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GENESIS OF THEORY AND PRACTICE OF PSYCHOLOGICAL EXPERIMENT IN THE HERITAGE OF OLEKSANDR NECHAIEV

The article deals with the issue of the development of theoretical foundations and practice of experimentation in the legacy of a prominent domestic psychologist of the end of the 19th - early 20th century Oleksandr Nechaiev. General comprehension and objective evaluation of theoretical and practical heritage of the past transforms the history of psychology into an essential part of psychological knowledge. The aim of the paper is to study and analyze his scientific works in the field of psychological experimentation. O. Nechaev and his colleagues firstly conducted researches on the effectiveness of the methods in the laboratory. If the method was promising, the experiment was continued at school. The first experiments of this type were aimed at examining leading associations in children of different ages, memorization of words of different meanings, attention, reading skills, ways of memorization, speed of mental work of students, etc. Natural experiments were not commonly used in the investigated period. It was the laboratory conditions under which the first experimental programs and methods of studying attention, memory, interests, performance, and suggestiveness of schoolchildren were developed and tested. The transfer of experiments from scientific laboratories to the natural conditions of the educational process (school classrooms) started taking place at the beginning of the twentieth century. O. Nechaev emphasized the importance of taking into account the basic principles of conducting a psychological experiment (naturalness, objectivity, integrity, and observance of the equivalence of conditions), which contributed to obtaining reliable results and improving the quality of schooling.

Keywords: *experiment, experimental psychology, pedagogical psychology, experiment program, experiment technique.*

Introduction

In psychology, experiment holds a prominent place among research methods because with its help it is possible not only to verify the truth of theorizes, hypotheses, but also get new psychological knowledge. It is one of the special methods of scientific cognition as it contributes to the solution of empirical tasks concerning revealing, profound studying and description of facts about psychological phenomena and processes investigated. As distinct from other methods, experiment is characterized by more differentiated technique, provides accurate qualitative and quantitative data, objective results.

Various challenges of modern psychological experiments cannot be addressed without studying the heritage of famous psychologists from the past, practical experience of the organization and holding psychological experiments in different historical periods. General comprehension, objective assessment, application of rich theoretical and practical heritage of the past transforms the history of psychology into the most significant branch of psychological science. The historic and psychological analysis will provide modern researchers with the opportunity to understand and generalize scientific heritage of academics of the past and pay attention to unsolved issues.

The paper **aims to** review and analyze scientific heritage of a famous researcher O. Nechaiev in the field of pedagogical experiments.

Objectives of the study:

1. To find out the factors of development of the experimental direction in the domestic psychological thought of the end of XIX - beginning of the XX century.
2. To reveal the contribution of O. Nechaev to the development of the theoretical foundations of a psychological experiment.
3. To analyze the programs and methods of experiments in the field of pedagogical psychology conducted by O. Nechaev and the staff of the laboratory of experimental pedagogical psychology.

Research Methods

The carried out research is of descriptive type. It is based on the analysis of the theoretical literature, as well as synthesis, generalization and systematization of the material, which helped to sum up and systematize the ideas of O. Nechaiev concerning the issue studied, as well as to substantiate theorizes of the research; chronological, logical-historical, and historical-genetic methods used provided the opportunity to observe the derivation of the psychological experiment as a research method in scientific heritage of O. Nechaiev.

Discussion

The period between the end of the 19th century and the beginning of the 20th century is extremely important in the history of the development of psychology as a science. It is characterized by general economic lift and the development of scientific thought. It conditioned the appearance of a great number of psychological directions,

among which there were experimental psychology, pedagogical psychology, reflexology.

Experiment as a method of scientific research in this period gained special significance in pedagogical psychology. Psychologists-experimentalists, paedologists, reflexologists contributed their ideas concerning verification and explanation of bonds between traditional principles, tools, methods and forms of the educational process which had been forming throughout centuries, to theory and practice available at that time. The objectivity of carried out experiments was provided by means of using the achievements of exact sciences, in particular, qualitative mathematical measuring methods were applied.

The studying of scientific heritage of such famous West-European psychologists and pedagogues as A. Binet, W. Wundt, V. Lai, E. Meiman, G. Fechner, comparison of one's own experiments with the researches of foreign scientists positively affected the development of domestic experimental psychology [5; 6; 7; 8].

Oleksandr Nechaiev (1870-1948) has made a great contribution into the development of research studies by creating a laboratory of experimental pedagogical psychology at Pedagogical Courses of Military Department for Training Officers. The employees of the laboratory (S. Blumenau, O. Lazurskyi, M. Rumiantsev) conducted a series of experiments concerning the issues of dominating association of children of different age, memorizing words of different meanings, attention, child reading, mental retardation of students, etc.

In the foreword to the scientific paper "Modern Experimental Psychology concerning the Issues of School Education" O. Nechaiev stated that the main goal of his work was finding out the significance of research tools for successful development of didactics [2, p. 3]. In his opinion, any experiment is first of all improved observation, and observation in its turn is systematic perception. The important peculiarity of any experiment is that an observer-experimentalist having a certain scientific goal actually evokes and changes the phenomena studied, qualitatively measuring them [2, p. 51].

The scientist paid great attention to the problems of children of school age, their day regime, the mastery of teacher's work, the issues of memorizing and solving school tasks. In his works, he suggested recommendations for teachers concerning organization and conducting experiments at school with the aim to engage new researchers into the work on studying psychological bases of schooling [2, p. 39].

He also tried to classify experiments. Thus, according to their aims he distinguished analytical experiments, which split the investigated phenomena, and synthetic which unite them. Besides, he also distinguished individual/simple experiments (whose object of research is one person) and mass ones (when several people are surveyed at the same time).

O. Nechaiev substantiated the necessity of conducting both laboratory and field tests – mass school research studies. He believed that these two types should be closely interrelated, at that "this connection should be manifested in the fact that any psychological school experiment should 'go out' from the laboratory and 'come back' to it". Before using a certain method in school experiments, a scientist must test it in the laboratory. On the other hand, in the process of analyzing the research outcomes one may face various difficulties, which are grounds for retesting the method and putting forward new research tasks [2, p. 56].

In the psychological science of the late 19th and early 20th centuries there were no clear requirements to the methodology of experiments organization. Therefore, O. Nechaev began to work in this direction. He substantiated the need to create certain conditions for conducting laboratory (individual) and non-laboratory (mass) experiments. The scientist argued that before the beginning of the experiment it was necessary to collect all preliminary information about the participants. For this purpose, it was necessary to issue a special sheet for each one, which specified the following data: name, surname, gender, nationality, permanent residence, occupation (if the child was tested, then the occupations of his/her parents were indicated), age, general well-being (information about earlier diseases, chronic diseases, etc.), the date of the experiment, the exact time of the beginning and end of the experiment, the general well-being of the participant in the day of the experiment, information about the day regimen before the experiment, etc.

According to O. Nechaev, the experiment participant should feel calm, easy, have no physical and psychological discomfort before and during the survey. In order to provide this, the experimenter must attract the participant's attention; make him/her interested in the process. During the experiment, the researcher should take a neutral position in relation to the surveyed, not to show his/her attitude to the way he/she performs tasks. Otherwise, the results of the experiment will be false. The functions of the researcher during the experiment should be limited to the setting of the task and monitoring its implementation. During the experiment bystanders are not allowed; therefore, only an experimenter, his/her assistant (if necessary) and the subject should be present in the laboratory.

It should be noted that O. Nechaiev put forward other requirements for non-laboratory (mass) experiments, since they involve many more people: a researcher, observers, teachers, students, and their parents. Under correct organization of a mass school experiment, even a single observation can yield significant results. Mass experiments at schools should be simple in organizing and conducting, their methodology should be accessible to every teacher. During such experiments, O. Nechaiev did not recommend using special equipment from laboratories. The tasks offered to the subjects must be concise, clear, precise and accessible. All students' responses should be timely recorded and processed properly. The researcher should deeply analyze, compare and statistically process the materials obtained during the experiment.

O. Nechaiev in his paper "The Simplest Measurements of the Degree of Mental Development of Children" wrote: "The result of every observation that we carry out in nature can only make sense for us if we compare it with the results of any other observations. The same thing should be said about psychological observation. The peculiarity of mental processes of a child during the experiments can be clear to us only after comparing them with the peculiarities of the same processes in other children. The results of psychological observations on children (no matter how simple they may seem at the beginning) should always be the only beginning for various instructive comparisons that constantly encourage a psychologist and a teacher to new reflections and works" [1, p. 26-27].

O. Nechaiev together with the staff members of the laboratory of experimental pedagogical psychology conducted a series of experiments on the study of students' age characteristics, since observations in this area were of great importance as the distribution of educational material, according to age could be done rationally only in case psychic peculiarities characterizing a certain age period were known.

In 1899, the researchers conducted two experiments that deserve our attention. The program, methodology and results of the first study are presented in M. Rumiantsev's work "Laboratory of Experimental Pedagogical Psychology in St. Petersburg" [3]. The purpose of the first experiment was to study the peculiarities of memorizing words and numbers by students of all ages (from 10 to 18 years old). The methods used in the research were as follows: every student was given ¼ sheet of paper, where he/she had to write down his/her surname and age. After that, the students had to put their pens on the table and listen to the experimenter. Then he loudly, clearly and monotonously read a list of 12 words and numbers, pronouncing every of them with the interval of 5 seconds. Having read all 12 words, the experimenter waited for another 5 seconds, and then asked the students to write down everything they remembered. The participants had two minutes to perform this task.

In order to investigate memory, it was suggested to memorize the words (three-component) of different meanings: 1) those expressing visual images; 2) hearing concepts; 3) abstract concepts; 4) touch images, thermal and muscle sensations; 5) feelings and aspirations; 6) numbers (for example 15, 27, etc.). There were two words of every meaning (total=12 words). The words were arranged in a certain order: there was one word of six groups in each of the two parts of the list. In the process of analyzing the results of the experiment, attention was drawn to the average number of words that students of every age remembered (quantitative analysis), and exactly what words of every meaning were memorized by them (qualitative analysis). The results of the experiment are presented in Table 2.1 and Table 2.2.

Table 2.1.

Results of the quantitative analysis of the experiment conducted by O. Nechaev (1899) in figures

Mean value of correctly reproduced words	Age of the subjects								
	10	11	12	13	14	15	16	17	18
	3.9	4.1	6.2	6.1	6	6.5	7.2	7.7	8.2

Consequently, the results of the quantitative analysis confirmed the assumption of the researcher that the quality and memory span, in particular memorizing the words, depend on the age of the student. The older the child becomes, the greater his/her memory span is. However, the age of fourteen years is critical when the quality and memory span decrease. This was explained by the scientist by the peculiarities of the adolescence.

Table 2.2.

The results of the qualitative analysis of the experiment performed by O. Nechaiev (1899), showing the influence of the meanings of words on their memorization by students of all ages

Dominating nature of associations	Mean value of correctly reproduced words								
	Age of the subjects								
	10	11	12	13	14	15	16	17	18
1. Touch images, thermal and muscle sensations	2.7	3.6	5.6	5.2	5.1	6.0	6.5	7.4	7.2
2. Numbers	5.1	6.1	7.8	7.9	8.0	7.7	8.7	8.7	9.3
3. Feelings and aspirations	3.2	3.6	4.2	5.0	4.6	5.2	6.4	7.0	6.9
4. Visual images	5.8	4.0	8.1	7.6	7.7	7.6	8.2	8.7	8.7
5. Hearing images	4.5	3.9	6.4	6.5	6.1	7.0	7.6	7.8	7.0
6. Abstract concepts	2.1	3.3	5.1	4.5	4.6	5.4	5.8	6.5	8.5

The analysis of the data obtained during the experiment made it possible for O. Nechaiev to make the following conclusions: 1) the average number of correctly reproduced words increases with age; 2) in the so-called "awkward age" (13-14 years) there is a delay in the development of word memory; 3) with age the memorizing of words becomes more conscious, the difference in the

ease of memorizing words of different meanings becomes less noticeable [3, p. 18].

The reliability of his findings is beyond any doubt but some 'mistakes' made during the experiment should be pointed out: the tasks in their complexity were not equivalent for the subjects; the same requirements were put forward to the participants of different ages (all the subjects were offered the same twelve words, although the younger children might not understand the meaning of some of them; all the subjects were given two minutes to write the words, that is, they did not take into account the fact that junior children write more slowly, etc.). Consequently, the principle of observance of equal conditions for the experiment was violated.

During the second experiment, not only memory for words and numbers was examined but also gibber. It was aimed at examining the effect of the meaning of words on their memorization. Summarizing the results of the experiment, O. Nechaiev made the following conclusions: 1) the meaning of a word has a great influence on the ease of its memorization; 2) different types of memory in school age are developed in different ways: the memory span gets increased with respect to objects and words that denote emotional images, and gets decreased when it comes to numbers [2, p. 109]. The scientist also compared the peculiarities of memorizing process of male and female students, which showed that male students had better memory for real impressions (objects and sounds), and female students – for numbers and words. The greatest difference in the overall level of development of memory of male and female students was manifested in the period from 11 to 14 years [2, p. 114-115].

In 1901, O. Nechaiev and the laboratory staff members conducted an experiment on the study of the speed of mental processes of students of different age (from 10 to 18 years old), which involved 345 participants. The research technique was as follows: the students were given sheets of paper with columns of tasks for the compilation of single digits on the reverse side of every one. Every row of students was given their variant of tasks to avoid cheating. According to a signal of the experimenter, the students turned the sheets with the examples and began performing tasks by writing the answers with pencils during a minute. The results of the experiment are illustrated in Table 2.3.

Table 2.3.

Results of the experiment conducted by O. Nechaiev (1901) on the study of the speed of mental processes of students of different age

	Age of the subjects								
Correct answers (mean value)	10	11	12	13	14	15	16	17	18
	20	20	23	22	32	29	35	38	41

The analysis of the results showed that older students demonstrated greater speed and success in performing tasks as compared to junior children [3, p. 23].

To ensure the reliability of the data, the experimenters examined the speed of writing of the subjects, which could affect the number of tasks performed. To this end, the subjects were dictated digits to wright down. After 30 seconds, the process of writing was interrupted by the "stand up" command. Then they were asked to sit down and on a signal to start putting as many dots as they can on the paper during five seconds. The experiment has shown that with age both the speed of writing and the performance of students get increased [3, p. 24]. However, we must also point out the disadvantages of this experiment: the method of composing single digits for studying the speed of mental processes of senior students was completely unacceptable, since the counting from 1 to 10 does not require mental activities and is carried out automatically.

Conclusion

Summing up, it should be noted that the emergence of an experimental direction in the domestic psychological thought of the late 19th and early 20th centuries was caused by the rapid development of production, technical progress, the development of natural and humanitarian sciences, especially psychology, the adoption of experimental methods of research, and the main thing – a new understanding of the nature of a child, his/her needs and interests. Significant achievements in experimental psychology during this period contributed to the formation and development of experimental pedagogical psychology that propagated the humanistic paradigm of education.

Oleksandr Nechaiev is a prominent psychologist, founder of national experimental and pedagogical psychology. The laboratory of experimental pedagogical psychology, organized by him, became not only scientific research, but also a scientific and organizational center. He conducted experiments, during which he studied the processes of associations and their peculiarities in different age periods, peculiarities of attention and memory of students, development of their interests, speed of mental processes, etc. Besides, he examined the features of children's mental development, the individual differences in the psyche of school age children, the psychological aspects of the organization and the hygiene of their mental work. Besides, he paid great attention to the study of the influence of a teacher on students. His experiments on the issue of direct and indirect suggestibility showed the greatest effectiveness of indirect suggestion in the pedagogical process. At the same time, students' active attention was considered by him as a necessary condition for the success of learning. According to the carried out researches, activation of memory and attention cannot be

performed without taking into account students' interests, the appropriate attitude to the perceived information.

The scientist emphasized the need for convergence of psychological research and pedagogical practice. He considered only experimental psychology based on objective methods that bring psychology closer to natural sciences to be truly scientific. The accumulation of scientifically valid facts, in his opinion, could be obtained by means of objective methods, first of all an experiment. Also, his ideas of understanding deep relationship of experimental method and self-observation were considered to be prominent. In his experiments, he proceeded from such inductive methods of study of correlations: the method of uniform similarity, the method of a single difference, the method of accompanying changes and the method of residues. O. Nechaev created special devices for his experiments: a mechanical chronoscope, a device for studying memory, and others.

The scientist stressed the importance of creating school psychological offices and laboratories that set not only educational but also research goals and supported the involvement of teachers in this work. In this regard, the issue of research methods, in particular the use of tests in school practice was considered to be a debating point. Relative simplicity of the procedure, possibility of testing without special equipment, rapid acquisition of statistically significant material, convenience of mathematical calculation made it widespread, giving hope for an effective solution to the urgent practical problems of school practice. The scientist himself was fond of testing (which he regarded as the experiment, during which the individual characteristics of the subject were studied), he designed it in such a way to be able to determine the difference and the degree of manifestation of certain mental characteristics of children changing with age. His works were full of valuable material, which helped to improve the state of education of pupils of that time.

It should be emphasized that, despite the imperfections of the experiments conducted by O. Nechaiev (mass experiments were not sufficiently qualitative; they were of artificial nature; the participants of different age were given the same tasks; the conclusions came down to finding an average indicator, etc.), they played an important role in the development of domestic experimental psychology.

Consequently, in his scientific works, experiments, O. Nechaiev raised a number of issues and offered their psychological and pedagogical solutions, which even nowadays are considered to be significant for modern students. His research work is imbued with advanced humanistic traditions, which are extremely valuable and relevant today. The scholar argued that every student had the right to be active and independent in teaching-learning activities; the educational process should not be detached from students' life, but rather closely connected with it in order to create favorable conditions for the development of the individuality of each educational process participant.

REFERENCES

1. Nechaev, A. P. (1921). *Prosteyshie izmereniya stepeni umstvennogo razvitiya detey [The simplest measurements of the degree of mental development of children]*. Syizran [in Russian].

2. Nechaev, A. P. (1909). *Sovremennaya eksperimentalnaya psihologiya v ee otnoshenii k voprosam shkolnogo obucheniya [Modern experimental psychology in its relation to school education issues]*. 2nd ed. Saint Petersburg [in Russian].

3. Rumyantsev, N. E. (1907). *Laboratoriya eksperimentalnoy pedagogicheskoy psihologii v S. Peterburge [Laboratory of Experimental Pedagogical Psychology in St. Petersburg]*. Saint Petersburg [in Russian].

4. *Trudyi Pervogo Vserossiyskogo siezda po pedagogicheskoy psihologii v S. Peterburge v 1906 g. (31 maya – 4 iyunya) : otchet, sostavlennyiy sekretarem siezda M. N. Konorovyim [Proceedings of the First All-Russian Congress on Pedagogical Psychology in St. Petersburg in 1906 (May 31 - June 4): a report drawn up by the secretary of the congress MN Konorov]*. (1906). Saint Petersburg [in Russian].

5. Binet, A. (1902). *La psychologie du raisonment; Recherches expérimentales par l'hypnotisme* [1886]. 3eme éd. Paris, Alcan.

6. Binet, A. (*1888). Études de psychologie expérimentale.* Paris, Octave Doin.

7. Wundt, W. (1874). *Grundzüge der physiologischen Psycholigie*. 3 Bde.

8. Wundt, W. (1909). *Einleitung in die Philosophie*. Leipzig.

ЛІТЕРАТУРА

1. Нечаев А. П. Простейшие измерения степени умственного развития детей / Александр Петрович Нечаев. – Сызрань, 1921. – 43 с.

2. Нечаев А. П. Современная экспериментальная психология в ее отношении к вопросам школьного обучения / Александр Петрович Нечаев. – 2-е изд. – СПб., 1909. – 285 с.

3. Румянцев Н. Е. Лаборатория экспериментальной педагогической психологии в С. Петербурге / Николай Ефимович Румянцев. – СПб., 1907. – 47 с.

4. Труды Первого Всероссийского съезда по педагогической психологии в С. Петербурге в 1906 г. (31 мая – 4 июня) : отчет, составленный секретарем съезда М. Н. Коноровым. – СПб., 1906. – 280 с.

5. Binet A. La psychologie du raisonment; Recherches expérimentales par l'hypnotisme [1886] / A. Binet. – Paris, Alcan, 3eme éd., 1902.

6. Binet A. *Études de psychologie expérimentale* / A. Binet. – Paris, Octave Doin, *1888.*

7. Wundt W. Grundzüge der physiologischen Psycholigie / W. Wundt. – 3 Bde., 1874.

8. Wundt W. Einleitung in die Philosophie / W. Wundt. – Leipzig, *W.* Engelmann, 1909.

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СТАНОВЛЕННЯ ТЕОРІЇ ТА ПРАКТИКИ ПСИХОЛОГІЧНОГО ЕКСПЕРИМЕНТУ У СПАДЩИНІ ВІТЧИЗНЯНОГО ВЧЕНОГО ОЛЕКСАНДРА НЕЧАЄВА

У статті порушено проблему розроблення теоретичних основ та практики експериментування у спадщині видатного вітчизняного психолога кінця XIX – початку XX ст. Олександра Нечаєва. Підкреслено, що загальне осмислення та об'єктивне оцінювання теоретичної та практичної спадщини минулого перетворює історію психології на найважливішу ланку науково-психологічного знання. Метою статті є вивчення та аналіз наукового доробку видатного вітчизняного ученого О. Нечаєва у галузі психологічного експериментування. У роботі визначено, що представники експериментального напряму в психологічній науці досліджуваного періоду використовували як лабораторний, так і природний експеримент. О. Нечаєв та його колеги спочатку проводили дослідження щодо з'ясування ефективності запроваджуваного методу в лабораторії. Якщо він виявлявся перспективним, експеримент продовжували у школі. Перші такі експерименти були спрямовані на дослідження провідних асоціацій у дітей різного віку, запам'ятовування слів різного значення, уваги, здатності до читання, способів заучування, швидкості розумової роботи учнів тощо. У статті підкреслено, що природні експерименти у досліджуваний період не набули масового характеру. Саме в лабораторних умовах розроблялись і перевірялись перші експериментальні програми та методики дослідження уваги, пам'яті, інтересів, працездатності, навіюваності школярів. Перенесення експериментів з наукових лабораторій до природних умов навчально-виховного процесу, тобто у шкільні класи, відбулося на початку XX ст. О. Нечаєв наголошував на важливості урахування основних принципів проведення психологічного експерименту (природності, об'єктивності, цілісності, дотримання рівнозначності умов), що сприяли отриманню достовірних результатів та підвищенню якості шкільного навчання. Психологи досліджуваного періоду, зокрема О. Нечаєв, проводили експерименти в двох формах: індивідуальній та колективній. У ході індивідуальних експериментів об'єктом дослідження був учень або група учнів, які вивчалися окремо один від одного. Під час колективних (масових) експериментів одночасно досліджувалися всі діти класу. Найбільш точним визнавався індивідуальний експеримент, оскільки увага експериментатора концентрувалася на одному випробовуваному. О. Нечаєв підкреслював важливість зворотного зв'язку між колективною та індивідуальною формами експерименту.

Ключові слова: експеримент, експериментальна психологія, педагогічна психологія, програма експерименту, методика експерименту.

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