями.Орудийные операции- это система движений вспомогательной вещи, орудия,приводящая к намеченной цели. Конечно, орудие в свою очередь приводится в движение рукой ,но не движение руки /или рук/ , а именно движения самого орудия составляют орудийную операцию. В описанном выше процессе доставания такими орудийными операциями являются вертикальный под"ем лопаты " лифтом" /все равно стоит ли при этом рукоять совершенно отвесно или чуть наклонена ,когда на нее

опирается поднимаемая вещь/, а не ход кости и локтя или перебирание руками по рукояти ; подсовывание лопасти под игрушку, а не те усилия ,которые производит при этом держащая лопату рука; облокачивание на рукоять , а не те вдвижения , с помощью которых это облокачивание достигается.Словом ,орудийная операция - эта система движений орудия,переводящая предметы из начального состояния в намеченное .

Орудийная операция представляет , сооой категорию, оо"ективную по отношению к суо"екту .Она - образец, которым суо"ект должен овладеть и которым он овладевает только постепенно .Естественно ,что те движения тела , с помощью которых суо"ект овладевает орудийной операцией, меняется в процессе усовершенствования деятельности . И нередко одна и та же орудийная операция,обслуживается разнообразными движениями руки,ооих рук и даже туловища ,которые могут калеидоскопически меняться на протяжении одного и того же акта доставания. Но всегда сочетание их направляется и определяется одним решающим моментом - задачей обслужить соответствующую орудийную операцию. Одни из этих приемов руки более целесообразны - как например захват " жезлом" или "чайной ложечкой", - другие менее целесообразны - как например держание "палкой" и орудование " сапкой" - более или менее целесообразны в том смысле ,что облегчают или затрудняют выполнение отдельной или даже ряда операций. Но решают дело не они, а степень оформления орудийных операции , кристализация и фиксация целесообразной системы движений самого орудия ; и лишь тогда , когда последняя еще

слаба или совсем не выступает ,эти движения рук начинают доминировать во внешней картине деятельности и решают ее исход.

Движения и захваты руки, держащей орудие, не составляют также и ручных операций ./ Аналогично орудийным операциям - и в противоположность им - ручные операции - это система движений руки, как самостоятельного орудия , та система движений , которую производит рука, когда она непосредственно соприкасается с об"ектом и самостоятельно выполняет намеченное воздействие.

Ручные операции - частный случай орудийных , когда орудием является сама рука. Естественно ,что операции производимые рукой как особым орудием , и каким нибудь другим орудием , имеющим " ясно выраженную индивидуальность , " будут носить печать совершенно четкого различия в самой системе составляющих их движений .

И действительно, мы видим ,эти различия с максимальной четкостью в эксперименте . Вот одна из основных частей нашего задачания :поднять вещь, лежащую на лопасти. Если мы опустим промежуточные звенья и возьмем лишь наиболее выразительные ,мы находим четкие ручные операции вначале возрастного ряда и четкие орудийные операции в его конце: Владик / двухлетка /,приподняв лопату на сколько этого требует выпрямившийся торс /он нагнулся с лопатой в оассейн/ , затем сгибает руку в локте,как если бы лопасть ,на которой лежит игрушка , была сжимающая ее кисть руки и нечего было опасаться падения игрушки. Ребенок действует так ,как действуют рукой , а не лопатой , лопата следует за движениями тела и конечностей,вопреки тем движениям ,которые она должна была проделать следуя

собственной логике,- она включается в систему ручных операций и становится простым удлинением руки.

А вот мальчик 8 лет / Шурма Ю./: он неудачно захватил лопату / " палки"/ и ему приходится делать акробатические движения всем телом, чтобы обеспечить правильное восхождение орудия, наклоняется вперед и набок, поворачиваясь грудью вправо и выворачивая правую руку локтем вверх, он буквально крутится волчком вокруг орудия , которое остается прочной осью всего этого перевозбка движений . Здесь ,наоборот , рука и все тело включается в систему орудийных операций и всячески приспосабляются к тому, что бы сохранить эту об"ективную систему в нерушимом виде. Вероятно никакое описание не сможет заменить непосредственное впечатление и адэкватно передать всей остроты этого различия, когда на глазах у наблюдателя одна и та же вещь, включаясь в разные системы операций , меняет свои свойства, свое лицо ,свое значение и вместе с тем характер ситуации в целом .Один раз она ассимилируется суб"ектом, становится продолжением его руки и вместе с нею противо*- стоит об"екту ; наличие промежуточного звена не меняет отношения суб"екта к предмету воздействия , и оно остается непосредственным . Другой раз эта промежуточная вещь--средство вступает в особую ,общественную систему отношения с суб"ектом - и теперь предмет воздействия опосредствуется ею, а суб "ект находит свое в ней новые ,"сверхестественные " органы, впервые действительно" выходящие за пределы ,положенные биолией " . /Маркс/.

На операции поддевания на лопасть можно особенно наглядно видеть, как одна и та же вещь то теряет ,то приобретает характер орудия[x/].

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x/ см.прим. на сл. стран.

На первых порах эта операция выражается в грубых попытках с силой прижать игрушку лопастью / а еще лучше рукоятью/ к стенке бассейна и таким образом подтянуть ее выше- словом поступить так, как мы поступили бы , если бы наша рука была лишена кисти и пальцев и представляла бы собой сгибающуюся по середине палку. И лишь на следующем этапе развития появляется собственно орудийное отношение к операции. Оно появляется сначала в " чистом виде" , свободное от всякого понимания своих технических условий , то в форме грубых и беспомощных попыток поддевания ,когда лопасть ударяет по бокам предмета ,то как " идеологическое" поддевание , когда лопата проходит высоко над игрушками. Оно выступает здесь скорее как подражание приему взрослых, чем (в качестве) самостоятельного предметного действия . Но этим наивным способом оно выдает ту основную истину , /которая на более высоких уровнях развития легко ускользает от психологического исследования /, что источником нового орудийного осознания предмета является не простое усмотрение технико-рационалистической связи цели и средства // которое как раз появляется позже/ , а общественное назначение этого предмета , фиксированное в приемах его употребления взрослым человеком .

Итак, в системе орудийных и ручных операции мы находим четкий признак ,позволяющий судить о том, имеем ли мы перед собой орудие или только средство . Одно наличие

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x/ Что касается закрепления, то этот прием не может получить в лопатке своего ясного ручного эквивалента /что же может заменить в лопатке зажатие в кулак?/ и оно проявляется скорей отрицательным образом , в неучете этого момента/о чем мы несколько раз упоминали выше/.

промежуточной вещи, так же как и целевой характер пользования ею - так сказать морфологический и функциональный признаки - недостаточны для различения средства от орудия ; даже изготовление этой вещи, бесспорно имеющее место у животных ,не может служить само по себе таким отличительным признаком ,ибо все дело в том,что готовится: орудие или средство . На этот вопрос может ответить только структура опосредствованного действия - решающим является системный критерий ,строение самой операции; ибо только она является подлинной действительностью орудия и средства ,как таковых ,их бытием в действии .

Почему это различие не выступало перед прежними исследователями ? Причина этого заключается в следующем Исследователи - экспериментаторы вообще не ставили перед своей задачу такого различения .Опираясь на понятие орудия ,как промежуточной вспомогательной вещи /как мы видим ,понятия совершенно недостаточного / одни из них / к их числу принадлежит Келер/ пытались показать ,что у животных есть зачаточные орудия ; и для этого они выбирали столь примитивные орудия ,что в них исчезали все собственно орудийные черты .Другие же,наоборот ,пытались показать /как это делал, например, Торндайк/, что никакого понимания орудии у животных нет - и тогда они подбирали для эксперимента такие задачи и такие орудия ,которые исключали всякую возможность ручных операций .

Когда в результате этих экспериментов перед исследователями -теоретиками /Плеханов, из психологов-Выготский , Вагнер / возникала задача различения между орудиями человека и животных ,они получали для ее решения уже негодный материал .Ибо различие между орудием и вспомога-

тельным средством становится заметным лишь при том условии, если мы подбираем в эксперименте : во-первых, такую такую деятельность ,которую можно выполнять и непосредственно и с помощью орудия и, во -вторых , такое орудие ,которое обладает четкой собственной логикой и в то же время допускает выявление ручных операции .Оба эти специальные и не всегда легко осуществимые условия не выполнены даже в опытах Келера.Палка и веревка,основные " орудия" келеровских шимпанзе,представляют несомненно большие преимущества для решения вопросов,которые поставил себе Келер ,но мало пригодны для выявления различных операций :эти не выразительные вещи могут применяться для самых различных целей и в них не фиксировано определенной системы операций ; любые способы действования соответствуют их безличной природе .С другой стороны, когда обезьяна в качестве палки пользуется одеялом или башмаками ,то такое применение настолько далеко от прямого назначения этих вещей, что самая возможность сравнения различных типов операций исключается и вещи выступают вне фиксированного в них контекста действия ,то-есть снова как естественные безразличные ,полифункциональные предметы.

Но если различие операций , а следовательно и характер каждой из основных форм операций не могли выступить перед сознанием исследователей ,то это не значит, конечно, что самые операции были лишены в их опытах и наблюдениях этого определенного характера. После того,как это различение показано и установлено , мы уже не можем сомневаться в том,что обезьяны в опытах Келера ,пользуясь палками ,обнаруживают классические ручные операции[x]/.Лучше всего это

x/ Ручные в том общем смысле,в каком лапа обезьяны может быть приравнена к руке, как естественному орудию.

показывают те же случаи использования таких " не подходящих " предметов ,как одеяло ,поля шляпы,соломинка и башмаки. Использование их делает честь умственным способностям шимпанзе и нет сомнения,что их поведение обнаруживает разум . Но это разум ручных операции ; он не считается с фиксированным в предметах их общественным употреблением ,он подчиняет вещи логике ручного действия . Это - инстинктивный разум / в чем мы соглашаемся с большинством исследователей /, разум, который ограничивается усмотрением возможности простого удлинения руки. Это,конечно, не должно означать ,что обезьяна изготовляя длинную палку имеет ввиду сделать свою длинную руку; вероятней всего она буквально имеет ввиду нечто длинное,чем можно дотянуться до цели . Но для нас совершенно достаточно того,что палка не только оптически ,но и механически ,по способу действования фактически является продолжением ее лапы.

И хотя Плеханов,в качестве не психолога легко соглашается с Дарвиным в том,что ветка, которою слон обмахивает мух со спины , представляет собой зачаточное орудие / " К развитию монистического взгляда на историю " гл. У ,стр. 108 ; 1906 г.изд./ , однако , даже не имея описания того,как слон производит эту операцию ,невозможно сомневаться в том,что эта ветка является простым продолжением хобота и слон действует ею так ,как на более доступных частях тела он действует непосредственно хоботом.

" Орудия " животных только удлиняют их естественные органы и понятно ,почему в жизни животных эти вспомогательные средства не играют существенной роли- ибо они

не играют новой роли, а старую роль они играют в целом гораздо хуже, чем естественные органы. Как бы ни было полифункционально средство, оно никогда не может сравняться с полифункциональностью такого естественного органа, как рука. Разве можно сравнить палку с рукой обезьяны или даже хоботом слона?! Но лапа, которая берет палку, ограничивается возможностями палки; она становится длиннее, зато она теряет несравненные преимущества кисти и пальцев. Выигрыш в одном отношении с лихвой покрывается потерей гораздо большего числа преимуществ. Поэтому применение вспомогательных средств имеет место у животных лишь в очень ограниченных случаях и при том, как метко подчеркивает Келер, лишь в " не серьезных " случаях, когда нет необходимости напрягать все свои жизненные силы и возможности.

Очевидно, мы должны рассматривать вспомогательные средства у животных не как зачаток орудия, а только как его биологическую возможность, не как зерно из которого орудие развивается, а как реальное условие его развития, - подобно тому как гортань является условием, но не причиной звуковой речи, как вообще физическая организация нашего обезьяноподобного предка было условием для его развития человека, существо которого - " совокупность общественных отношений"- формируется, однако, из совсем другого источника. Энгельс гениально показал, что только внутри новой действительности общественного труда возникает орудие, изготовление которого оформляет самый процесс труда. Сначала общественное производство, опираясь на естественные возможности, достигает известной степени развития и лишь тогда из него и в нем, а не в индивидуальной деятельности, рождается орудие. Средство животного отделено от орудия

человека каким-то периодом сообственно исторического развития. В течение его " когда человеческий труд еще не освооодился от своей примитивной ,инстинктивной формы " /Маркс/, намечаются первые контуры первобытного коммунистического производства и лишь когда на этом пути уже сделаны известные успехи , случайные вспомогательные средства преобразуются в орудия . Материал естественного средства получает новую общественную логику , логику труда и только с этого момента возникают орудия в сообственном смысле слова. Поэтому с самого начала орудие несет на себе печать общественных приемов своего употребления ,которые выступают перед отдельным человеком в качестве такой же об"ективной действительности , как и самое вещественное бытие вещи. И конечно ,его психологический контекст совсем иной, чем психологический котекст вспомогательного средства у животного .

Ни материально, ни психологически нет прямой линии от вспомогательных средств животных к орудию человека; между ними лежит факт образования человеческого общества , на основе коллективного труда . Орудие и средство - аналогичные , а не гомологичные образования. Они представляют собой не качественно разные ступени в развитии одной и той же вещи, а наоборот вещи сходные в ряде отношений, но принадлежащие к двум качественно разным и самостоятельным линиям развития . Вспомогательные средства у животных лишь возможность ,но не действительность орудия хотя они в самом свернутом его виде, они - естественное условие орудий человека, причина появления которых лежит в иных и совершенно новой - исторической действительности.

IV.

Второй вопрос ,который ставит перед нами экспериментальный материал: о последовательности и причине в развитии и смене операции, тесно связан с только что разобранным вопросом об истинном психологическом значении обоих видов операции и , вместе с ними , различии орудия и средства. Дело в том,что в нашем материале,благодаря его расположению по возрастам,бросается в глаза определенная зависимость между уровнем развития и типом операции: чем старше дети , тем меньше ручных операций , тем больше орудийных операций ,тем больше основных этапов деятельности захватывают эти орудийные операции. Эта прямая зависимость естественно толкает на два предположения о причине, вызывающей такое изменение операции.

Согласно одному из них / Бюлер ,Енш/ дети, становясь старше, все больше знакомятся со свойствами орудия и доступных вещей, осознают их об"ективные соотношения и вместе с этим совершенствуется их практическая деятельность .За сменой операции , за переходом от средства к орудию лежит развитие мышления ребенка. Согласно другому/бихевиористы / дело здесь не в разуме , а простом в том,что ребенок с возрастом приобретает больше навыков в обращении с разными предметами . Различные признаки лопаты и игрушек для него становятся сигналами все более целесообразных действий и , таким образом , за качественной сменой операции скрывается процесс накопления " опыта" ,образования все более сложных связей между элементами среды и реакциями ребенка.

По отношению друг к другу эти два предположения составляют антиподы ,но различие средства и орудия они

одинаково считают явлением вторичным , а развитие мышления или накопление навыков ,наоборот ,первичным и определяющим .Согласно этим двум предположениям , ручные операции, совершенствуясь благодаря навыкам или мышлению,постепенно переходят в орудийные. Это прямо противоположное нашей точке зрения,так как мы настаиваем на первичности орудийных операции. Мы говорили ,что орудийные операции формируются в общественном труде и не являются продолжением ручных операции также ,как общественное производство не является простым усовершенствованием животной деятельности .

Критерии типа операции, установленный выше,позволяет в отдельном случае определить , имеем ли мы дело с применением орудия или вспомогательного средства . Но сейчас возникает дальнейший вопрос : как связаны между собой ручные и орудийные операции в развитии отдельного ребенка , как этот ребенок овладевает готовым орудием . Несомненно это овладение и вместе с тем переход от ручных операций к орудийным происходит постепенно , а постепенно означает какую то преемственность , какую то общность и связь - и это снова ведет к представлению о том,что общей причиной такого перехода является развитие мышления или накопления навыков. Наше исследование останется незавершенным , если мы не проверим теперь общее положение о первичности орудийных операции в отношении самого процесса овладения орудием : А для этого нужно снова обратиться к опытному материалу , приведенному во 2-й главе , и прежде всего установить фактическое положение: как совершается в наших опытах переход от ручных операции к орудийным , действительно ли на наш материал дает основание для одного из этих допущений .

Более внимательное наблюдение над участием интеллек-

туальных процессов и процессов воспитания навыков в деятельности наших испытуемых на разных возрастных этапах позволяет выделить четыре очень характерные ступени в ходе овладения отдельным практическим заданием / поддевания , закрепления , поднимания / x/.

Первая ступень с внешней стороны представляет собой картину довольно типичных " проб и ошибок" . Дети непрерывно и обычно в быстром темпе повторяют с небольшими вариациями однотипные и мало эффективные действия лопаткой. По контрасту с ними бросается в глаза непрерывная смена способов захвата рукоятки : не то ребенок все время как бы ощущает неудобство и стремится лучше приспособиться к орудию , не то увеличенной подвижностью руки он как бы компенсирует малую подвижность лопаты в отношении игрушек. Удачные приемы закрепляются не сразу и, появившись , нередко снова уступают место менее удачным. Но постепенно адекватные приемы становятся все чаще и общее усовершенствование деятельности происходит по типичной , зубчатой ,полого ниспадающей кривой.

Вот как например образуется у наших младших испытуемых один из лучших приемов поднимания / путем перебирания обоими руками деревка лопатки / . Перед тем, как этот прием впервые появляется у Зины Д., она действует следующим образом : правой рукой захватывает деревко лопатки " палкой" и , поднимая лопатку , сгибает руку в локте ; затем подхватывает левой рукой и еще больше подтягивает лопату к себе, к горизонтальному положению ; игрушки , конечно падают .

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x/ см. примеч. на след . стран.

Это повторяется еще раз; Зина бросает лопату и лезет в бассейн сама. Когда мы возвращаем ее к орудию , то сначала все идет к тому, чтобы снова повторилось то же самое . Но случайно Зина берет лопату " жезлом" , а этот захват вынуждает поднимать руку прямо вверх ,при чем на довольно значительном отрезке пути лопата естественно идет по вертикали . Зина перехватывает рукоять ,как прежде, левой рукой, но теперь и это возможно лишь через захват " жезлом"; небольшое движение вверх ,которое также по необходимости ведет лопату вертикально , игрушки оказываются на уровне бассейна

х/ Относительно этих ступеней практической интеллектуальной деятельности , а также двух основных фактов , касающихся их взаимной связи/о них - ниже/, необходимо подчеркнуть ,что в настоящей статье они выдвигаются лишь как эмпирические обобщения процесса овладения орудием у наших испытуемых . В своем общем значении они остаются недоказанными ; такое доказательство требует специальных исследований и не входит в задачу настоящей работы . Таким образом положения устанавливаемые в IУ-й главе, оправданы по отношению к описанному выше и опытному материалу ,но последний для этих положений составляет не более , чем иллюстрацию . Поэтому и помещаемая в конце IУ главы критика теорий развития мышления и навыков , как причины перехода от средства к орудию ,имеет ограниченную силу, она действительна лишь для приведенных выше наблюдений и ,может быть , для области овладения заданной формой поведения , к которой описанные опыты относятся. Эта критика от фактов должна быть , следовательно, дополнена общим анализом основ этих теорий, что и будет сделано в У-й главе ,в заключение.

и свободная правая рука благополучно их снимает . Так непредна
меренно со стороны ребенка , сиой вещи и состояльств, ф
ормлнется этот хороший прием. Но проявившись ,он неоднократ-
но сменяется другими / стр. 16-18/ и все время остается таким
грубым, что его об"ективные достоинства явно отступают на
задний план перед его суб"ективными удоствами / удоства-
ми захвата / . Эта черта особенно ясно выступает у другого
ребенка той же группы, Маруси В., которая в точности воспроиз-
водит описанный процесс образования приема ; в меру своей
произвольной активности Маруся всячески портит естественный
лифт лопаты и в результате этот лифт выходит у нее"виляющим"
/стр. 20/.

Обозначая эту форму деятельности принятым термином
" пробы и ошиоки" ,необходимо подчеркнуть внешний и неадек-
ватный характер этого названия . По отношению к тому,на что
направлены пробы и ошиоки , они оозначают слепоту действия.
Но было бы ошиокой видеть в этой слепоте отличительную черту
деятельности наших младших испытуемых . Наоборот , все
говорит за то,что их активность обусловлена непосредственно
усматриваемой целью : настойчиво и целеустремленно дети охо-
тятся за одними игрушками и упорно отбрасывают остальные,
" нехорошие " , они все снова меняют способы захвата рукоят-
ки и поднимания лопатки , пытаясь активно приспособиться к за-
даче,И конечно , деятельность этих детей отличается не тем
что непрерывно терит неудачи и в отношении неведомых ребен-
ку свойств вещей оказывается " слепою" - это ведь имеет ме-
сто на всяком уровне развития при столкновении с действитель-
но новыми условиями . С положительной стороны она характери-
зуется тем,что в значительной мере состоит из ручных опера-
ций в отношении наглядно познаваемых вещей, тем,что в ней

каждое движение следует в порядке непосредственного ответа естественным приемом на мгновенное изменение ситуации: руки в отношении игрушек , и т.д. . Отсутствие предварительного , отделенного от внешней деятельности мышления , прямое действие по направлению к об"екту , выступающему перед ребенком в своих непосредственно данных свойствах , - вот что скорей составляет отличие этой ранней формы овладения новой орудийной операцией .

Вторая ступень отличается от первой тем , что наряду с попытками , которые внешне выступают как быстро сменяющиеся пробы , появляется деятельность, сравнительно длительное время осуществляющая одну и ту же операцию. Этот нового типа поведение заключается в том, что случайно возникшее благоприятное положение лопатки / или игрушки на лопатке / немедленно задерживается и в дальнейшем все усилия ребенка направляются к тому , чтобы всячески его использовать . Удачное положение делит весь процесс на два отрезка : " до " и "после " и при переходе действия от одного из них к другому его течение резко изменяется. До этого момента оно грубо порывисто , протекает в быстром темпе, с частой сменой приемов ; но как только появилось критическое положение , оно становится крайне осторожным , течет замедленно и выполняется с помощью очень небольшого количества приемов — все теперь направлено на то, чтобы сохранить и по возможности использовать счастливую случайность .

Примером этой формы деятельности служит один из эпизодов с Таней Т. / вторая группа наших испытуемых , трехлетки /. Она долго и довольно безуспешно охотится за красной целлулоидной рыбкой . От быстрых и грубых ударов легкая игрушка все время отскакивает и перескакивает через лопасть.

Но,вот подскочив , рыбка падает на лопасть - моментально прекращаются резкие движения и Таня очень осторожно , пристально следя за положением добычи , медленно вынимает лопатку из бассейна / стр. 25/.

Конечно , ребенок подмечает далеко не все положения, обладающие об"ективными достоинствами . Он фиксирует только некоторые положения , преимущества которых ему известны из прошлого опыта. Но в этих пределах все поведение ребенка производит такое впечатление ,как будто он все время стережет появление определенных орудийных положений, хотя еще и не владеет приемами , которые могли бы уверенно к ним подвести. Приемы остаются непосредственным ,но течение деятельности расчленяется этапами , выделение которых говорит об осознании основных заданий данной орудийной операции. Таким образом на этой ступени впервые выступает разум ,как фактор ,обособленный от непосредственно производимой деятельности и так сказать извне вступающий в ее течение. Мера этого вмешательства еще не велика : разум не создает активно благоприятных ситуации , он только внимательно следит и подхватывает случайно возникающие положения .

На этой ступени развития поведения детей носит двойственный характер . Преобладает как и раньше примитивная "естественная " деятельность , дающая внешнюю картину проб. Но теперь уже не только они решают исход операций. Наоборот, нередко она служит лишь поставщиком удачных положений , которые используются мышлением и служат поворотными точками в развитии процесса. Создается впечатление ,что вначале разум остается в стороне и только наблюдает беспорядочную смену проб : но заметив выгодное положение ,он покидает созерцание и начинает громко направлять ход действия . Если предм-

дущую форму мы обозначили стадией проб и ошибок ,то вторую стадию развития деятельности,с ее специфическим участием мышления можно,было бы назвать "стадией подстерегания ".

Следующий третий этап в развитии овладения предметом, характеризуется тем,что теперь суб"ект делает активные попытки создать удачные положения или применить успешные приемы. Он уже не действует прямо ,непосредственно ,как на первой стадии , и не выжидает , когда случайно выпадет благоприятная ситуация , что имеет место на второй ступени , - теперь он пытается намеренно ее воспроизвести . Но его действительное понимание ситуации еще во многом уступает его активности и нетрудно обнаружить ,что в сущности он пытается воспроизвести положения и приемы , которые однажды оказались успешными, но которые отнюдь не всегда являются наилучшими , а зачастую оказываются даже нецелесообразными.

Для того этапа характерны действия , которые можно было бы в известном отношении назвать " хорошими ошибками ", так как в них особенно ясно выступает ограниченность учета обстановки . Слава Д. / трехлетка ,стр. 27/ под конец эксперимента начинает доставать игрушки следующим образом . Когда ему удалось выкатить большой красный конус по стенке бассейна,он обрадованный , начинает применять этот прием к другим игрушкам : к пирамиде ,которая без того плотно сидит на лопасти и теперь лишь цепляет своими рогами за выступы досок; к целлулоидному лебедю ,который все время подскакивает на лопасти от сотрясений / при движении по неровной стенке бассейна /. Но, особенно отличается склонностью к навязчивым приемам Леня Д. / из той же группы испытуемых стр. 28-31/ Например , большой ролик стоит на своей широкой округлой головке и это лучшее положение для того,что бы поддеть и устойчиво поднять

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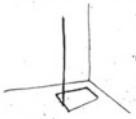
Но Леня перевертывает кузов набок и накатывает его на лопасть

его на лопасть, при чем ролик естественно через нее перекатывается. Неоднократно от ударов ролик снова становится то на головку, то на основание, но Леня упорно опрокидывает его на бок, пока наконец с затратой громадных усилий ему не удается достигнуть своей цели / облокотив ролик о деревко лопатки /. Далее, все игрушки Леня пытается сначала волочить по стенке бассейна, в том числе и те, которые в этом не нуждаются / рыбка, лебедь, маленький куоик - они достаточно устойчиво сидят на лопасти /. Он волочит даже прямо не подходящие для этого предметы / большой куб, призма/, которые цепляются углами за выступы досок бассейна и операция заканчивается неудачей. Наконец Слава доходит до того, что ведет передний край лопасти по стенке, в то время, когда вся лопата отклонена к средине бассейна и большой красный конус лежит, опираясь на рукоять - это уже трогательная данность некого приема, которая наивно выдает свое происхождение от строптивого, но еще не очень разумного мышления.

На этой третьей стадии разум уже доминирует над непосредственным течением внешней деятельности. Но над ним самим еще довлеют приемы более ранней стадии его развития. Эти пройденные этапы в снятом виде, превращенные в идеи, прошлый "опыт" служат основанием для более высокой активности суб"екта в настоящем. Но в то же время они ограничивают ее своим несовершенством. И мы "воочию видим" эту ограниченность в том упорстве, с каким ребенок пытается насильственно осуществить свое намерение и нередко вопреки об"ективной целесообразности, непрерывным затруднениям и неудачам все снова и снова возвращается к излюбленному приему. Даже отказавшись от него, ребенок переходит к каком

нибудь другой idée fixe ,отличающейся тем же специфическим узостью . Внешнее течение деятельности характеризуется теперь непрерывным вмешательством этого не по разуму активного мышления. И по этому господствующему признаку мы могли бы обозначить всю описываемую стадию развития деятельности,как "стадию навязчивого вмешательства ".

Четвертая форма отличается от предыдущих практически полным овладением задачей . Все течение деятельности /и особенно быстрые исправления на ходу ее случайных нарушений / говорит о том,что теперь , наконец , ее регулятором является разум , достаточно полно учитывающий об"ективные свойства и связи вещи. Ребенок не поднимает лопаты , пока не укрепит катящуюся игрушку ,облокотив ее на рукоятку ; а поднимая лопатку он сохраняет небольшой наклон , обеспечивающий это облокачивание . Он уже не прочует достать игрушку , от противоположной стены бассейна , орудуя лопатою как " санкой"; когда игрушка закатывается в угол , он поддевает ее ,ставя лопасть параллельно сторонам угла, наглядно показывая этим,



что он учитывает основное правило : свойства орудия должны соответствовать материальным условиям задачи .

Сочленение лопасти и руки становится гибким и подвижным ,но не в смысле частых изменений захвата , а в том отношении ,что вся рука и даже тело в целом всячески приспосабливаются к нужному движению орудия ; поэтому способ захвата рукоятки теряет решающее значение . Здесь уже нет насильственных приемов , наоборот ,приемы лопатки приспособляются к любому положению доставаемых вещей. Если ребенок и пытается сначала изменять положение игрушки на более удобное , то это большей частью соответствует действительным требованиям задачи. В целом эта стадия отличается как полнотой и тонкостью учета об"ективных отношений , так и овладением навыков в произ-

водстве соответствующих движений. Ее поэтому по праву можно обозначить как " стадию ос"ектвной регуляции".

Эта четвертая стадия является последней в нашем экспериментальном материале. Но есть много оснований полагать ,что она отнюдь не является вообще последней формой развития " интеллектуальной практической деятельности " и что то сознание ос"ективных отношений , которого достаточно для выполнения нашей несложной задачи , далеко не является познанием собственно механических отношений , действительно имеющих в ней место . Об этом говорят в частности следующие наблюдения.

В продолжение опытов с доставанием игрушек мы проводили исследование , в котором дети должны были сами изготовить орудие по образцу нашей лопатки . Эти опыты ставились детьми 5-10 лет , т.к. для младших задача оказалась непосильной .После того,как эти старшие дети два-три раза опорожняли бассейн от игрушек - для них задача доставания как описывалось выше, не представляла трудности- они научались артистически пользоваться лопаткой /пример - наш последний восьмилетний испытуемый стр.39-40/; затем мы последовательно предлагали им разнообразный материал : толстую аллюминиевую проволоку ,лопасти с разными петлями , различные палки и веревки , и т.д. и просили сделать лопатку / для той же цели доставания игрушек из бассейна /. Эти опыты выявили много любопытных моментов в осознании детьми орудия ,которым они практически вполне овладели. Самым общим среди этих моментов является следующий факт : между возрастом ,когда вполне оформляются все орудийные операции / доставания с помощью нашей лопатк / и возрастом, когда впервые появляется первое явное уменье изготовить

самое орудие , учтя его динамические свойства , проходит столько же - если не больше - времени ,чем то ,которое отделяет ручные операции двухлетки от законченных орудийных операций пятилетнего ребенка . Этот факт говорит о том, что понимание механических свойств лопаты , /составляющих физическую основу пользования ею / и совершенное практическое владение ею ,как орудием ,отделены друг от друга большим возрастным промежутком.

Правда , свойства лопаты ,как целого , в отношении вещей ,которые нужно ею доставать - это не тоже самое ,что свойства и соотношения частей самой лопаты . Однако, эти две группы свойства настолько тесно связаны ,что невозможно так сказать научное понимание орудия без такого же понимания его частей . Поэтому то обстоятельство ,что понимание и учет свойств обоих этих групп настолько разнится и так отделены по времени , заставляет нас предположить,что об"ективные связи ,которые ребенок учитывает на четвертой ступени развития своей практической деятельности осознаются им далеко не в полной мере и выступают перед ним не так, как перед инженером , не в качестве собственно механических отношений , а скорее в виде практикой очерченных предметных свойств и связей, об"ективно выражающих пути и препятствия его личного действия. Очевидно ,наша четвертая ступень не является последним этапом развития деятельности ребенка. Разум,которым здесь уже полностью руководить поведением , еще сохраняет по своему внутреннему содержанию / а вместе с ним и по своей внешней ограниченности / местный колорит приемов, из которых он реально сразуется / хотя жесткие ребра вещей уже расчленили эти приемы на несамостоятельные части/.

Итак, на пути от самых первых и беспомощных попыток до полного овладения орудием можно выделить-в зависимости от характера и меры участия мышления- четыре следующие формы деятельности .

На первом этапе мы находим,суммарно выражясь , "пробы и ошибки" .Они говорят о том,что задача : " действовать орудием," еще черезчур трудна для наших младших испытуемых .Однако, ее сверхтрудность означает не просто ее психологическое выключение , а наоборот определенное отношение к ней ребенка . Может быть самое значительное обстоятельство этой первой стадии заключается в том,что орудийная задача уже стоит перед ребенком ,что орудие уже принимается им в свою деятельность - как навязанное и технически мешающее ,но обязательное и существенное звено.Нужно не просто достать , а достать лопаткой - таково условие задачи, и ребенок снова и снова пытается орудовать ею. Конечно ,уменье пользоваться лопаткой у него отсутствует и он, естественно ,пускает в ход приемы , которыми только и владеет , т.е. ручные операции.

На втором этапе развития уже выделяются основные положения предмета по отношению к лопатке ,так сказать основные этапы,через которые должен пройти предмет на протяжении доставания.Эти положения расчленяют весь процесс на ряд четких рабочих заданий. Но еще отсутствует увязка между ними и приемами , с помощью которых они достигаются.

Третья ступень характеризуется наличием такой увязки Однако ,она еще так бедна по своим формам и поэтому так эмпирически жестка, что не столько естественные положения предмета определяют применяемый прием, сколько наоборот на-

личие известного приема в распоряжении ребенка определяет то положение , которое он пытается придать вещи для того, чтобы ее достать .

Только на четвертой ступени связь между приемом и положением предмета становится подвижной и выбор способа действия определяется строением наличной ситуации.

В этой лестнице развития " интеллектуальной практической деятельности " каждый последующий этап как он становится на плечи предыдущего . Приемы ,которые устанавливаются ощупью на одной ступени , становятся формой разумной регуляции на следующей и мышление , впитывая опыт практики,постепенно все более овладевает самой практической деятельностью. Следуя по ходу этого процесса мы обнаруживаем что интеллектуальные операции представляют собой ничто иное, как реальные действия , которые раньше возникали непредвиденно ,из неожиданного изменения внешней обстановки , а теперь производятся ребенком намеренно ,как бы согласно некому внутреннему плану. Последовательность форм деятельности,с помощью которых дети разных возрастов овладевают одним и тем же орудием , намечает картину того,как постепенно из массы накопленного опыта образуется мышление в виде выбора конкретных приемов и условий их применения .

Но таким образом оказывается,что на каждой данной ступени мышление ,по своему формальному содержанию , по составу своих операций как бы отстает от наличной практической деятельности.Это-факт чрезвычайной важности ,но взятый изолированно он легко получает чрезмерную общность и тогда приводит к недоразумениям . Для того,чтобы установить его настоящее значение ,его необходимо ограничить в следующих трех отношениях . Во-первых , сходство между прие-

мами интеллектуальной и практической деятельности говорит о их реальной связи в прошлом ,но остается внешним и формальным сходством и допустимо говорить о психологическом отставании мышления от практической деятельности . Если обратить внимание на реальную среду подлежащих сравнению практических и интеллектуальных операций ,то окажется ,что приемы мышления ни по характеру,ни по способу применения уже не походят на те элементы практической деятельности ,от которой они в свое время произошли. Они вырваны из контекста случайных действий и мимолетных изменений обстановки ,они фиксированы ,применяются намеренно. Раньше они случайно получались ,теперь они планомерно производятся .Если их внешнее оформление в общих чертах остается прежним, то существенно меняется их отношение к личности ,а с ним и они сами ,как психологическая деятельность суб"екта.

Во-вторых ,существенно меняется и отношение этих операций у предмету воздействия.Прежде эти операции вызывались случайным изменением об"екта ,теперь они определяются в первую очередь задачей ,представлением о намечаемом изменении предмета. Операции становятся не только в известной мере независимыми от предмета воздействия ,но - отношения обращается - последний начинает зависеть от этих операций, ибо именно они вовлекают его в систему предстоящих изменений. Становясь основным элементом плана ,операции мышления ,все еще напоминая по форме прошлое операции практической деятельности , в действительности предвосхищают ее будущее содержание . Если мышление по внешности отстает от практической деятельности ,то по своей психологической функции оно забегает вперед нее.

Третье ограничение заключается в том,что изменение операции практической деятельности при трансформации их в операции мышления есть результат их обработки , которая осознается как осознание. Намеренно применяются в дальнейшем лишь те успешные действия , которые осознаются. Возможности и мера осознания являются поэтому одним из важнейших условий перехода ребенка на следующую ступень овладения предметом.Сталкиваясь с богатством реальных свойств и отношений вещей, практическая деятельность всегда оказывается шире своего сознательного плана и ребенок , осознавая ее неудачи и неожиданные достижения ,преодолевает ограниченность наличной стадии овладения предметом и делает шаг к переходу на следующую ступень. Именно поэтому ход развития в целом и производит ,как мы говорили выше такое впечатление ,что ребенок как бы непрерывно оборачивается на самого себя и каждый последующий этап развития как бы становится на плечи предыдущего /Пьяже,Выготский ,Штерн/.

Но для того,чтобы не составить себе ложного представления об этом непрерывно восходящей роли мышления и о самом механизме его развития, необходимо подчеркнуть еще два следующих общих факта в картине изменения практической деятельности наших испытуемых .

Во-первых насколько можно судить по нашим наблюдениям ,эти отдельные стадии могут иногда совмещаться /особенно вторая и третья /, но никогда они не переходят друг в друга непосредственно . Мы не видим , например ,чтобы третья стадия изменялась в четвертую ,хотя они являются ближайшими соседями и кажется что отличаются лишь степенью сознания об"ективных отношений . И такая раздельность форм

существует при условии , когда на протяжении опыта происходят непрерывные изменения приемов - их смена , совершенствование распад. Но эти изменения всегда ограничены пределами определенного типа операции и не сопровождается переходом от одного из них к другому.

Очень показательна в этом отношении эволюция навязчивого приема у того же Лени Д. /стр. 30/ . Леня волочит по стенке бассейна самые неподходящие предметы : большой куб, призму ,пирамиду , которые своими ребрами цепляют за щели и выступы досок /из которых сколочен бассейн/. Дело часто кончается неудачей и под влиянием этого отрицательного опыта, он несколько меняет свой прием : теперь он ведет по стенке бассейна только передний край лопаты , а большой красный конус лежит, облокотясь на рукоять. Произошло ограничение приема, но его конечно нельзя назвать рациональным : как раз теперь дело идет о круглой вещи, которую удобно катить боком по стенке, а вместо этого Леня продолжает вести по стенке край лопаты, сохраняя основной недостаток приема .Логика Лени также прозрачна, как и несовершенна : вещи цепляли - и он отводит вещь, которая уже не цепляет ,сохраняя ближайшую причину затруднения .Почему происходит цепляние - Леня не понимает, недостаток приема ему неясен и повторные неудачи ведут к атрофии приема , а отнюдь не к осознанию его динамических связей и его исправлению. Леня кончает тем, что отводит лопатку от стенки бассейна ,то есть просто оставляет прием.

В то же время наблюдение показывает ,что на каждой ступени развития деятельности может быть достигнуто если не полное ,то очень значительное овладение задачей.Но оно всегда осуществляется с помощью той формы поведения , какая свойственна данной ступени и лишь в ее пределах .

Наши малыши около двух лет довольно быстро совершенствуются в поднимании лопатки,но это происходит путем проб и ошибок и результат сохраняет всю ограниченность этого приема достижения известной внешней формы деятельности; тоже самое имеет место и на других уровнях. Ребенок достигает внешне правильного результата всячески варируя отдельные движения в пределах ,допускаемых наличной формой поведения ,или беспорядочно накапливая в разных направлениях целые акты этого же типа ; но за его границы он в отдельном опыте не переступает .Формы деятельности непосредственно не переходят одна в другую.Они появляются одна за другой вместо с возрастом и ходом общего развития испытуемых. Очевидно нужны изменения в более широком поле личности для того,чтобы могло произойти качественное изменение формы деятельности внутри данной частной операции.

Во-вторых ,мы должны еще раз подчеркнуть факт, на который мы уже указывали выше / в резюме второй группы испытуемых ,стр. 31-33/ .Этот факт заключается в том,что формы вмешательства мышления в практическую деятельность на протяжении одного и того же акта доставания неодинаков в различных операциях . У младшей и средней группы испытуемых нам постоянно приходится видеть ,что в то время, как, скажем ,поднимание находится на ступени активных и навязчивых приемов , поддевание еще держится на уровне пассивного подстерегания удачных случаев, а закрепление на лопасти вообще не стоит перед ребенком , как задача и оказывается результатом " проб и ошибок ".

Неравномерность развития мышления в задачах с разным материальным содержанием - так можно обозначить этот факт

- представляется вначале явлением странным ,почти парадоксальным .В самом деле, легко допустить ,что разум на известной ступени развития дает неодинаковые результаты в заданиях разной трудности ; предполагается ,что сам то он при этом остается неизменным ,а его приемы-всюду одинаковыми .Но то,что мы находим здесь, представляет собой нечто совершенно иное : один и тот же ребенок обладает как бы несколькими видами разума и по каждому из них стоит одновременно на разных ступенях развития .

Необходимо еще раз подчеркнуть своеобразие этого положения .Восстановим для этого конкретную ситуацию : перед нами находится ребенок , мы даем ему задачу,потом вторую ,третью .Наши задачи меняются - но ребенок остается тем же самым ;выбор задач определяется нами ,но ребенок не зависит от этого выбора ; мы ведь собственно и хотим проверить ,что такое есть ребенок " в себе ". Казалось бы, мышление ребенка ,на каком бы уровне развития оно не находилось,не может измениться существенно на протяжении тех нескольких десятков минут, в течение которых длится исследование , а тем более - многократно измениться, резкими скачками , в разных направлениях при переходе от одной задачи к другой.

Но именно это утверждает факт неравномерности. Он означает ,что когда мы меняем задачу /конечно,известным образом,в известных пределах /,то меняется и мышление ребенка. Разум не выступает навстречу задаче,как сила ,постоянная на данном отрезке времени, Напротив ,оказывается,что не только результат ,но самая деятельность мышления зависит от содержания задачи ,от ее материала и меняется вместе с ним.

Если мы обратим внимание на содержание интеллектуальных операции , которые меняются вместе с задачей , факт неравномерности станет еще разительнее. В самом деле,эта зависимость заключается в том,что с увеличением трудности задачи , приемы мышления становятся все менее совершенными . Это, действительно, странно! Почему мышление , достигшее известного совершенства в задачах одного типа, к новым задачам подходит с приемами гораздо более низкого уровня? Почему ребенок не использует тех интеллектуальных возможностей , которыми уже владеет?

На это могут ответить следующие три предположения :

1. Разум ребенка есть величина непостоянная ,он меняется в зависимости от произвола , с каким мы подаем ему задачи.

2. Нет единого разума , существует столько отдельных видов мышления , сколько может быть представлено задач различных типов.

3. Вообще нет разума , нет мышления . Есть отдельные интеллектуальные операции , которых существует столько , сколько можно подобрать новых об"ектов для теоретической деятельности .

Не трудно видеть однако , что все эти возможности сводятся к одной - последней , а с нею мы приходим к отрицанию разума не только в качестве единой ,но и вообще самостоятельной способности . Неравномерность мышления обозначает,что мышление есть не более , чем общее понятие для известного типа психологической деятельности суб"екта.

Итак, мы будем понимать в дальнейшем парадоксальный факт неравномерности мышления , просто следующим образом: в задачах с разным материальным содержанием ребенок обнаруживает не одинаковую степень развития различных форм

своей теоретической деятельности . Теперь проблема повора-
чивается к нам другой стороной и пожалуй , не окажется
ничего более обычного, чем то обстоятельство , что мышле-
ние ребенка , так же как и его практическая деятельность,
развито не одинаково и неодинаково умело в разных направ-
лениях . Иоо в качестве конкретной формы деятельности ,
мышление впервые оразуется / и формируется / в столкно-
вении с известным материалом по его образцу и по образ-
цу практической деятельности , от которой оно здесь не-
отделимо . На этих ранних этапах оно состоит из единич-
ных приемов , непосредственно отображающих условия част-
ной ситуации и обладающих очень узким кругом применения .
Обобщение об"екта, а вместе с ним и перенос действия из
одной области в другую предполагают высокую степень овла-
дения предметами и психологически являются гораздо бо-
лее поздними образованиями . Пока такого овладения и обоб-
щения нет или они несовершенны , мышление и не может быть
чем нибудь иным, как отдельными группами приемов различной
степени внутренней организации, связи и общности—в зави-
симости от различия действительного овладения соответ-
ственными свойствами вещей. При таком понимании мышления
факт его неравномерности теряет для нас свою парадоксаль-
ность ; зато он становится теперь ключем к пониманию под-
линного содержания самого процесса мышления.

На этом мы закончим разбор основных закономерностей ,
которые обнаруживает генетическое рассмотрение нашего эк-
спериментального материала . Мы могли бы под"итожить его,
выделив в развитии конкретных форм овладения новым орудием
следующие основные факты:

I. Неравномерность развития отдельных форм деятель-

ности . Практическая деятельность ребенка не одинакова по своему строению не только на разных возрастах ,но и в одном и том же возрасте в разных операциях . Мышление , в качестве " интеллектуальной практической деятельности" обнаруживает такие же различия.

2. Отсутствие прямой генетической связи между последовательными формами развития мышления . Отдельные формы мышления - даже те , которые суб"ект ,находясь на данной ступени развития , одновременно обнаруживает в разных операциях - не переходят друг в друга непосредственно . Такой переход обусловлен общим развитием суб"екта /отсюда - его возрастом/.

3. На ранних ступенях овладения готовым орудием мышление отстает от практической деятельности по формальному составу своих операций.

Как теоретическая деятельность , мышление сегодня воспроизводит в идее вчерашний день практической деятельности[x/].

Эти факты имеют кардинальное значение для решения интересующего нас вопроса . Опираясь на них мы можем теперь установить , насколько соответствуют действительности те два предположения ~~и~~ о роли навыков или мышления в переходе от ручных операций к орудийным - которые возникают на всяком генетическом материале из констатации

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x/ Однако, практическая деятельность, опираясь на это отстающее мышление, делает следующий шаг в овладении ситуацией . Это свидетельствует о том, что руководясь мышлением практическая деятельность не просто отображает его с мертвенной точностью ,но сразует с ним новое целое. Мышление ,фиксирующее прошлый этап практической деятельности ,составляет только часть реальной деятельности настоящего.

общей связи между возрастом и типом изменений .

Против гипотезы навыков , как определяющего фактора в смене операций и переходе от средства к орудию , мы выдвигаем тот факт ,что решение задачи на самом деле не всегда идет по типу проб и ошибок , характерному для воспитания навыков . Наоборот , из четырех форм деятельности, наблюдаемых нами и в общих чертах отвечающих возрастным этапам в овладении задачей , три обнаруживают явное вмешательство разума. Только на первой ступени / и лишь в той ограниченной мере, в какой здесь происходит усовершенствование в овладении орудием /, можно говорить о господстве " механизма" навыка; но уже на второй ступени"проб и ошибок " явно комбинируются с мышлением , а на третьей уступает мышлению ведущую роль .

Конечно , и на самых зрелых уровнях развития навык сохраняет важное значение . В опытах по изготовлению лопатки , о которых мы упоминали выше / стр. 60-61/ . Мы предлагали детям-для того,чтобы хорошо ознакить их с орудием - несколько раз очистить бассейн от игрушек .И несмотря на то, что для детей 5-10 лет эта задача вообще уже не представляет трудности , время всей операции от одного раза к другому резко сокращается , а ловкость всех движений заметно увеличивается . Нет сомнений , что в значительной мере это улучшение шло за счет образования навыка, которым совершенствуется на глазах.

Однако, роль и место навыка меняется в зависимости от того ,какова та форма деятельности, в освоении которой он участвует . Если на этапе " проб и ошибок " навык выражает самый способ подбора отдельных движений , составляющих действия , самый способ нащупывания их формы , определяемой извне строением ситуации , то на ступени " ос"ектвного регу-

ляции" навык располагается так сказать внутри уже известной формы деятельности и ограничивается тем, что сообщает гибкость ее сочленениям, а отдельным составляющим ее движениям -плавность" четкость выполнения. Если иметь ввиду навык в качестве конкретного типа овладения задачей, то было бы равно ошибочно и отрицать его значение, и придавать ему значение одинаковое, а тем более- решающее на всех этапах развития деятельности.

Те же возражения мы выдвигаем и против гипотезы решающей роли развития мышления. Мы отвергаем ее на том основании, что значение мышления / как и само мышление / на разных уровнях фактически различно. На ступени проб и ошибок мы не находим или находим лишь в зачатке мышление, как особую форму деятельности, отдельно от деятельности практической. Да и на второй ступени -"подстереганий"- оно играет еще подчиненную роль. Лишь на уровне " навязчивого вмешательства " оно начинает доминировать во внешнем течении деятельности и только на четвертой полностью руководит ею.

Опыты с воспроизведением лопатки показывают нам, как поздно - по сравнению с периодом практического овладения орудием - появляется действительное понимание его орудийных свойств. Основной и общий факт, который мы установили выше, заключается в том, что разум вначале отстает от практической деятельности не только по общей линии развития, но и по каждой специальной операции, так как он развивается из этой практической деятельности перенимая от нее приемы, содержание, возможности и ограниченность. Поэтому было бы фактической ошибкой приписывать мышлению всегда одинаково-решающую роль. Как раз на тех ранних этапах развития, когда совершается переход от средства к орудию, меньше всего

оснований признавать разум определяющим началом. Наоборот, самое возникновение разума в это время еще является задачей будущего.

Принципиальный недостаток обеих концепций - о решающем значении образования навыков или изменения мышления- заключается следовательно в том,что они исходят из таких абстрактных связей между развитием деятельности и возрастом,что просматривают и утрачивают подлинное содержание этих отношений в их многообразии . Правда , и сила и элементарная привлекательность указанных концепций заключается именно в том, чтобы рассматривать все формы поведения ,как варианты одного "начала"; с их точки зрения самое различие форм деятельности, от которого мы ведем свои возражения , может быть теоретически перетолковано, как результат различия в сложности навыков или уровней мышления. Однако такое " ооощение " не только эмпирически не правомерно ,не соответствует фактам реального строения отдельных форм конкретной деятельности ,но и теоретически его нельзя осуществить- хотя бы с позиций самих этих теорий.

На этой теоретической несостоятельности мы должны остановиться в заключение ,конечно ,только в самых основных чертах.

У.

Сначала мы рассмотрим концепцию ,которая считает навык решающим фактором в образовании новых форм поведения. Навыком обычно называют , во I-х тот механизм , с помощью которого усваиваются новые движения / и относительно которого никто не сомневается в его физиологической природе /, и во 2-х , ту новую форму поведения ,которая реализует с помощью этого механизма . Связь между этими двумя значениями понятия

" навык" такова:

Физиологическое образование навыка представляют себе, как установление прочного стереотипа связей между отдельными процессами в центральной нервной системе . Соответственно этому в сфере поведения навыком обозначают такую форму деятельности ,которая образуется в индивидуальном опыте и составляется из отдельных действий принадлежащих прежним формам поведения. Последние в отдельных случаях в свою очередь могут оказаться навыками ,но очевидно система навыков в целом должна опираться на какие то врожденные формы деятельности,которые составляют начальный двигательный капитал животного при его появлении на свет. Следовательно,новая форма поведения , в качестве навыка ,представляет собой сочетание отдельных ,самостоятельных по отношению друг к другу и,в конечном счете,врожденных действий.

Решение вопроса , может или не может сыграть навык ту роль творческого фактора в развитии поведения , которую приписывает ему разбираемая концепция , зависит,следовательно,от того,каковы условия и вместе с тем реальные возможности такого сочетания. Их то мы теперь и должны установить.

Усвоенный навык представляет собой законченное двигательное целое. В нем можно выделить элементарные звенья, образующие тесно спаянную цепь действий , в которой каждое предыдущее звено влечет за собой последующее. Но до того ,как навык установится ,именно это сочетание отдельных действий и представляет основную проблему . Исходное условие навыка заключается в том,что первоначально эти действия между собой не связаны ; более того,они могут входить частями в другие сложные соединения , из которых их тогда необходимо вычленить , прежде чем сводить в новые образования. Но возьмем простейший

случай и предположим ,что навык образуется путем сочетания отдельных ,самостоятельных врожденных действий. Для того, чтобы увязать их в целое нового навыка на основе механизма условных рефлексов / другого механизма сочетаний высшей нервной деятельности , мы пока не знаем /необходимо: I/ повторно вызывать и подкреплять каждое действие в отдельности специфическим для каждого из них образом ,и при том 2/ в такой связи и такой последовательности , в какой они должны впоследствии образовать новый навык. Ближайший анализ показывает,однако,что соединение этих двух условий вносит такое ограничение в возможности образования навыка,которое сводит на нет его роль в создании новых форм поведения.

В самом деле, первое условие требует чтобы действия, составляющие новый навык, и вызывались и подкреплялись своими специфическими раздражителями /иначе ведь их и нельзя было бы вызвать /. Но эти раздражители представляют собой часть жизненной ситуации животного и в естественных условиях необходимо связаны с известным устройством этой среды. Правда ,человек может вырвать отдельные частные ситуации из их естественной связи и соединить их каким нибудь другим искусственным образом -но ведь человек и человеческий способ действия еще сами должны быть получены на основе навыка/если эта теория навыка претендует на об"яснение перехода от средства к орудию / и , следовательно ,мы имеем право допустить пока лишь до-человеческие , ,естественные' отношения. А в естественных условиях ,как мы уже сказали , стимул , вызывающий врожденную реакцию означают целую ситуацию ,которая соответствует этой реакции и в которой последняя получает подкрепления ,Итак, сохранение этих стимулов и подкреплений в навыке означает сохранение этих ситуаций .

Естественные ситуации , соответствующие отдельным действиям ,должны сохраниться и внутри их естественная среда должна остаться неизменной - таково первое условие. В то же время, согласно второму условию ,сочетание этих естественных участков должно измениться существенно и перестроиться так , чтобы соответствовать последовательности элементарных действий в новом навыке. Действительно, если они не увязаны между собой эти элементарные действия,то это значит ,что не были прямо увязаны между собой и те части окружающей среды, которые служат для них раздражителями. Подобно тому,как врожденные действия , будучи самостоятельными как то иначе конструировали целое поведения животного , так и отвечающие им отдельные ситуации среды не были непосредственно увязаны между собой потому, что располагались в природе в каком то ином порядке , чем тот, которого требует второе условие нового навыка. Животное органически связано со своей естественной средой, его строение и деятельность /врожденная деятельность / отображает строение окружающей его действительности и возникновение нового поведения в природе означает /и предполагает / изменение самой природы.

Условие возникновения новой формы поведения путем навыка заключается , следовательно , в том ,что отдельные ситуации ,вызывающие отдельные действия нового навыка, должны остаться неизменными внутри себя ,но в тоже время решительно изменить отношения между собою. Как отдельные камни мозаики ,они должны быть вырваны из своих естественных связей и расположены в новом порядке согласно образцу ,содержание которого не имеет никакого отношения к их родным условиям. Но чья же рука в природе заменит руку

художника, составляющего мозаику? Очевидно, в природе изменение отношения между отдельными большими участками среды, между отдельными ее "ситуациями" возможно только в силу изменения самих этих ситуаций. Но изменение последних лишает нас первого условия образования нового поведения.

Таким образом, если сохраняются элементарные ситуации, то не может возникнуть новая общая ситуация навыка, а если она возникает, то нарушаются частичные ситуации. Очевидно, в естественных условиях соединение обоих основных и равно необходимых условий навыка не реализуемо и новая форма поведения в природе не может возникнуть как навык, в результате сочетания уже наличных самостоятельных действий.

Животное приспособленное к среде, не меняет своего поведения, пока не изменятся эти условия среды. А когда они изменятся, соответствующее изменение поведения видимо идет двумя путями. Один из них заключается в том, что животное использует ту меру подвижности, которая имеется, хотя и в разной степени, в каждой форме поведения. В меру этой естественной подвижности наличной формы поведения животное непосредственно приспособляется к новым условиям, подобно тому например, как цыпленок выйдя из яйца, сразу и начинает клевать зерна в разных направлениях. В этом типе приспособления на каждом этапе возникает собственно не новая форма, а новая вариация уже наличной формы поведения. Но эта новая вариация имеет свою зону подвижности не совпадающей с исходной формой, подобно тому, как два пересекающиеся круга частично выходят за пределы один другого. Новые внешние условия действуют на данный вид в определен-

ном направлении и, слагаясь постоянно в этом направлении, отдельные вариации в конце концов могут дать форму, которая уже существенно отлична от исходной.

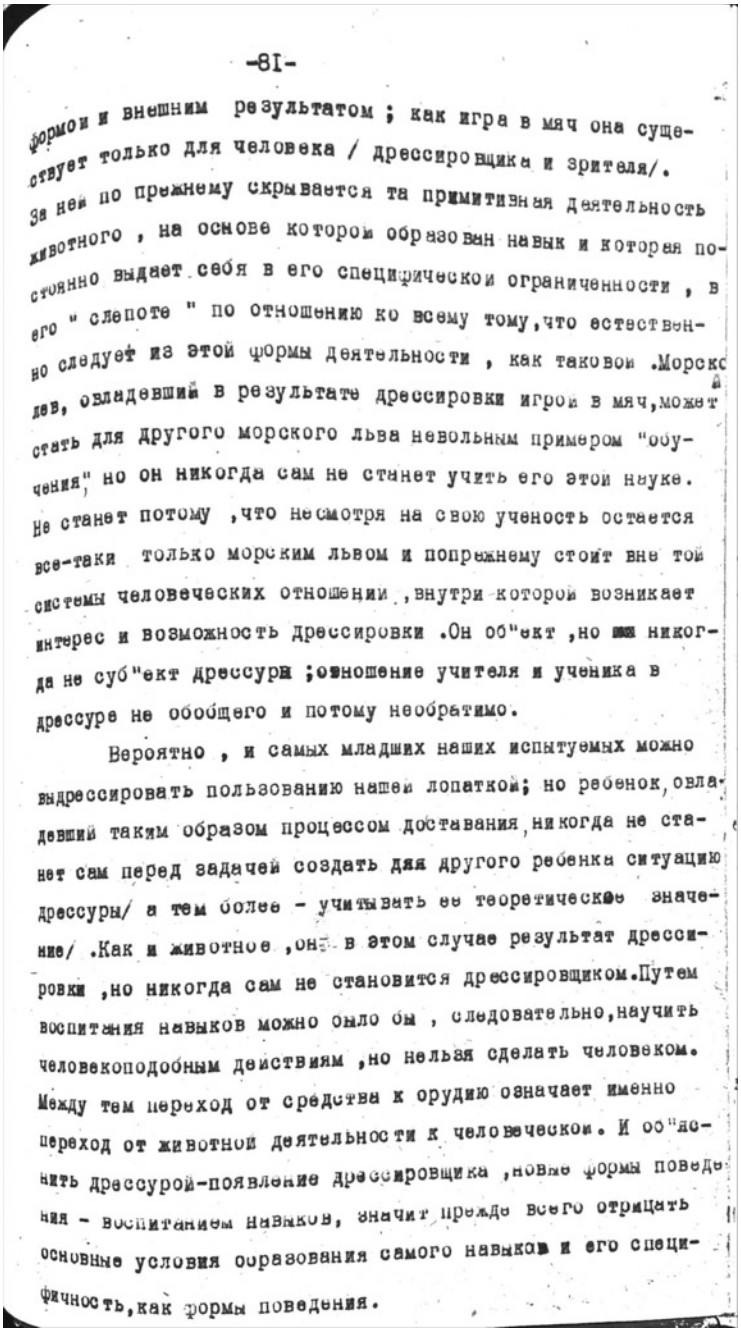
Второй путь заключается в том, что новые формы поведения возникают вместе с новыми вариантами телесной организации, как их функциональное выражение. Среди этих новых форм, те, которые не отвечают новым условиям, уничтожаются вместе с их носителями, и остаются те, строение которых соответствует условиям среды.

В обоих случаях постепенное образование новой формы поведения происходит не через сложение элементов прежнего поведения (хотя впоследствии эти элементы и можно будет в ней отметить), а путем развития одних и ослабления других ее сторон. Оба эти пути стоят под действием общего начала: наибольшей приспособленности к новым обстоятельствам, которая служит мерилом для их естественного отбора. Материал для последнего поставляют вариации внутри наличной формы поведения и вариации самой этой формы, выражающие в сущности одну и ту же величину: анатомо-физиологическую организацию данного животного. Не индивидуальный навык, а видовая изменчивость и естественный отбор являются в природе творческим началом образования новых форм поведения.

Только человек, намеренно преобразующий природу в процессе труда, способен вырвать отдельные ее компоненты из их естественной связи и создать для другого существа те искусственные условия, в которых можно привить ему внешним и слепым для него образом, в качестве навыка новую форму поведения. Этот механистический и направ-

лемый теоретически прежде всего противочеловеческого разума способ приобретения новой формы деятельности становится возможен только благодаря сознательной организации его человеком и лишь внутри человеческого общества. Но в дрессировке - ибо речь идет именно о ней - особенно ясно выступают две основных черты , присущие навыку всегда и везде ,навыку как таковому : во I-х , новая форма поведения ,прививаемая путем дрессировки , остается внешней и никогда не становится новой формой поведения для самого суб"екта,во 2-х ,эта новая форма никогда не образуется в навыке , а лишь закрепляется на его основе у отдельных испытуемых .

Если человек и создает те искусственные условия , при которых эти действия будут следовать в новом порядке , образуя новое целое ,то однако,по самому принципу составления последнего,это целое будет получаться независимо от самого " воспитанника ", в качестве внешнего результата этой новой последовательности ; для испытуемого же остануться подлинной реальностью только отдельные составляющие действия , из которых каждое будет иметь и свое особое начало / в стимуле / и свой конец/ в его безусловном подкреплении /. Новая форма поведения ,привитая в качестве навыка,останется чуждой для самого воспитуемого. Так например,когда "ученые" морские львы играют в мяч на арене цирка,то для них подлинным биологическим значением этой деятельности остается попрежнему получение рыбы, которую они теперь вынуждены добывать столь чуждым для себя способом. Игра в мяч никогда не становится собственной деятельностью животного ,она остается для него внешней



формой и внешним результатом ; как игра в мяч она существует только для человека / дрессировщика и зрителя/. За ней по прежнему скрывается та примитивная деятельность животного , на основе которой образован навык и которая постоянно выдает себя в его специфической ограниченности , в его " слепоте " по отношению ко всему тому,что естественно следует из этой формы деятельности , как таковой .Морской лев, овладевший в результате дрессировки игрой в мяч,может стать для другого морского льва невольным примером "обучения" но он никогда сам не станет учить его этой науке. Не станет потому ,что несмотря на свою ученость остается все-таки только морским львом и попрежнему стоит вне той системы человеческих отношении ,внутри которой возникает интерес и возможность дрессировки .Он об"ект ,но не никогда не суб"ект дрессуры ;отношение учителя и ученика в дрессуре не обоюдного и потому необратимо.

Вероятно , и самых младших наших испытуемых можно выдрессировать пользованию нашей лопаткой; но ребенок, овладевший таким образом процессом доставания,никогда не станет сам перед задачей создать для другого ребенка ситуацию дрессуры/ а тем более - учитывать ее теоретическое значение/ .Как и животное ,он в этом случае результат дрессировки ,но никогда сам не становится дрессировщиком.Путем воспитания навыков можно было бы , следовательно,научить человекоподобным действиям ,но нельзя сделать человеком. Между тем переход от средства к орудию означает именно переход от животной деятельности к человеческой. И об"яснить дрессурой-появление дрессировщика ,новые формы поведения - воспитанием навыков, значит прежде всего отрицать основные условия образования самого навыка и его специфичность,как формы поведения.

Это становится еще ясней ,когда мы обращаем внимание на вторую основную черту дрессировки . Эта черта заключается в том,что в дрессуре дело всегда идет лишь о том, чтобы привить воспитаннику некую форму поведения , заранее намеченную в представлении дрессировщика и воплощаемую им в организации внешней обстановки .Только в этомтслучае новый навык образуется в результате внешних сочетаний отдельных действий - но как раз в этом случае воспитание навыка бесспорно предполагает готовую форму деятельности ,подлежащую усвоению,и образование навыка заключается не в созидании, а только в освоении этой новой формы. Подобно тому ,как мозаика предполагает готовую картину - образец и означает не самую картину , а собственно,лишь способ ее реализации , так и навык возможен лишь внутри готовой формы деятельности и,строго говоря,обозначает не ее , а способ ее реализации у данного суб"екта.

Но если таким образом все дело заключается в том,что форма новой деятельности должна быть намечена в организации среды ,то не может ли она - снова возвращаемся мы к прежнему вопросу - не может ли она возникнуть " случайно" , в силу непреднамеренного стечения внешних обстоятельств? Может , конечно . Сплошь и рядом возникает непредвиденная,"естественная " дрессировка, которая нередко вводит доверчевых исследователей в заблуждение относительно умственных способностей животных .Но дело в том,что об"ективные условия этой невольной дрессировки остаются теми же ,что и для дрессуры,проврдимой умышленно .Подобно намеренной дрессуре , она ограничена сочетанием двух разобранных выше условий. Она также может встретиться лишь в условиях человеческого

общежития - нарушающих не только сложившиеся формы поведения животного ,но и строение его среды .Она также предполагает,готовую форму, которая может быть и не осознается дрессировщиком ,но реально выступает перед дрессируемым в сочетании внешних условий ,как нечто подлежащее усвоению;выступает тоже только об"ективно , так как суб"ективно новая форма ,усваемая в качестве навыка,всегда остается для воспитуемого совокупностью прежних действий. Непреднамеренная ,естественная дрессировка в природе не может возникнуть потому,что дрессировка ,как метод образования новых форм поведения /новых хотя бы для данного животного / , в природе вообще несуществует.

Мы говорили выше,что навык- со стороны суб"екта - означает усвоение новой деятельности в качестве старой. Но теперь мы видим,что и об"ективно он не создает новую форму деятельности , а лишь реализует ее в поведении данного индивида. Таким образом ,навык ,всегда располагается внутри готовой формы поведения - в качестве механизма,соединяющего отдельные его движения . И собственно,в этом понятии физиологического механизма , обеспечивающего последовательность нервных импульсов и сокращений мышц, навык впервые получает свое настоящее содержание .

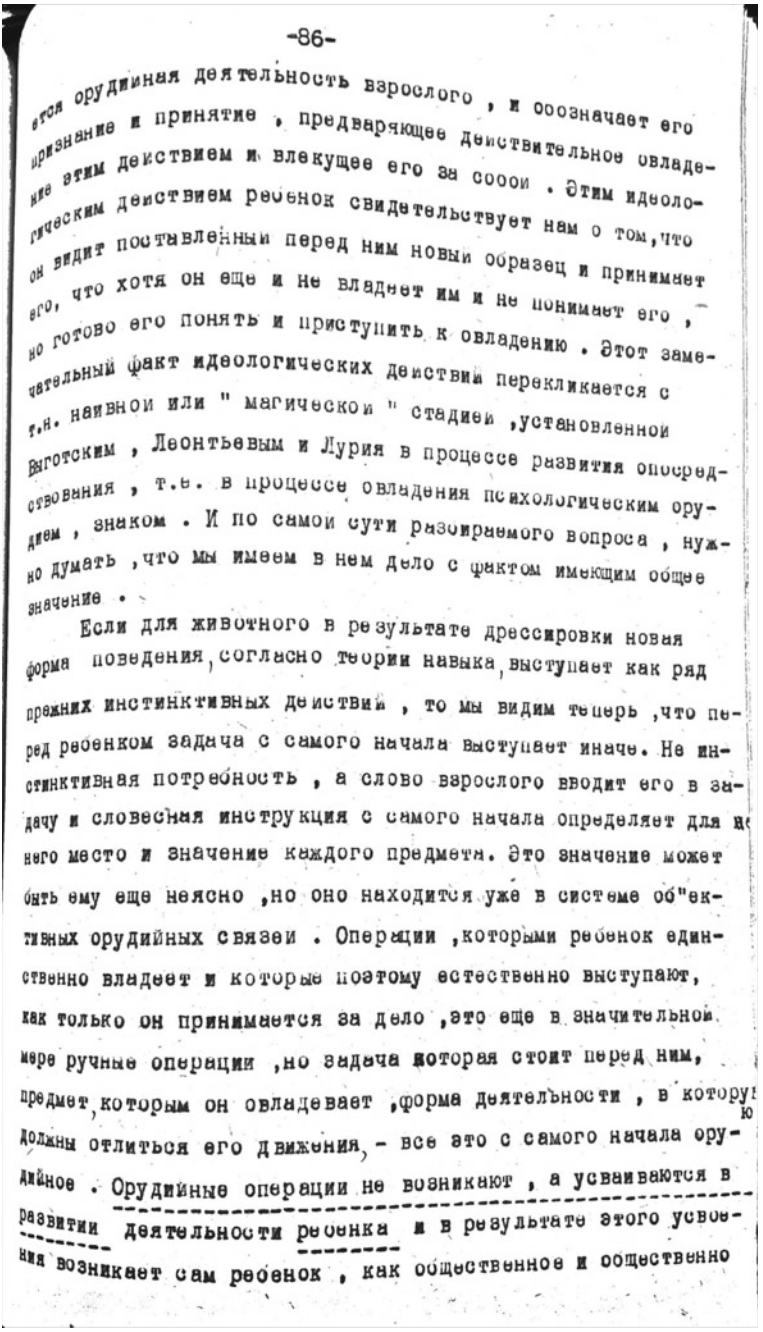
Одна и таже форма деятельности обеспечивается разными движениями и , наоборот ,одна и та же группа движений, с очень небольшими изменениями,может обслуживать разные формы поведения .Между поведением и его физиологическим механизмом существует сложная зависимость /признание которой глухо и бессодержательно заключено уже в известном положении Уотсона о том,что по отношению к внешней среде организм выступает как " целое"/. Естественно поэтому ,

что при одной и той же физиологической организации суб"ек-
та, скорость и прочность образования навыка, его гибкость
и легкость переноса его на новые действия определяется не
столько им самим, сколько свойствами новой формы поведения,
внутри которой он реализуется.

Навык не создает нового поведения, он только закрепля-
ет у суб"екта ту его форму, внутри которой сам осуществля-
ется. В природе навыки образуются, естественно, внутри инстинк
тивных форм поведения и, обеспечивая им совершенство от-
дельных составляющих движений, он ведет к дальнейшему
закреплению этих врожденных форм деятельности в целом.
Таким образом он составляет не творческий, а скорее консер
вативный фактор поведения. В пользу этого свидетельствует
так же тот простой, но основной и общий факт, что чем бед-
нее поведение животного, тем большее место занимают в нем
врожденные формы деятельности и тем стереотипнее выполняет-
ся каждая из этих форм. Если бы правильна была теория накоп-
ления навыков, как движущей силы в развитии поведения, то
следовало бы ожидать как раз обратного: тогда, наоборот,
животное обладало бы тем большими шансами развития, чем
большим арсеналом готовых форм, поставляющих разнообразный
материал для новых действий, оно располагало от рождения.
Но повторяем: уже в биологическом развитии мы видим обрат-
ное отношение. И несомненно, что отрицательным условием
перехода к историческим формам деятельности было такое изм
нение условий жизни обезьяно- подобных предков человека,
при котором они прежде всего должны были утратить большин-
ство своих врожденных, штандартных, инстинктивных форм по-
ведения.

Навык не является фактором образования новых форм поведения, а тем более- перехода от животных его форм к качественно новым, историческим. И не увеличение навыков с возрастом является поэтому причиной перехода ребенка от средства к орудию, а наоборот этот переход -к которому ребенка понуждает его общественное окружение - является причиной отмирания прежних навыков ручных операции и освоения новых навыков - пользования орудием. Об"яснять образованием навыков появление новых форм поведения, как этого требует разбираемая концепция, значит об"яснять то, что уже предполагается в начале об"яснения, об"яснять так, что оно теряется в его конце.

Мы уже несколько раз подчеркивали то обстоятельство, что в опытах, описанных выше, ход процесса овладения орудийными операциями показывает, что новая форма поведения образуется отнюдь не постепенно, в результате накопления навыка, а наоборот с самого начала выступает перед ребенком как готовая форма, подлежащая усвоению. Одно из самых ярких и значительных явлений этого процесса представляют собой действия, которые мы назвали "идеологическими". Они наблюдаются в отношении всех трех операции, входящих в наше задание: поддевания, закрепления и поднимания. Эти идеологические действия заключаются в том, что ребенок производит орудием действие, которое по своей форме воспроизводит адекватное действие этим орудием, но фактически еще оторвано от предмета и лишено своего материально-технического содержания. Это- идея действия, выраженная в движении, но еще не реализованная, это - чистая форма действия, еще лишенная реального содержания. Оно возникает как подражание образцу, каким явля-



ется орудийная деятельность взрослого , и сознавает его признание и принятие , предваряющее действительное овладение этим действием и влекущее его за собой . Этим идеологическим действием ребенок свидетельствует нам о том,что он видит поставленный перед ним новый образец и принимает его, что хотя он еще и не владеет им и не понимает его , но готово его понять и приступить к овладению . Этот замечательный факт идеологических действий перекликается с т.н. наивной или " магической " стадией ,установленной Выготским , Леонтьевым и Лурия в процессе развития опосредствования , т.е. в процессе овладения психологическим орудием , знаком . И по самой сути разбираемого вопроса , нужно думать ,что мы имеем в нем дело с фактом имеющим общее значение .

Если для животного в результате дрессировки новая форма поведения, согласно теории навыка, выступает как ряд прежних инстинктивных действий , то мы видим теперь ,что перед ребенком задача с самого начала выступает иначе. Не инстинктивная потребность , а слово взрослого вводит его в задачу и словесная инструкция с самого начала определяет для него место и значение каждого предмета. Это значение может быть ему еще неясно ,но оно находится уже в системе об"ективных орудийных связей . Операции ,которыми ребенок единственно владеет и которые поэтому естественно выступают, как только он принимается за дело ,это еще в значительной мере ручные операции ,но задача которая стоит перед ним, предмет, которым он овладевает ,форма деятельности , в которую должны отлиться его движения, - все это с самого начала орудийное . Орудийные операции не возникают , а усваиваются в развитии деятельности ребенка и в результате этого усвоения возникает сам ребенок , как общественное и общественно

действующее существо.

Люлик Д. наш первый испытуемый ,не имеющий двух полных лет , ребенок, у которого так ясно выступают ручные операции , с такой же ясностью ,однако , с самого начала ведет себя как маленький и слабый человек ,но человек. Когда ему подают лопатку он поворачивает ее лопастью кверху : он хочет орудовать палкой. Значение и возможности данного орудия ему неизвестны , он видит в нем другое другие - но орудие ,палку. Ведь одно дело, если бы он ,взяв лопату так, как она подана, просто использовал ее как палку , а совсем другое, если он намеренно обращает ее в палку/вопреки удобству для руки, которой мешает лопасть /. Он видит в лопатке самое простое и недифференцированное орудие, ближе всего подходящее к инстинктивным функциям руки ,но он видит в нем все таки орудие с его постоянным , об"ективным значением ,орудие в системе об"ективных операций . И после тщетных попыток полезть самому в колодец ,он действительно произносит " пакой", оборачивается к оставленной лопате , снова опускает ее вниз рукоятью и пытается орудовать ,как палкой.

Ребенок действует орудием еще как продолжением руки, но ведь уже выступает перед ним,как орудие . И на каждом этапе развития процесс идет по линии все большего овладения орудийностью . Наличие ручных , т.е. животных операций у ребенка ,имеет принципиальное значение для доказательства самого факта существования двух основных типов операции . Но это не значит конечно ,что вся или хотя бы основная деятельность ребенка инстинктивна, и что по своей действительности на ранних ступенях развития ребенок - является попросту маленьким животным . Более подробное и тщательное изучение пока-

бывает ,что естественные ,животнообразные формы деятельности выступают у ребенка лишь там ,где еще не сложились ее человеческие формы ;но при этом они никогда не появляются самостоятельно , а наоборот всегда внутри основных человеческих отношений,как бы ни были последние широко и неясно намечены . Ручные операции проскальзывают у ребенка в широких петлях орудийной деятельности и поэтому опыт, накопляемый с их помощью,все более тонко заполняет ткань собственно орудийных операций.

Вторая теория , которую нам предстоит рассмотреть, утверждает в противоположность теории навыков ,что причиной развития деятельности ребенка и перехода его от средства к орудию является развитие мышления. Если теория навыков отводила решающую роль изменениям внешней среды, то теория разума передает инициативу духовной активности суо"екта. Помимо их общего отрицательного отношения к нашей концепции / о решающем значении об"ективной системы отношений , в которую включается деятельность суо"екта / разительное сходство между ними, несмотря на внешнее различие ,заключается следовательно в том,что реальную практическую деятельность суб"екта они обе рассматривают ,как явление вторичное, производное от сочетания прежних действий. Только это сочетание ,согласно новой теории , возникает не в результате навыка, а в силу усмотрения новых об"ективных отношений . Благодаря этому теория ведущей роли мышления казалось бы с самого начала устраняет трудность,о которую разбивается теория навыков : новая форма деятельности , которая для навыка должна быть дана в окружающих условиях и которая не может быть дана в них силами самой природы , теперь попросту усматривается мышлением в свойствах окружающих вещей.

Хотя таким образом на передний план выдвигается способ-

ность мышления находить в предметных связях новые пути для действия ,но жизненным нервом и подлинным смыслом этой теории является на самом деле не вопрос об этой способности , а именно вопрос об отношении мышления к реальной ,внешней практической деятельности , и лишь отсюда- к окружающей природе. Мы должны еще раз подчеркнуть ,что характерное для разбираемой теории решение заключается в том положении , что не развитие практической деятельности является основой формирования и способности мышления , а наоборот развитие мышления определяет характер и возможности практической деятельности . Практическая деятельность ,согласно этой теории, имеет для развития мышления только то значение ,что поставляет ему сырой материал : ставит перед ним новые проблемы ,сталкивает с новыми свойствами вещей. Но выяснение новых отношений и нахождение новых путей действия принадлежит целиком мышлению. Можно было бы сказать, что согласно этой теории,мышление усматривает безразличную канву об"ективных отношений и ,согласно поставленной задаче,чертит на ней путь ,которому затем следует практическое действие.

Итак, предпосылка разбираемой теории заключается в том,что система об"ективных связей стоит перед суб"ектом, как вещь , и непосредственно им воспринимается. Но это неверно дважды .

Это неверно, и в том случае, когда эти связи наличны в об"екте - ибо это еще не значит ,что они существуют также для сознания суб"екта. Любой предмет обладает бесчисленным количеством свойств и отношений ,но лишь ничтожная доля их выступает перед сознанием действующего лица. А между тем суб"ект , в качестве реального предмета , зависит от всех свойств и отношений тех вещей, с которыми он сталкива-

ется. Чем же обусловлена эта избирательность познания ? Очевидно, перед сознанием суб"екта выделяются лишь те особенности окружающего мира, которые являются прямым об"ектом его воздействия. Так например , сложный химический состав мяса, плодов , злаков и кореньев является основой их пригодности в качестве пищи; но перед сознанием дикаря -охотника выступает не этот химический состав , а только те свойства животных и растений, на которые он ориентируется в охоте или собирании. От характера практической деятельности зависит , следовательно, то какого рода и в каком разрезе выступят перед сознанием наличные связи окружающей среды. И также , как в природе суб"ект усматривает лишь об"екты своей деятельности , так и об"екты побуждают его лишь к уже наличным , а отнюдь не новым формам этой деятельности .

Но тем более неверна эта предпосылка в том случае, когда об"ективные связи лишь возможны ,но еще не существуют. А это как раз и есть случай отношений орудия и предмета воздействия , отношений , которые устанавливаются лишь после того , как суб"ект реализует вещь, в качестве орудия. Круглый гладки камень на берегу моря может стать великолепной пулей для пращи, но ... пока нет пращи, он не является орудием . И может ли он сам подать мысль о праще? Для животного ,которое вообще не пользуется оружием ,он отнюдь не представляет больших метательных преимуществ ,чем всякий другой камень . И только существо ,которое уже бросает камни ,да еще может быть пользуется для этого каким нибудь вспомогательным орудием, сможет оценить его баллистические достоинства .Какие из возможных отношений между предметами будут в действитель-

ности установлены -это зависит , следовательно ,от того, какова по своему характеру устанавливающая деятельность суо"екта . Для известной формы деятельности могут быть использованы новые связи между предметами . Однако не эти новые предметные связи обуславливают преодоление старых форм деятельности , а наоборот наличные формы деятельности определяют и размеры , и направление , и значение новых отношений , которые могут быть установлены суо"ектом в окружающих его вещах . В частности , в зависимости от того, какую по своему внутреннему строению систему представляет собой деятельность суо"екта , технические связи средства и цели включаются в разные системы отношений - ручных приемов или орудийных операций - и соответственно этому их развитие продолжается в разных направлениях и обнаруживает разные возможности.

Если бы мы даже согласились с тем,что мышление попросту усматривает безразличную канву об"ективных отношений , то и тогда определение пути практического действия-по чисто технической необходимости-опирался бы не только на эти об"ективные связи, но и на те возможности , которыми суо" ект фактически располагает . Организация охоты например , зависит не только от желания добыть как можно больше зверя, и не только от знания его повадок и образа жизни, но в первую очередь от того , располагает ли охотник современным оружием или идет на охоту со стрелами и костяным гарпуном. Даже видя об"ективные связи предметов , пути практического действия вдоль них можно определить лишь в соответствии с наличными возможностями практической деятельности суо"екта. И, пожалуй ,именно в силу своего безразличия ,абстрактное мышление , приглашенное на консультацию практическим потреб-

ностью и ограниченное ее целью , намечало бы не новые формы деятельности , а лишь более удобное применение прежних форм.

Мы видим ,что во всех этих случаях абстрактное мышление не только не способно,оставаясь " усмотрением," создать новую форму практической деятельности ,но кроме того оно всегда и с необходимостью теряет свою безразличную природу , которую приписывает ей разбираемая концепция .Всякий раз , когда заходит вопрос о конкретном определении процесса мышления ,оно перестает быть простым усмотрением и превращается в теоретическое воспроизведение того действия, пути которого оно собирается наметить . Иначе говоря , всякий раз ,когда мышление сталкивается с вещами ,оно перестает быть "усмотрением " и превращается в деятельность ,особую ,специальную , теоретическую деятельность внутри первичного и основного типа- практической деятельности данного индивида.

Величайшее насилие интеллектуалистической теории развития поведения над действительностью последнего заключается в том,что она уничтожает самое мышление ,как специфическую деятельность и сводит его к восприятию. Но так как само восприятие вопиет о том,что бы быть понято ,как своеобразная деятельность ,то последовательно проводя свою точку зрения эта концепция вынуждена , далее ,или свести восприятие к непосредственному и необ"яснимому усмотрению внешних вещей или превратить его в такое же простое и необ"яснимое отображение в сознании физиологического процесса.

Начав с утверждения первичной активности духа ,эта концепция раскрывает ее в конце концов как полную пассивность; устранив из мышления ограничивающую его специфичность ,она лишает его всякой содержательности и вместе с тем самостоятельности . Направление и содержание конкретного процесса

мышления", т.е. вся проблема мышления, должны быть переданы теперь какой-то другой инстанции и, таким образом, эта концепция обнаруживает свою тайну: она не решает, но отодвигает от себя решение проблемы. Отображение действительности, являющееся продуктом мышления, эта теория отождествляет с самым мышлением, результат она объявляет совпадающим с процессом. Констатацию факта она превращает в его объяснение и обрывает исследование в самом начале. Эта теория есть отрицание теории и в этом заключается причина ее постоянного самоотрицания.

Итак, разбор теории первичности развития мышления в смене операции и переходе от средства к орудию приводит нас к тем же результатам, что и анализ фактического материала.

Эти результаты можно было бы кратко резюмировать следующим образом. Мышление решает задачи, которые ставит ему предшествующая деятельность, в конечном счете деятельность практическая; оно решает эту задачу средствами, которыми оно располагает в результате предшествующей деятельности, в конечном счете практической деятельности. Следовательно, самое мышление представляет собой частную форму деятельности субъекта, которая возникает на определенном уровне развития его практической деятельности, из нее, на ее основе, как ее осветление. Мышление перенимает у практической деятельности ее опыт, ее содержание, ее приемы, направление ее движения и представляет собой таким образом, на первых порах ничто иное, как ее идеальное воспроизведение.

Естественно, что в качестве такой конкретной формы деятельности разум по своим целям, возможностям и перспек-

тивным развития определяется строением практической деятельности, на теле которой он возникает , интересами которой он питается и путь которой он в дальнейшем призван освещать. В мышлении известный тип практической деятельности находит для себя новые возможности и благодаря им утверждается в развернутом виде и на еще более широкой основе . Но именно поэтому мышление представляет собой не только дальнейшее развитие наличного типа поведения ,но вместе с тем и его закрепления.

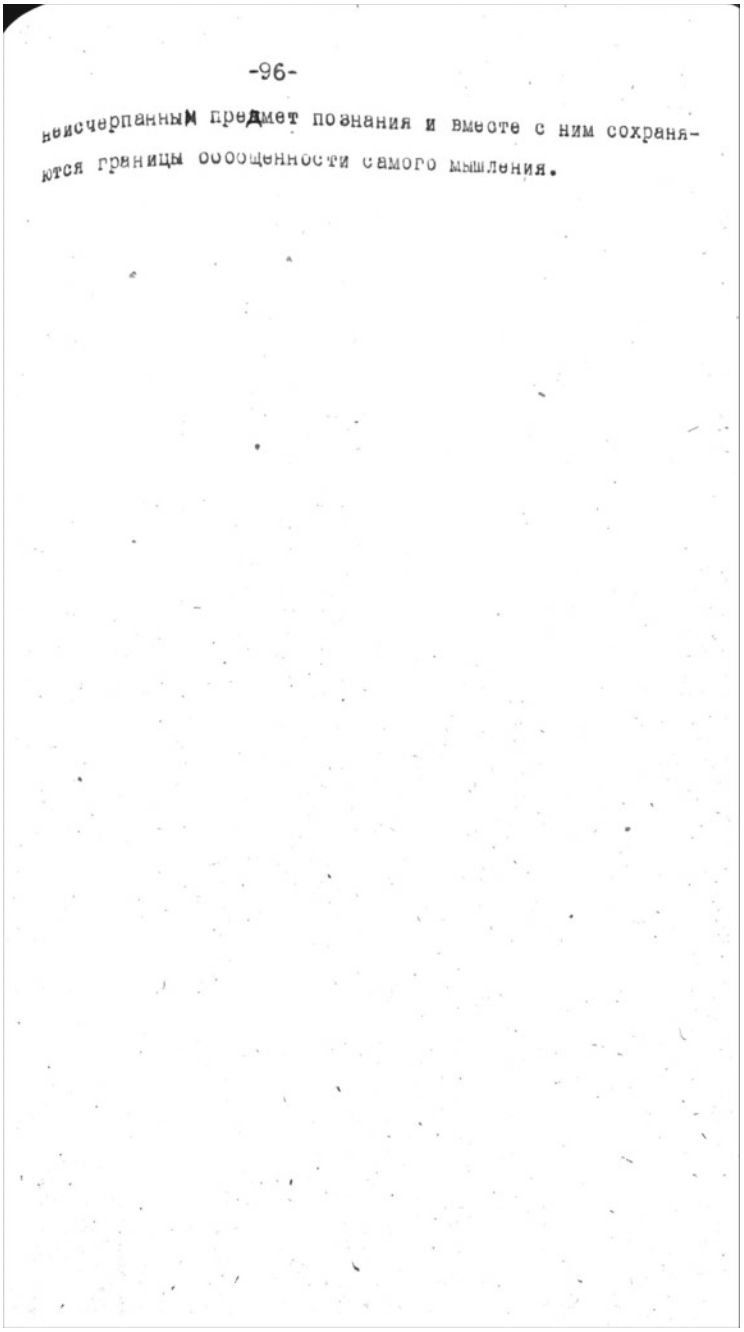
Тем более относится все это к мышлению в животном мире. Более чем где нибудь очевидно,что внутри инстинктивного поведения мышление только закрепляет непосредственную форму деятельности ,хотя бы и усложняло ее в исключительных случаях вплоть до ведения промежуточных материальных средств. Разве решение задач у келлеровских шимпанзе(свидетельствует о чем нибудь большем или отличном) их практической деятельности? Разве то состоятельство ,что шимпанзе останавливается перед элементарными механическими трудностями в одних случаях и легко справляется с ними практически в других , может быть об"яснено иначе ,чем специальными условиями их жизни в естественной обстановке. ?Мышление вообще , мышление животных особенно наглядно ,продолжает , заостряет и закрепляет особенности видовой практической деятельности своего носителя. И задача орудийной деятельности не возникает до того,пока сама орудийная деятельность не становится действительностью ,выдвигающей перед мышлением свои новые задачи.

Если мы внимательно присмотримся к фактам, хотя бы в том скромном размере , в каком они изложены во второй главе настоящей работы, то мы без труда убедимся ,что ребенок

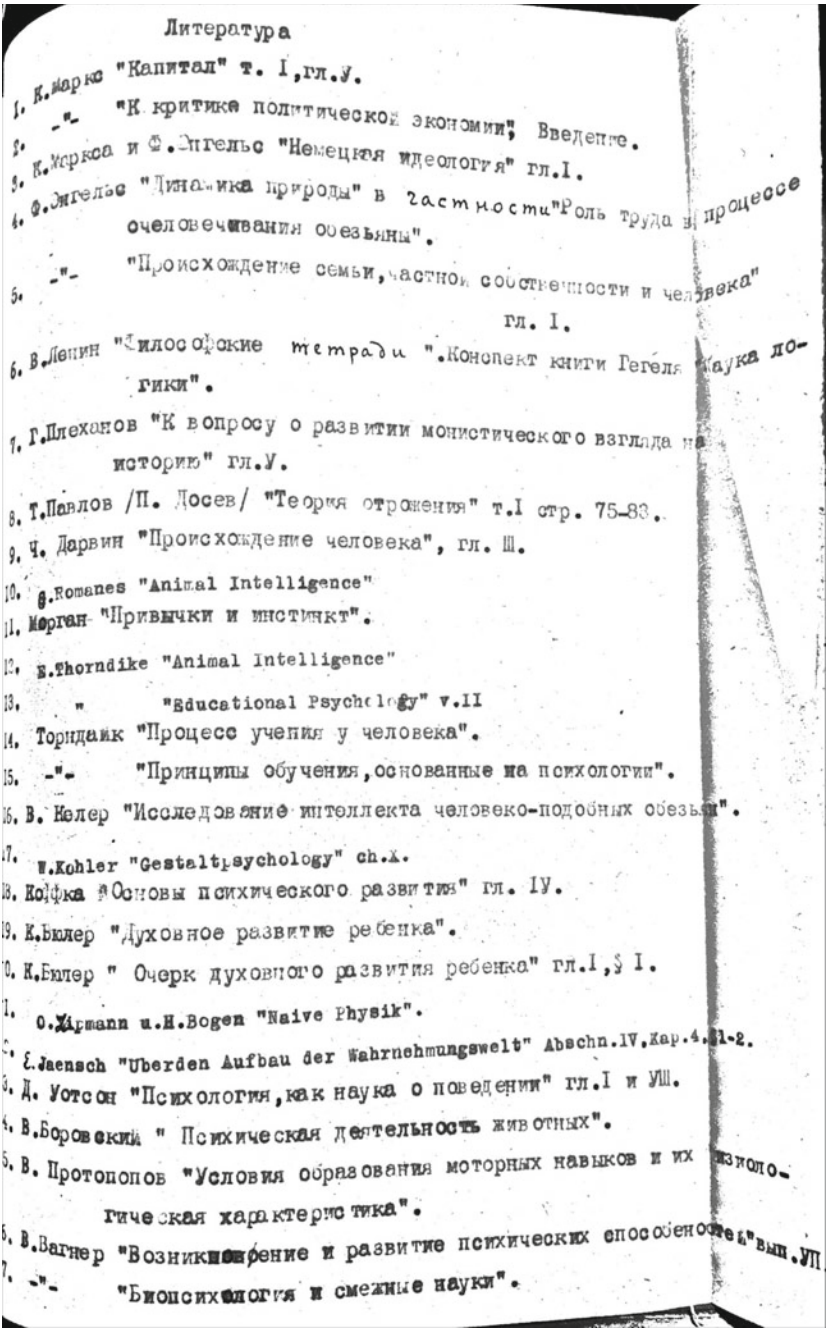
с самого начала стоит перед задачей орудийной деятельности и ручные операции проскальзывают у него лишь как рудимент в широких петлях его еще не развитой ,но орудийной практики. Не разум является причиной перехода от ручных операций к орудийным , а наоборот , замена ручных операций орудийными - замена, которая наступает в результате усвоения общественных форм отношения к вещам - ведет к переходу мышления с пути его биологического развития , принципиально ограниченного непосредственным отношением к природе ,на путь развития общественного ,опосредствованного трудом и речью и неограниченного в перспективе также ,как неограничена в перспективе и опирающаяся на развитие орудий практическая деятельность человека.

Только на этом пути общественно-исторического развития по мере того,как человеческая практика все более превращает естественную среду в очеловеченную природу , мышление человека все более освобождается от своих исторических ограничений и начинает все более об"ективно отображать предметные связи. И чем более конкретно выступает перед человеком многообразие в единстве окружающего мира , тем более само мышление противостоит ему,как некое единое и однородное образование.

Разум ,как общая способность не существует в начале развития ,но лишь осуществляется в историческом процессе. Он возникает в результате обобщения об"екта и самих приемов разумной деятельности и поэтому всегда имеет конкретное строение и определенную меру своей общности. Пределы разума , как общей " способности", непрерывно расширяются , в перспективе будущего они отодвигаются в неопределенную даль. И все же они никогда не исчезают,так как всегда остается



неисчерпанным предмет познания и вместе с ним сохраняются границы обобщенности самого мышления.



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P. Y. Galperin's Psychological Significance and Difference Between Tool Use by Humans and Animals: Implications for Research and Practice

Gethin Llewellyn Thomas and Irina Engeness

In this final chapter we will critically discuss the implications of P. Y. Galperin's dissertation for research and practice focusing specifically on learning and teaching in sport coaching and educating with digital technology. While the focus will be on the discussion presented in previous chapters, links will also be made to Galperin's later and other related research where the initial ideas from his PhD were further developed. The discussions will focus particularly on the roles of the social, skill and pedagogical in the development of human consciousness. Here, we will highlight where Galperin's ideas have significant implications for pedagogical practices aimed at educating all learners. We discuss where his teaching and learning approach, can cultivate an understanding of the learning process, which has the potential to enable lifelong learning through enhancing a teacher/coach and student/athlete's agentic learning and development.

The Role of the Social in the Development of Human Consciousness

Psychological and Manual Tools

In the dissertation Galperin maintains Vygotsky's and Leontiev's legacies by offering a social and historical approach to understanding the development of human

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consciousness. The opening chapters begin by addressing differences between human tool use and animal means providing the foundation for distinguishing between psychological and manual tools. In humans, he identifies that tools determine and affect the activities in which they are used and crucially, present opportunities for new forms of activity. With animals' means, on the other hand, it is natural behaviour and not the tools themselves that determines how they are used. The significance here is that human tool use is connected and employed in the system of social production, which is not the case for animals' means.

Specifically, Galperin explains that when humans interact with tools' they either become part of the tool-mediated operations social system or the tool gets included in the system of an individual's operations. If we take the sport of golf as an example, professional golfers' have mastered the use of clubs (i.e. cultural tool) which allows them to play the game. When they are on the course and pick up a specific club (e.g. seven iron), their bodies comply with the requirements of its operations and rejects its own. Therefore, during the golf swing both head, hands, arms, legs and torso become the holder and a mover of the club and the player becomes part of the historical, social and psychological reality of the game. Meanwhile, if an individual who has no experience of golf (playing or viewing) holds a club for the first time it will only become an extension of the arm/s function and will lose its own operations (i.e. its use as a golf club). In this instance, the club is an auxiliary mean, becoming an extension of the person's arm and will not present new opportunities for the individual (for example, being used to reach an object stuck in a tree).

The golf club, therefore, can be used as an example of identifying the differences between a tool and auxiliary means. The golf club will only resemble a tool for animals, as they cannot become part of its mediated operations system. The club will always be used as an auxiliary mean (i.e. extension for an arm) as a system of tool operations is absent in animals. For humans, the golf club carries a specific type of activity; resulting from the historically and socially developed ways of playing the game of golf. It reflects an outcome of centuries of development within society and collective production, which does not exist for animals and therefore highlights the different trajectories of development.

How humans interact with tools is also crucial in digital technology and specifically in massive open online courses (MOOCs) which are becoming increasingly popular at all levels of education (Castaño-Muñoz et al., 2018; Deng et al., 2019; Engeness, 2021b). Previous research into the role of digital tools in human learning has identified its reductionist and instrumental nature (Orlikowski & Iacono, 2001). This is primarily underpinned by the behaviourist approach to learning from Skinner and colleagues operant conditioning research (Skinner, 1953). This approach focuses on (i) achieving some desired patterns of behaviour, (ii) generating desired behaviour patterns through small incremental steps, and (iii) reinforcing correct responses through the delivery of extrinsic rewards (Light, 1997). Digital tools designed in this way for example, supply the learning materials in small chunks, offer drag and drop functions, multiple choice tasks while providing learners immediate feedback on their answers. Here, similar to animals' tool use identified above, digital technology can be described as a 'black box', where the logic and trajectories of

the performed actions are not revealed (Engeness, 2018). This use of digital tools either utilises learners' existing knowledge, mostly of factual nature or is based on a learner's guess in search for the right answer. Therefore, the historical and social are absent and such digital tools hardly offer minimal opportunities for learning and development of human consciousness.

Critiques of Galperin's work have often associated his research with behaviourism portraying him as a "Soviet Skinner" as it is claimed that he gives prominence to "programmed learning" where new tasks are separated into smaller manageable steps (for example, Horlacher, 2015). However, as Arievitch (2020) explains, Galperin's philosophy and research on learning contrasts considerably with the conceptual foundations of all types of behaviourism. The dialogical relationship between understanding both the procedural and conceptual aspects are at the core of Galperin's pedagogical framework. This challenges Skinner's idea of a "teaching machine" where reinforcement, conditioning and direct instruction are viewed as being key elements for human learning. According to Galperin, for development to occur, it is crucial that teachers (and coaches) ensure that individuals understand the principal reasons for doing and learning something, thus making the process of development of new "knowledge" their own (Arievitch, 2020).

The foundations of Galperin's pedagogical contribution emerge and are presented in the thesis. He conceptualises and, in doing so, considerably extends the approach to the development of human thinking presenting it as a transformation from manual to tool-mediated operations (Engeness, 2021c). He explains that this transformation occurs when the social and publicly accepted ways of acting with tools are mastered, initiating thinking and development of human consciousness. This transformation highlights a movement away from consciousness as a biological line of development, restricted by its relationships with the natural environment, to its unlimited social, tool- and language-mediated human line of development. Human thinking, therefore, is a type of social activity that emerges during the development of practical activity and is gradually enriched with experience, content, methods and directions.

The Role of Skill in the Development of Human Consciousness

Activity and Skill Development

Galperin also considers the role of individual skills for the development of new types of activities in the thesis. He explains that a skill is a combination of individually acquired and independent inborn actions, which can enhance the development of human activities. To create a skill, individual sequential movements identified need to be continuously repeated, reinforced, while maintaining a specific and sequential flow. However, Galperin argues that adopting this approach is not creative and limits a skill's role in developing new types of activities as it is developed out of context. He

explains that accumulating skills in this way is useful only to develop or stabilise the activities within which they exist. For example, when typing a text, several skills are performed to create a file, type words and sentences using the keyboard, formatting the text and checking the spelling. Although these skills are useful, they do not enhance learners' understanding about how to write a high-quality text. In other words, these skills do not develop new understandings or new psychological functions with learners.

In his later work Galperin expanded on these ideas emphasising that a skill is not an independent phenomenon but a very important characteristic of an action (Engeness, 2021c). He explained, that if skills are developed with learners consciously, through providing a complete orienting scheme (see below), the duality between skills and activities disappears. Crucially, here a skill is integrated into the activity and learners can adapt and perform actions by using skills in different contexts. On the other hand, skills successfully developed out of the context of the practical activity, remain unconscious to the learner because the relationship between the action and its external conditions is not recognised. Such skills appear to have very limited areas of application when taken out of the context or conditions under which they were created. Learning a skill in this way is very sensitive to various factors and interferences and is challenging to apply in different contexts. Galperin emphasised that learning and developing the wide application of skills should occur during specifically designed practical activities. By adopting this developmental approach skills become more contextualised and adjusted to the conditions of a real activity. In addition, when the conditions of the activity are realised by the learners, it can enhance their ability to transfer the skills to different activities and contexts.

Skill development research in sport science has adopted alternative perspectives to Galperin and is primarily dominated and underpinned by positive assumptions (Barker et al., 2021). As highlighted in the digital technology research above, it is based on reductionist, deterministic and instrumental principles where the mind is separate from body, individual from environment, and athlete from skill. As Galperin identified this decontextualised approach promotes a dichotomy between skills and activity with optimal performance of a movement sought without an understanding of the unfolding process. Research in this area has predominantly focused on enrichment theories and ecological theories of motor skill acquisition and performance to develop new forms of behaviour/actions (Araújo & Davids, 2011). The emphasis of enrichment theories of skill learning is on individual athletes acquiring enriched internal states (Schmidt and Lee, 211). Thus, from a cognitive perspective, athletes possess mental representations which organise and regulate perception, action and cognition, which through practice and experience produce high levels of performance (for example, Eccles and Tran Turner, 2014). Here, skilled athletes acquire knowledge during the learning process, which through experience and practice allows for more accurate inferences in action during competition or training (Ericsson, 2007). This type of information processing assumes that the human brain acts like a computer, where knowledge input produces a behavioural output, leading to regulation of perception and action (Anson et al., 2005). As Galperin highlights viewing performed actions in this way resonates with the idea of a 'black box', mentioned

above, where the logic and trajectories of the learning process are not revealed to the learner. From this perspective, it remains unclear (i) how these mental representations develop in the minds of athletes and (ii) how different situations trigger athletes' behavioural responses in accordance with stored mental representations. Cognitive theories of human behaviour, therefore, are described as 'indirect' as the world can only be understood through stored mental representation (Michaels & Carello, 1981).

Although cognitive theories are still commonly used within sport science, recent research has moved towards viewing skill development as an interactive process of physical and social performance between individuals in context (Araújo & Davids, 2011). Critiques of cognitivism claim that 'knowing' cannot be viewed solely as a mental construct based on individual personal features, emphasising that environmental interactions are crucial for contextual adjustment (Araújo & Davids, 2016). In recent years the ecological dynamics perspective on skill acquisition has emerged where it is claimed successful behaviour is adaptable to a wide range of performance contexts (Button et al., 2020). From the ecological dynamics framework, a constraints-led approach (CLA) has emerged, which explains that athletes' actions are based on perceptions of surrounding informational constraints (i.e. perception and action) (Araújo & Davids, 2011). Therefore, it is not the stored mental representations but affordances (i.e. opportunities) that informs individual actions (Araújo & Davids, 2016). Skills are not acquired but are adaptable within a performance environment and players adjust actions appropriately to context. Adaptability is a key feature as the environment, task and an individual's constraints vary in different situations (Davids et al., 2006). Learning therefore is viewed as being direct, with athletes responding in appropriate ways to the manipulation of task and environmental conditions (e.g. size of playing area, position of the players, etc.). Although the ecological perspective emphasises athletes' capacity to monitor and respond to changing environmental conditions, the development of activities with athletes appears to be downplayed. In doing so, athletes' actions and interactions are viewed as adequate responses to the changing environmental conditions rather than developing conscious understanding of the activities to enhance meaningful contributions.

Although behavioural, cognitive and ecological dynamics appear useful in developing specific sports skills, the development of athletes conceptual understanding of physical actions or skills and how this links to engagement in an overall activity appears to be underplayed. Recent research has increasingly recognized sport coaching as a socio-pedagogical non-linear activity characterized by complexity and ambiguity (Jones et al., 2016; LeBed & Bar-Eli, 2013; Thomas et al., 2021). This challenges the dominant reductionist and instrumental conceptions of coaching, which focuses on technique and/or skill refinement, and learning is considered a linear process of knowledge transmission (Light et al., 2015). Coaching within this objective view of knowledge often leads to the development of techniques in isolation away from, or external to, a game context which has had limited success in enabling the transfer of skills from the training field into games (De Souza & Mitchell, 2010). Although, the ecological dynamics theoretical framework and specifically the CLA has challenged this perspective, through advocating a nonlinear pedagogical

approach (Renshaw et al., 2016), learning continues to be understood as a reactive process. CLA facilitates a coupling of learners' perceptual and action systems during on-field learning, however, an understanding of the relationship between the process of developing an action and its external conditions is likely to remain absent or incomplete. Further complications of using such approaches emerge when coaching team games, as the development of solutions to tactical situations during matches is based on individual or subjective analysis and not players collective understanding of the activities. As Galperin's research highlights learning is a complex historical, social and pedagogical process where contextualized development of skills integrated into activities is essential. Within sport coaching, this involves a transformative process of continuous building and enacting of both coach and athlete's agentic capabilities to enhance learning and development (Thomas et al., 2021). It is essential that a coach provides a pedagogical structure/framework to develop activities with adequately integrated skills while enhancing athlete agency as a learner. Through maintaining respect and security in this process, it can also lead to the enhancement of a coach's pedagogical and social agency.

In his dissertation, Galperin offers an alternative approach to mastering skills and cultural tools by emphasising that learning should occur in specifically designed practical activities. By adopting this perspective, the pedagogical approach and design of practical activities becomes crucial. The potential value of Galperin's pedagogical framework for coaches to develop skills and conceptual understanding was recently emphasised by Engeness et al. (2021). It was suggested that Galperin's legacy can be used to structure collaborative solutions to team tactical problems (abstract), through the dialectical movement of applying theoretical knowledge and skills in practical situations (concrete). Findings from Galperin's extensive research, demonstrates the potential advantage of using the second type of orientation (complete and provided by a coach/teacher) for developing practices for athletes. Using the development of tactical knowledge between teammates in basketball as an example (Vasiljev, 1971), it provides the opportunity to enhance the players ability to develop their conceptual understanding of the game, the role of tactical interactions and individual contributions of the players. In the basketball study, players developed enhanced awareness of their own and teammates' tactical performance, while developing the ability to analyse and adapt movements, prior to, during practices and within competitive games. Therefore, Galperin's work has the potential to provide the basis for a pedagogical framework to develop specific skills and tactical understanding in both team and individual sports (Thomas et al., 2021).

The Role of Pedagogy in the Development of Human Consciousness

Learning with Structure or Through Trial and Error

In the dissertation Galperin investigates applying a trial-and-error approach to mastering the cultural tool (i.e. spade) and presents empirical evidence demonstrating the value of using this approach for children's learning and development. In his study, he summarises the approach in *four phases: trial and error, monitoring the flow of the activity, persistent interference and objective regulation* which explains the children's attempts to perform activities with the cultural tool. Through each phase the children transfer from random actions to engaging in conscious activities with the tool. In doing so, the tool acquires psychological significance becoming a sign for the children. Galperin explains that each phase is distinctive and builds on the other as they reflect the increasing role of children's consciousness during the practical activity with the tool. The four phases performed by the children demonstrate different thinking and level of consciousness. Based on this empirical evidence, Galperin clarifies that it is the inconsistency in the development of practical activities that causes variation in the development of children's consciousness. For example, children demonstrate high level of consciousness in activities they master, however this level of does not transfer to other activities where children have not previously engaged. Galperin concludes, that the trial-and-error approach may be used to master practical activities with tools, however, it is time-consuming and not an effective way of developing children's conscious understanding of actions that employ cultural tools. Therefore, Galperin developed an approach to learning, where the structure of the learning activity and the mediating role of cultural tools for developing cognition and advancing knowledge, are distinguishing features (Engeness & Lund, 2020).

Based on more than 20 years of research, Galperin suggested that a learning activity comprised of orienting, executive and control features. These different parts of a learning activity were developed in detail in his work, creating a complex system aimed at representing processes of teaching and learning in formal educational settings. The orienting, executive and control functions of learning and teaching activity were the foundations of the dialectically developing phases or forms of transformation of external activity, with material or materialised objects, into internal psychological activity. Galperin outlined the dialectically developing forms of this transformation as: (i) motivation, (ii) orientation, (iii) materialised action, (iv) communicated thinking, (v) dialogical thinking, and (vi) acting mentally.

In the initial *motivational form*, a learner's attitude and relation to the learning outcomes to be achieved is formed. In the *orientation form*, Galperin identified three types: (i) *incomplete*, where mediational tools and essential characteristics of the concept are identified by learners through trial and error. In this case, learning happens very slowly with many mistakes and the learning activity is extremely sensitive to the slightest changes in conditions. This type of orientation was used by the children in Galperin's thesis which was the focus of his analysis; (ii) *complete*, where the

teacher tells the learners all the essential features of the concept necessary to solve a particular problem. However, these essential characteristics are specific and can only be used in one case, for example, when solving a specific problem. Learning happens quickly, with minimum mistakes; however, the transfer of skills formed in the course of such activity is only possible when there is close similarity in learning situations; and (iii) *complete but constructed by learners* following an approach offered by the teacher, which is aimed at identifying the essential features of the target concept. By using an approach offered to the learners by the teacher, a specific orientation can be constructed by learners, which is suited to a particular case. With the third type of orientation, learning happens quickly with minimum mistakes, and the skills formed in this activity are transferrable to other learning situations.

In the third *materialised form* of action, learners interact with material (real objects) or materialised objects (models, simulations, animations, schemes, etc.), and become less dependent on support as they develop greater awareness of the meanings they carry. Speech becomes the main guiding tool in the fourth *communicated thinking form*, which reflects learners' activity with material or materialised objects. Here communicated thinking does not imply learners' ability to explain but rather, to complete the activity by talking. In communicated thinking an activity already acquires the characteristics of the ideal, theoretical activity, but it is still 'visible' and available for assessment from the outside. The fifth form, *dialogical thinking*, a learner establishes a dialogue with him or herself so that the activity is transformed mentally. In dialogical thinking a mental activity: (i) presents itself as a reflection of the materialised activity on the ideal plane, where material or materialised objects are substituted with their images; (ii) is directed to the images of the material or materialised objects; and (iii) reflects learners' ability to mentally perform the activity with the images of the material or materialised objects. The transformation of communicated thinking to dialogical thinking happens by substituting externally oriented speech with its image. In dialogical thinking, the activity is directed internally with the learner establishing communication with him/herself (as another person). The learners' ability to perform an activity in the form of dialogical thinking reflects the activities pathway from its materialised to dialogical form. In the final form of *acting mentally*, an activity is a pure mental act with the focus on its outcome. The activity is performed through inner speech and does not include dialogue with a learner as 'another person'. It is purely an individual activity completed by means of mental images and meanings that help a learner to deal with similar or differing situations on the basis of previous experience.

In digital educational contexts, Galperin's conceptual contribution inspired the MOOC design principles suggested by Engeness (2021a, 2021b). These principles are aimed at helping learners to reveal the potential of digital (cultural) tools embedded in digital environments, such as texts on webpages, video resources, assignments and any other activities for learners. In doing so, these digital tools acquire psychological significance to become signs that enhance the development of new psychological functions in leaners. The digital environment designed, on the other hand, becomes a tool for developing leaners' understanding of how to engage in online learning (Engeness, 2021b). She explains that when designing

a digital environment, it is important to identify (i) the target concept to develop students understanding (ii) the essential characteristics or structural parts of the target concept. In addition, students' prior knowledge and skills assist in identifying the sequence of presenting essential characteristics of the target concept. This design principle reflects the need to develop conceptual understanding with learners due to the systemic organization of human consciousness. Other design principles highlight the need to structure the learning process according to the third type of orientation: complete and constructed by learners. Here, students are presented with an overview of the entire activity, termed by Galperin as an *operational scheme of thinking*, to enhance understanding of the learning process. Resources, such as texts on web pages, videos, etc. are also introduced to develop learners' conceptual understanding in materialized form. Finally, opportunities for social interaction, such as discussion forums and synchronous online meetings alongside feedback, facilitate students learning in online environments (Engeness, 2021a, 2021b).

From the cultural-historical perspective, MOOCs designed with these principles, can become an *artefact*—a human-made object that provides a means for learners to make sense of activities (Kaptelinin & Nardi, 2012; Miettinen & Paavola, 2018; Säljö, 2010). A digital medium is created during a complex process of interplay and transformations through learners' interactions with digital tools in specifically designed digital environments (Rubtsova, 2019; Rückriem, 2009). Such a digital medium appears to become a psychological tool, acquiring functional significance for learners to enhance understanding *of the essence of learning* in digital environments. It positions individuals as conscious and independent learners who can envisage, engage, and drive their learning forward.

Recent debates in sports coaching research have focused on the position of leaners, problematising 'athlete centred' and 'empowerment' philosophies (Denison et al., 2017; Jones et al., 2018). Critiques of such approaches have questioned the value of such approaches based solely on athletes driving their own learning with limited structure or guidance from coaches. As Galperin explains in the dissertation, a learner/s can only directly engage with and influence features of the surrounding context that are consciously identifiable. The importance of a more knowledgeable other's (i.e. teacher or coach) in creating a learning activity is highlighted as the position and meaning of tools as cultural objects are revealed through interacting with learner/s. A coaches' influence to make teaching explicit, purposeful and directed through structured exploration has been reiterated, ensuring knowledge development and learning (Harvey et al., 2018). Through setting specific learning objectives and engaging in iterative planning a coach and athlete can react and respond according to contextual developments (Jones & Ronglan, 2018; Thomas et al., 2021). Therefore, how a coach interacts and explains ideas, values, strategies, and speech patterns, influences greatly what an athlete internalises and learns, as knowledge does not emerge by itself (Jones & Ronglan, 2018; Jones & Thomas, 2015; Jones et al., 2018). Crucially in the context of Galperin's research, coaches should offer a scheme of orientation (see above) to develop individuals' agency through engagement with the process of mastering and realising tool-mediated operations during practical activities.

Within sports coaching the development of learners' skills and conceptual understanding about what it means to engage in activities appears to be underemphasised; where learning is often viewed as being reproductive and knowledge acquired through trial and error (Barker et al., 2021). As explained above in 'traditional' forms of coaching, training sessions in team games such as football are created to develop techniques in isolation, away from, or external to, a game context (De Souza & Mitchell, 2010). Recently, however, there has been a shift towards placing greater emphasis on developing skills within game or race contexts, with a constraint-led approach for instance, giving prominence to behaviour emerging through manipulation of constraints during practices (Chow, 2013; Rothwell et al., 2021). The focus here is on a coach being a facilitator designing exercises that allow the 'game to be the teacher' with players implicitly learning the required skills within the context presented (Renshaw et al., 2016). Although this is an encouraging progression, the limitations highlighted in Galperin's thesis and through the first type of orientation in his later research are evident. Without an orientation scheme provided by coaches, players develop their conceptual (i.e. tactical) understanding and skills implicitly, through perception and action, learning to play the game subjectively through trial and error.

Engeness et al. (2021) recently provided an example of how Galperin's pedagogical framework can potentially be used to develop tactical knowledge between teammates in an invasion game. Using the second type of orientation a coach pinpoints essential features of the game, identifying what activity (e.g. observe when to pass) they want players to learn to use in games. A crucial element here is that the key characteristics of the game are presented alongside descriptions of players role on and off the ball in these situations. Players can then analyse specific tactical problems based on their role in relation to ball (e.g. if in possession) in the form of materialised action using detailed objects, such as descriptions on an orienting card, provided by the coach. Players use the cards to communicate their thinking by analysing and explaining verbally to teammates their role in solving the tactical problem. This collaborative analysis, using objects such as specialist telestration technologies (e.g. Coach Paint, ChyronHego), focuses on creating an agreed understanding of actions in specific tactical situations. Galperin explained that creating this common orienting basis allows players to critically challenge others knowledge while also providing the coach with the opportunity to develop individuals' tactical understanding. Recent research has recognised coaches work as both negotiated and contested, whereby the opportunity for players to act appropriately must be 'noticed' and explicated (Corsby & Jones, 2020). Thus, an observation of performance is not a visual perception, but a social act and what is 'seen' is collaboratively constructed by coaches, assistants, and players. Subsequently in Galperin's framework, the activity moves from materialised to dialogical thinking whereby the players communicate their thoughts first with their teammates and the coach and then with themselves (as another person), before finally becoming a pure mental act focusing on its outcome (acting mentally).

Concluding Remarks

In this final chapter we critically discussed the implications of P. Y. Galperin's dissertation for research and pedagogical practice focusing specifically on learning and teaching with digital technology and sport coaching. While the focus was on the initial ideas presented in the thesis, links were also be made to his later and other related research. The discussions focused on three specific areas of his work: the roles of the social, skill and pedagogical in the development of human consciousness.

First, the importance of the social, through the transformation from manual to tool-mediated operations during practical activity, was presented for developing human thinking. Using the sport of golf and MOOCs as examples it was explained that thinking and development of human consciousness happens through mastering publicly accepted ways of acting with cultural tools during social practical activities. The pedagogical value of this approach for conscious development of learners was emphasised, demonstrating its unlimited social, tool- and language-mediated position. Crucially, this perspective contrasts with the biological line of development which is restricted by relationships with the natural environment.

Second, Galperin's work offered an alternative approach to skill and conceptual development in digital technology and sport coaching, where specifically designed practical activities are crucial for learning and development to occur. It was explained that if skills are developed in the context of specifically designed and consciously realised activities, it can enhance the learners' ability to transfer and adjust skills to various contexts. Skills developed out of context of the practical activity, appear to have little value and limited areas of application. Therefore, the potential value of Galperin's work as a pedagogical framework for future research and practice was highlighted to develop not only skills, but also activities and learners' conceptual understanding in both digital and sport coaching environments.

Third, in the pedagogical section, examples were presented of how Galperin's framework could be used for learning and teaching in both digital technology and sport coaching contexts. Using the findings in the thesis as evidence the limitations of using the trial-and-error approach were explained as being time-consuming and an ineffective way of developing children's conscious understanding of action. The importance of a teacher (or coach) offering a complete scheme of orientation was highlighted, with examples from research using his design principles in MOOCs and promoting conceptual understanding in team games provided. Thus, structuring learning activities was presented as crucial to learners' mastering of cultural tools, their transfer to signs and developing individual agency during practical activities.

To summarise, it was highlighted how Galperin's conceptual contribution can potentially have significant implications for research and pedagogical practices in digital technology and sport coaching. Through his teaching and learning approach, an understanding of the learning process can be cultivated, which has the potential to enable lifelong learning through transforming a teacher/coach and student/athlete's agentic learning and development.

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