

THE ROLE OF E. WEBER AND T. FECHNER'S RESEARCH IN THE EMERGENCE AND FORMATION OF PSYCHOPHYSICS

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Introduction. In the process of scientifically studying the human psyche, various branches of psychological science have gradually emerged. One of these branches, psychophysics, is a scientific field aimed at investigating the quantitative and qualitative relationships between human sensory processes and external environmental influences. Psychophysics occupies an important place in the history of psychology, as it developed as one of the first scientific directions that enabled the study of mental phenomena through experimental methods. This field serves to determine the relationship between human sensations and external physical stimuli, to explain their закономерности on a scientific basis, and to develop objective criteria for mental processes. The formation of psychophysics represents a crucial stage in the transformation of psychology into an independent scientific discipline and has directly contributed to the emergence of experimental psychology.

The formation of psychophysics dates back to the mid-nineteenth century. During this period, research conducted in the natural sciences, particularly in physiology and physics, demonstrated that mental processes could also be studied using scientific methods. Within this context, psychophysics emerged, and systematic investigations aimed at the quantitative measurement of sensory processes began. The development of this field is largely associated with the names of the German scholars Ernst Weber and Gustav Theodor Fechner. Their scientific research provided a new methodological foundation for determining the relationship between human sensations and external stimuli. As a result, it became possible to study mental phenomena not only theoretically but also experimentally.

In his research, Ernst Weber paid particular attention to determining the sensitivity level of the human sensory system. He conducted experiments aimed at identifying the minimal detectable difference perceived through the sensory organs and achieved significant scientific results that occupy an important place in the history of psychophysics. The concept of the "difference threshold" proposed by Weber made it possible to measure sensory processes quantitatively. In his experiments, he attempted to determine the sensitivity of human perception by comparing objects of different weights and established that the difference in sensation depends on a certain proportion of stimulus intensity. This regularity later became widely known in psychology as "Weber's Law."¹ This law demonstrated that human sensations are not determined by the absolute magnitude of external stimuli, but rather by the relative change in their intensity.

While Weber's research served as an important stage in establishing the scientific foundations of psychophysics, Gustav Theodor Fechner further developed these ideas and made a significant contribution to the formation of psychophysics as an independent scientific discipline. Fechner sought to explain the relationship between human sensations and physical stimuli through mathematical expression. He scientifically substantiated the existence of certain regularities between mental and physical processes. According to Fechner, an increase in the intensity of an external stimulus does not lead to a linear increase in the strength of sensation, but rather to a logarithmic change. This idea later

¹ G'oziev E.G. *General Psychology*. – Tashkent: Publishing House of the National Society of Philosophers of Uzbekistan, 2010. – p. 112.

became the basis for the formation of the psychophysical principle known as the “Weber–Fechner Law.” This law has been recognized as an important theoretical foundation in psychophysics and has contributed to the development of methods for the quantitative measurement of sensory processes.

As a result of Fechner’s scientific investigations, the main methods of psychophysics were developed. He proposed several experimental techniques for determining sensory thresholds, which later came to be widely used in psychological research.² In particular, methods such as determining the absolute threshold, measuring the difference threshold, and evaluating the intensity of sensation became essential components of psychophysical studies. These methods significantly expanded the possibilities for scientifically investigating the characteristics of the human sensory system. This, in turn, provided a strong impetus for the development of psychology as an experimental science.

The development of psychophysics subsequently had a significant influence on the emergence of such fields as experimental psychology, neuropsychology, and cognitive psychology. The importance of Weber and Fechner’s research lies in the introduction of a quantitative approach to the study of human sensory processes.³ Their scientific work contributed to the formation of a system of objective measurement in psychology. As a result, psychology gradually moved beyond the scope of theoretical knowledge based on philosophical reasoning and began to develop as an independent scientific discipline grounded in experimental methods.

Today, psychophysics continues to develop in close connection not only with psychology, but also with physiology, neurobiology, and cognitive sciences. In modern research, psychophysical methods are widely used to study the functioning of the human sensory system in greater depth, to determine the relationship between brain activity and sensory processes, and to explain the mechanisms of human perception. From this perspective, the field of psychophysics founded by Weber and Fechner remains one of the important scientific directions that has retained its relevance to the present day.

Thus, the scientific investigations of Ernst Weber and Gustav Theodor Fechner hold particular significance in the emergence and formation of psychophysics. The identification of закономерности related to the difference threshold by Weber, and the mathematical development of these ideas by Fechner, created the foundation for the establishment of psychophysics as an independent scientific field. These studies are significant in that they made a substantial contribution to the development of psychology as a scientific discipline based on experimental methods.

Main Part. Psychophysics is one of the important experimental branches of psychology, aimed at the scientific study of the interrelationship between human sensory processes and physical stimuli present in the external environment. This field serves to determine how the human sensory system functions, how external influences are perceived, and how they are reflected in mental processes. Psychophysics is recognized in the history of psychology as one of the scientific directions that played a significant role in the formation and development of experimental methods. In particular, during the nineteenth century, psychophysical research had an exceptionally important role in the establishment of psychology as an independent scientific discipline.

In the formation of psychophysics, studies focused on the physiological characteristics of the human sensory system served as an important theoretical foundation. Human sensory organs ensure the interaction of the organism with the surrounding environment by receiving various external stimuli. Therefore, sensory processes constitute the initial stage of human cognitive activity. The scientific

² Davletshin M.G. *Fundamentals of Psychology*. – Tashkent: O‘qituvchi Publishing House, 2005. – p. 86.

³ Nishonova Z.T. *History of Psychology*. – Tashkent: Fan va texnologiya Publishing House, 2013. – p. 54.

study of sensory processes is one of the essential tasks of psychology, and identifying their specific quantitative and qualitative regularities forms the primary objective of psychophysics.

The formation of psychophysical research is directly associated with the scientific works of the German scholar Ernst Weber. By studying the sensitivity of human sensory organs, Weber sought to determine the relationship between the intensity of external stimuli and sensory experience. In his experiments, he mainly focused on weight perception, skin sensations, and tactile sensitivity. Weber's experiments demonstrated that, in order for a person to perceive a change in a given stimulus, the change must not be less than a certain minimal amount. This phenomenon was later termed the differential threshold. This concept is considered one of the fundamental theoretical categories of psychophysics.

One of the regularities identified by Weber is that the human sensory system perceives not the absolute change in stimuli, but their relative change⁴. For example, when an additional weight is added to a light object, a person can easily notice the difference; however, when the same amount of weight is added to a heavier object, the difference in sensation is perceived to a lesser extent. This phenomenon is of significant scientific importance for understanding the principles of how the sensory system functions and later served as a basis for the formulation of psychophysical laws.

The theoretical foundations of psychophysics were further developed by Theodor Fechner. Building on Weber's experiments, Fechner attempted to determine the mathematical relationship between the intensity of sensation and the strength of physical stimuli. As a result, he formulated one of the fundamental laws of psychophysics, widely known as the psychophysical law. According to this law, human sensation increases in relation to the logarithmic change in stimulus intensity. ⁵This scientific perspective made it possible to study sensory processes in psychology using mathematical and statistical methods.

The formation of psychophysics led to the widespread application of experimental methods in the history of psychology. Whereas psychology had previously been regarded primarily as a discipline based on philosophical reasoning, the results of psychophysical research contributed to its development as an experimental science equipped with precise scientific methods. ⁶This represented a significant scientific turning point in the development of psychology. From this stage onward, psychology became capable of studying the human psyche not only theoretically, but also through experimental investigation.

The development of psychophysics also exerted a considerable influence on other branches of psychology. In particular, psychophysical methods began to be widely applied in such fields as experimental psychology, cognitive psychology, and neuropsychology. Through these methods, the specific characteristics of human perception, attention, memory, and other mental processes started to be studied on a scientific basis. For this reason, psychophysics is considered one of the important methodological foundations in the development of psychological science.

Psychophysical research also plays a crucial role in understanding the mechanisms of the human sensory system. Through sensory processes, individuals receive initial information about the external

⁴ To'raqulov X.A. *Fundamentals of Experimental Psychology*. – Tashkent: University Publishing House, 2014. – p. 96.

⁵ Mamatov M.M. *Fundamentals of General Psychology*. – Tashkent: Tafakkur Publishing House, 2018. – p. 134.

⁶ Karimova V.M. *Psychology*. – Tashkent: Fan Publishing House, 2012. – p. 118.

world. This information is subsequently processed through perception, thinking, and other mental processes. Therefore, the in-depth study of sensory processes is essential for understanding the general закономерности of human cognitive activity.

In contemporary psychological science, psychophysical research continues to advance with the help of new technologies. For example, computer technologies and neurophysiological research methods allow for a more precise investigation of the functioning of the human sensory system. This demonstrates the continued relevance of psychophysics within the framework of modern scientific research.

The theoretical and methodological foundations of psychophysics remain highly significant in the development of psychology today. The in-depth study of the human sensory system is important not only for psychology, but also for neurology, cognitive sciences, and artificial intelligence research. Therefore, the psychophysical theory developed by Weber and Fechner continues to serve as an important theoretical foundation for modern scientific investigations.

Conclusion. The results of the study indicate that the formation of psychophysics represents one of the significant scientific turning points in the history of psychology. The emergence of this field established new methodological approaches to the study of the human psyche and created the foundation for the development of psychology as an independent scientific discipline based on precise experimental research. In this process, the scientific investigations conducted by the German scholars Ernst Heinrich Weber and Gustav Theodor Fechner are of particular importance. Their research provided a scientific basis for the study of mental processes not only from theoretical or philosophical perspectives, but also through experimentation and quantitative measurement.

The principle of differential sensitivity developed by Weber made it possible to achieve a deeper understanding of the functioning mechanisms of the sensory system. On the basis of this idea, it became possible to determine how human sensations respond to changes in external stimuli, and the concept of sensory thresholds was introduced into scientific discourse. As a result, the possibility of expressing psychological processes through quantitative indicators emerged. Subsequently, Fechner further developed these ideas and succeeded in expressing the lawful relationship between the strength of sensation and the intensity of stimuli in mathematical form. This strengthened the theoretical foundations of psychophysics and stimulated the widespread application of experimental methods in psychology.

At the same time, an important aspect of psychophysical research is that it contributed to determining the capabilities and limits of the human sensory system. This served as an essential scientific foundation not only for theoretical psychology but also for applied research. The methods developed within psychophysics later functioned as an important methodological basis for the formation of fields such as experimental psychology, cognitive psychology, and neuropsychology. In particular, the possibility of quantitatively analyzing sensory processes created broad opportunities for a deeper scientific investigation of the human psyche.

Summarizing the results of the study, it can be concluded that the scientific investigations conducted by Weber and Fechner played a fundamental role in the formation of psychophysics and made a significant contribution to the development of psychology as an experimental science. These studies demonstrated the existence of objective measurements of mental processes and opened new possibilities for the scientific study of the human sensory system. Even today, the laws of psychophysics are widely applied in modern psychology, neurobiology, and cognitive sciences, serving as an important theoretical and methodological foundation for the investigation of human perception and sensory processes. Therefore, studying the process of the formation of psychophysics is

of great importance for a deeper understanding of the historical stages of the development of psychology and for determining the prospects of contemporary scientific research.

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