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Nataliia Viktorivna ZHYLIAK,
Candidate of Psychological Sciences, Associate Professor,
Senior Lecturer at the Department of Social Work, Psychology,
and Socio-Cultural Activity Named after T. Sosnovska,
Educational and Rehabilitation Institution of Higher Education
"Kamianets-Podilskyi State Institute"
E-mail: NatalieZhyljak@ukr.net
ORCID: 0000-0002-3772-6687
https://www.scopus.com/authid/detail.uri?authorId=57221372045

Maryna Borysivna VOLOSHCHUK,
Lecturer at the Department of Social Work, Psychology
and Socio-Cultural Activity Named after T. Sosnovska,
Educational and Rehabilitation Institution of Higher Education
"Kamianets-Podilskyi State Institute"
E-mail: marinabormv@gmail.com
ORCID: 0000-0002-3600-6792

IDEA OF THE REFLECTION RING (ARC) IN THE HISTORY OF PSYCHOLOGY

The article deals with the history of the formation of the ideas of the reflex ring to explain human behavior. The most important steps of enriching scientific ideas in the history of psychological science are described: from the reflex arc to the reflex ring. The peculiarities of the introduction of the feedback principle in the motion control of the ring scheme were explained, which explained the adequate determination of the stimulus and the logically and naturally completed response. It is analyzed how the ring reaction scheme explains the assimilating feeling and the integrating function of the images.

The purpose of the study is to find out the essence of the development of the ideas of the reflex ring as a scheme of interrelation of motility and psyche.

Results. It was found that R. Descartes, who by his works created a powerful impetus for the transition of psychological knowledge from purely philosophical to empirical foundations, played a significant role in the formation of the ideas of the reflex ring, T. Hobbes, who created a system of psychology containing the foundations for the development of materialistic deterministic determinism. behavior (associations); G. Leibniz, who stated that perception depends on the experience of the subject (apperception) and outlined a certain cyclical pattern of functioning of this process; D. Berkeley, who applied the reflex ring (arc) scheme in his theory, which explained the functioning of vision. However, the idea of the reflexive ring to explain the behavior of the subject is finally formed in the writings of J. Dewey.

L.V. Chkhaidze divided the reflex ring into internal and external as they play different roles in the management of human psychomotor acts.

Key words: *psychomotor, psychology history, reflex ring (arc), feedback principle, inner and outer ring, image functions.*

Наталія Вікторівна ЖИЛЯК,
кандидат психологічних наук, доцент,
доцент кафедри соціальної роботи, психології та соціокультурної діяльності імені Т. Сосновської,
Навчально-реабілітаційний заклад вищої освіти
«Кам'янець-Подільський державний інститут»
E-mail: NatalieZhyljak@ukr.net
ORCID: 0000-0002-3772-6687
https://www.scopus.com/authid/detail.uri?authorId=57221372045

Марина Борисівна ВОЛОЩУК,
викладач кафедри соціальної роботи, психології та соціокультурної діяльності імені Т. Сосновської,
Навчально-реабілітаційний заклад вищої освіти
«Кам'янець-Подільський державний інститут»
E-mail: marinabormv@gmail.com
ORCID: 0000-0002-3600-6792

ІДЕЇ РЕФЛЕКТОРНОГО КІЛЬЦЯ (АРКИ) В ІСТОРІЇ ПСИХОЛОГІЇ

У статті розглядається історія становлення ідей рефлекторного кільця щодо пояснення поведінки людини. Описані найбільш важливі кроки збагачення наукових уявлень в історії психологічної науки: від рефлекторної дуги до рефлекторного кільця. Розкриті особливості запровадження принципу зворотного зв'язку в керуванні рухами за схемою кільця, що пояснило адекватне визначення стимулу, логічно та природно завершену відповідь. Проаналізовано, як саме схема кільцевої реакції пояснює асимілююче відчуття й інтегруючу функцію образів.

Метою дослідження є з'ясування сутності розвитку ідей рефлекторного кільця як схеми взаємозв'язку моторики та психіки.

Результати. З'ясовано, що у становленні ідей рефлекторного кільця значна роль належить Р. Декарту, який своїми працями створив потужний стимул для переходу психологічного знання із суто філософських на емпіричні засади, Т. Гоббсу, який створив систему психології, що містить основи для розвитку матеріалістичної детермінської схеми керування поведінкою (асоціації); Г. Лейбніцу, який констатував, що сприймання залежить від досвіду суб'єкта (аперцепція), означив циклічну схему функціонування цього процесу; Д. Берклі, який застосовував схему рефлекторного кільця у своїй теорії, що пояснювала функціонування зору. Однак ідея рефлекторного кільця щодо пояснення поведінки суб'єкта остаточно сформована у працях Дж. Дьюі та інших. Л.В. Чхаідзе розділив рефлекторне кільце на внутрішнє та зовнішнє, оскільки вони відіграють різні ролі в керуванні психомоторними актами людини.

Ключові слова: *психомоторика, історія психології, рефлекторне кільце, принцип зворотного зв'язку, внутрішнє і зовнішнє кільце, функції образів.*

Introduction. The uniqueness and importance of the history of psychology as science is in the specific way of thinking of scientists about man, psyche, the meaning of life presented in context of historical epochs and events, especially, from the first phenomena about the soul of the ancient Greeks to the modern one psychology approaches.

Among various schemes for explaining the control of human behavior, a prominent place in the history of psychology belongs to the idea of a ring. This topic remains relevant even for modern scientists. The study of the idea's formation features of the reflex ring is an important scientific task in the history of psychology, the solution of which was initiated in the works, namely, of V.A. Romenets [10; 11], A.I. Shynkariuk [12] and others.

Purpose of the article is to find out the essence of the development of the ideas of the reflex ring (arc) as a scheme of the interconnection of motility and psyche.

Main tasks:

1) consider the history of the formation of ideas of the reflex ring regarding the explanation of human behavior;

2) describe the important steps in the enrichment of scientific ideas in the history of psychological science: from the reflex arc to the reflex ring;

3) reveal the features of the implementation of the feedback principle in controlling movements according to the ring scheme;

4) To analyze how exactly the circle reaction scheme explains the assimilating feeling and the integrating function of images.

Presentation of the main research material. Analysis of recent research and publications. French philosopher and naturalist René Descartes (1596–1650) made significant steps in the development of this problem in the first half of the 17th century [6]. The scheme of the organism's responses to the action of external and internal environmental factors proposed by him was a unique explanation of the cause-and-effect features of behavior management, the mechanisms of its determination, the psychological significance of which received a powerful stimulus for the transition from purely philosophical to empirical principles. At the same time, the English philosopher-materialist Thomas Hobbes (1588–1679) created a system of psychology in which sensations and representations (traces of sensations) as elements of consciousness interact on the basis of contiguity in space and time.

Such mechanistic connections will be called "associations" in the future and serve the emergence of the associative direction in psychology. Despite the fact that the author considered mental processes to be only a phenomenal reflection of brain processes, theoretically proving their mechanistic limitations, it can still be argued that the mechanisms of mental functioning proposed by him are the basis for the development of a materialistic deterministic behavior control scheme.

The outstanding German scientist (philosopher, linguist, historian, mathematician) Gottfried Wilhelm Leibniz (1646–1716), reflecting on the principles of mental reflection, came to recognize the activity of the soul even in sensations [7; 8]. He introduced the concept of "apperception" into scientific circulation.

The separation of perception and apperception, or a primitive presentation of a certain content and a clearly conscious perception, not only established the dependence of perception on a set of factors determined by the subject's experience, but also indicated a certain cyclic scheme of the functioning of these processes.

Regarding the problem of the reflex ring, we should note that approaches to its understanding in psychophysiological terms are outlined in the theory of vision functioning developed by George Berkeley (1685–1753). This English philosopher explained the visual perception of space from the standpoint of the principle of association on the basis of subjective idealism, which contributed to the formation of associative psychology [1–5].

Cyclic mechanisms of behavior management are holistically seen in the ideas of the reflex ring, formulated by J. Dewey (1859–1952). The psychologist and philosopher of Michigan, Chicago and Columbia universities was convinced that all mental abilities are tools for solving life problems [1–5]. J. Dewey's instrumentalism actually resulted in functionalism, he can be considered the founder of functional psychology as an independent direction. Dewey and his followers considered the body as a whole system and criticized the structuralism of Wilhelm Wundt (1832–1920) and Edward Titchener (1867–1927), who sought to highlight the "sensory mosaic" of consciousness.

Representatives of functional psychology were convinced that all mental processes and properties are aimed at the connection of the organism with the environment, and structural psychology is a kind of concentrated essence of the introspective interpretation of the psyche, the study of the psyche as closed in its own consciousness. Functional psychology, based on the theory of evolution of Charles Robert Darwin (1809–1882), the positivist psychology of Herbert Spencer (1820–1903), the pragmatic psychology of William James (1842–1910), seems to complete the period of formation of natural and scientific psychology, which is significant in scope and content, and the concept of the reflex ring developed by J. Dewey, represents the idea of cyclicity at a new, much higher level.

V.A. Romenets notes: "The idea of a ring, according to Dewey, acquires significant vital meaning precisely because the ring is a coordination of members who enter into conflicting relationships with each other. This conflict is expressed in the temporary disintegration of the adaptive act and the need to reproduce integrity in the interaction of sensory stimuli and motor responses" [11, p. 256].

A little further, the scientist emphasizes that, according to Dewey's concept, "stimulus" and "response" are distinguished as functional phases of integral mutual mediation or complementation. "The idea of a ring makes it possible to understand how a stimulus is adequately defined, and a response can become logically and naturally completed.

Any behavioral achievement means that the motor response helps in the discovery, invention and constitution of the stimulus. This is how a purposeful movement of a certain level arises, as a result of which the complex of sensations becomes more expressive and more and more objectified" [11, p. 256]. This is the first description of the principle of feedback in the history of science in

controlling human behavior. Even more, Dewey applies the idea of the reflex ring to explain the nature of mental evolution, analyze mental activity, study motor attitudes, and justify the uniqueness of consciousness.

Repetition of even simple actions is not their exact copying. It is repetition without repetition. Therefore, under such conditions, the effector commands once sent to the muscles cannot fully determine the kinematic and dynamic characteristics of the action. It is necessary to correct the movements based on the detection of discrepancies between the image-goal of the action and its real parameters.

Biomechanical measurements have experimentally confirmed the idea of "regulation of movements by sensation" by means of ring circuit feedback. This is one of the most important principles of all types of management. The correct relationship, in particular, muscle tension and effective movements, requires the continuous input of corrective signals into the work of muscle synergies. The corrective signals themselves are formed, as already mentioned, on the basis of a comparison of the planned and actual movement [6].

Investigating the features of controlling voluntary actions according to the ring scheme (brain – centrifugal nerves – muscles – proprioceptors – nerves), directed to the center – the brain, where the area of direct communication is the brain-muscle path, and the feedback path is m "yaz-mozok", L.V. Chkhaidze proposed to divide this ring into outer and inner [6].

The outer ring, according to the author, includes a direct connection (brain – muscles) and an external arc of feedback (visual, auditory, olfactory, tactile and other receptors that have meaningful afferentation – the brain). The inner ring includes a direct connection (brain – muscles) and an internal arc of feedback (proprioceptors that are not directly connected to human consciousness – the brain).

So, in the two-ring scheme proposed by Chkhaidze, the direct bond region is shared by the inner and outer rings. L.V. Chkhaidze proposed such a scheme for controlling voluntary motor actions of a person because the inner and outer rings play different roles in controlling the subject's psychomotor activity.

The outer ring controls the semantic side of the motor act, and the inner ring controls the work of muscle synergies. This functional division is proven by clinical studies. Due to the degeneration of the pathways of the spinal cord, coordination of movements is lost (the meaning of the action is preserved), and with damage to the relatively highest parts of the brain, violations of the meaningful part of the action are observed (the coordination of movements is preserved).

For example, animals with the highest parts of the brain removed walk quite skillfully, but do not notice food.

It can be stated that the function of the inner ring is to ensure biomechanically appropriate movements through long-term training, and the function of the outer ring is to perform the meaningful task of the action by learning the finest details of the meaningful structure of the action.

At the same time, Chkhaidze notes that this distribution of functions is not absolute and not the same in all cases. In particular, when performing unfamiliar actions, a person in the lower parts of the central nervous system does not yet have an appropriate program of muscle synergies, and the higher parts are forced to control both the semantic structure and the motor composition.

It is clear that higher departments are not adapted to manage specific synergistic details and actions are performed biomechanically irrationally (due to external feedback). The author emphasizes that if one of the action control rings does not fully cope with its duties, then the second (partial) takes over its functions, but from the motor act, under such conditions, one or other of its components always fall out.

These facts are confirmed in the research of A.I. Shynkariuk [12].

The two-ring movement control scheme developed by L.V. Chkhaidze, improved by O.R. Malkhazav [9], having actually proposed two schemes: a scheme of forming a mental image of the performance of movement (action, activity) and a scheme of psychophysiological mechanisms that ensure the construction, organization and management of motor activity.

In these schemes, the author revealed in detail the relationship between psychological and physiological mechanisms of controlling psychomotor actions. Analyzing the cyclical nature of behavior management, V.A. Romenets writes: "True, the idea of the ring must be complete".

Then the "ring" becomes a "spiral", because feedback is not a repetition of content, but the acquisition of a new one [10, p. 257]. Let's agree with this and apply it for confirmation regarding the management of psychomotor actions: "It is known that the motor-sensual image of an action and its objective-intellectual understanding, that is, the same mental model of an action that regulates and controls its execution, inevitably implies the presence of search attempts and selection in the process of multiple repetition of the action. Successful movements, benchmarks that have justified themselves, methods of regulation and methods of combining movements into a coherent action are selected and fixed" [11, p. 21].

Therefore, the feedback serves not to repeat the content, but to acquire new techniques for performing movements, changing the techniques of sensory control, changing the techniques of central regulation.

Conclusions and suggestions. In the formation of the ideas of the reflex ring, a significant role belongs to R. Descartes, who with his works created a powerful stimulus for the transition of psychological knowledge from purely philosophical to empirical foundations, T. Hobbes, who created a system of psychology that contains the foundations for the development of a materialistic deterministic scheme of controlling behavior (associations); H. Leibniz, who stated that perception depends on the experience of the subject (apperception) and defined a certain cyclic scheme of the functioning of this process; D. Berkley, who used the reflex ring scheme in his theory explaining the functioning of vision.

The idea of a reflex ring to explain the subject's behavior was finally formed in the writings of J. Dewey. He abandoned the study of the psyche as closed in its own consciousness and proved that the reflex ring is a coordination of members entering into conflict relations with each other. This explained the adequate definition of the stimulus and logically and naturally completed (feedback principle).

L.V. Chkhaidze divided the reflex ring into internal and external, as they play different roles in controlling psychomotor acts of a person. O.R. Malkhazov fundamentally complicated the two-ring scheme and revealed in detail the relationship between psychological and physiological mechanisms of movement control.

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