Obutchénie
Revista de Didática e Psicologia Pedagógica

DOI: http://doi.org/10.14393/OBv9.e2025-28

Contributions of P. Ya. Galperin's Formative Methodology to the design of intervention programs based on historical-cultural neuropsychology[1]

Contribuições da metodologia formativa de P. Ya. Galperin para o desenho de programas de intervenção a partir da neuropsicologia histórico-cultural

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ABSTRACT
This theoretical essay examines P. Ya. Galperin's formative methodology and its articulation with historical-cultural neuropsychology, highlighting its applicability in the development of intervention programs. Although widely used in education for the formation of school skills and scientific concepts, this methodology is still little explored in the rehabilitation of psychological processes. It is argued that the principles of rehabilitative teaching and Galperin's formative

RESUMO
Este ensaio teórico examina a metodologia formativa de P. Ya. Galperin e sua articulação com a neuropsicologia histórico-cultural, destacando sua aplicabilidade na construção de programas interventivos. Embora amplamente utilizada na educação para a formação de habilidades escolares e conceitos científicos, essa metodologia ainda é pouco explorada na reabilitação dos processos psicológicos. Argumenta-se que os princípios do ensino reabilitador e da

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DOI: http://doi.org/10.14393/OBv9.e2025-28

methodology complement each other in the development of intervention practices, favoring the reorganization of the complex functional systems involved in skills such as reading, writing, and calculation. Historical-cultural neuropsychology offers a model for understanding the systemic and dynamic functional organization of these psychological processes in the brain, while Galperin's formative methodology contributes to the formulation of general methodological principles of rehabilitative teaching. Elements such as the externalization (materialization) of the psychic process, the orientation of teaching from the external environment, the use of auxiliary supports (cultural prostheses), and the gradual internalization of actions are fundamental for neuropsychological rehabilitation. In this context, this theoretical essay aims to recover the theoretical-methodological assumptions of Galperin's theory and analyze its applicability in the formulation of intervention programs in neuropsychology.

Keywords: Neuropsychological Intervention. Neuropsychological Rehabilitation. Formative Methodology. Historical-Cultural Neuropsychology. P. Ya. Galperin.

metodologia formativa de Galperin se complementam no desenvolvimento de práticas interventivas, favorecendo a reorganização dos sistemas funcionais complexos envolvidos em habilidades como leitura, escrita e cálculo. A neuropsicologia histórico-cultural oferece um modelo para compreender a organização funcional sistêmica e dinâmica desses processos psicológicos no cérebro, enquanto a metodologia formativa de Galperin contribui para a formulação de princípios metodológicos gerais do ensino reabilitador. Elementos como a externalização (materialização) do processo psíquico, a orientação do ensino a partir do meio externo, o uso de suportes auxiliares (próteses culturais) e a interiorização gradual das ações são fundamentais para a reabilitação neuropsicológica. Diante desse contexto, este ensaio teórico tem como objetivo resgatar os pressupostos teórico-metodológicos da teoria de Galperin e analisar sua aplicabilidade na formulação de programas interventivos em neuropsicologia.

Palavras-chave: Intervenção neuropsicológica. Reabilitação neuropsicológica. Metodologia formativa. Neuropsicologia histórico-cultural. P. Ya. Galperin.

1 Introduction

The formative methodology has been regarded as one of the most relevant and still influential proposals for contemporary pedagogy and psychology. Formulated by the Soviet physician, neurologist, and psychologist Piotr Yakovlevitch Galperin, within the context of the theory of developmental learning in the former Soviet Union, the formative methodology aimed to offer a new method for investigating the genesis and development of children's psychological processes, while also establishing a comprehensive system of the necessary conditions for the formation of academic knowledge and skills (PUENTES, 2021). It is, therefore, the study of psychological processes through their guided formation toward a specific objective (OBUKHOVA, 2019), a methodological approach grounded in the genetic-experimental method of L. S. Vygotsky and A. N. Leontiev.

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The principle of guided formation contributes not only to pedagogical practice but also to clinical practice, particularly in the context of rehabilitative teaching.

The formative methodology is referred to in the literature by various names, such as "formative experiment," "gradual experiment," and "systematic experiment," and it is used to investigate the forms of teaching-learning (*obuchénie*, in Russian) that promote development (LONGAREZI, 2021). This approach resulted in the development of a theory of development concerning the ontogenetic formation of psychic activity — *the Theory of the Stage-by-Stage Formation of Mental Actions and Concepts* — as well as in the formulation of a theory of learning derived from the methodological proposals of the genetic-formative experiment (PUENTES, 2021; SOLOVIEVA & QUINTANAR, 2019). Its contribution to educational practice, especially in the formation of academic skills and scientific concepts, has been increasingly recognized (FOSSA et al., 2022). This methodology has served as a reference for the design of various instructional and psychoeducational programs, implemented in schools for at least 30 years, with students of different age groups and across various subjects (HAENEN, 1996). However, its application in clinical practice, particularly in the intervention and rehabilitation of psychological processes, remains underrecognized (SOLOVIEVA & QUINTANAR, 2019).

When patients — whether children or adults — present difficulties in performing cognitive activities such as reading, writing, and arithmetic, due to various medical or educational factors, neuropsychology faces questions similar to those in the pedagogical field: How can a skill or mental action be formed or rehabilitated? What should be the didactic sequence of actions that make up an intervention program? What alternative learning paths can allow the individual to overcome deficits? When developing intervention programs based on the diagnosis or profile of the case under study, the neuropsychologist must conduct a formative teaching process, grounded in the neuropsychological characteristics of the involved profile of strengths and weaknesses. In the words of Solovieva and Quintanar (2019):

DOI: http://doi.org/10.14393/OBv9.e2025-28

> This process must be conducted with guidance that is accessible and appropriate for the patient, whether child or adult. This guidance must be analyzed and developed based on clinical data obtained from the anamnesis and qualitative assessment, which allows the definition of psychological goals for rehabilitation or correction. This means that the methodology of the formative experiment is extremely useful for neuropsychology. (Solovieva & Quintanar, 2019, p. 102) [our translation].

Thus, the practical application of Galperin's formative methodology may be useful not only for developmental and educational psychology but also for neuropsychological intervention and rehabilitation in both children and adults. The aim of this theoretical essay is, therefore, to revisit the theoretical and methodological foundations of Galperin's theory, analyzing its applicability to the construction of neuropsychological intervention programs. To this end, the main formulations of Galperin's formative methodology and its application in educational practice will first be presented. Next, the principles of rehabilitative teaching will be addressed from the perspective of historical-cultural neuropsychology. Finally, theoretical-conceptual articulations will be made to integrate both fields of knowledge, providing guiding elements for the construction of intervention programs in clinical settings.

2 Galperin's Formative Methodology and Its Practical Application in Education

Although P. Ya. Galperin began his career in the 1930s and experimental programs in education were carried out in the 1950s, the development of his theory occurred primarily between the 1940s and 1970s in the Soviet Union. The investigative focus during this period was the development of theoretical thinking in children approximately 6 to 11 years old—an age range in which study becomes the primary activity (LONGAREZI, 2021). According to Puentes (2021), the antecedents of this theory date back to research conducted in Moscow during the 1930s and 1940s. Notable among these are L. S. Vygotsky's studies on concept formation in thinking, the work of D. B. Elkonin and M. V. Camezo on the

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development of reading and writing skills, and A. V. Zaporozhets's contributions regarding the importance of organizing and orienting the conditions under which an action occurs, as well as the procedural content involved.

The foundation of the *Theory of the Stage-by-Stage Formation of Mental Actions and Concepts* lies in the understanding that there is a genetic relationship between mental operations and external practical actions. This means that the development of a child's thinking takes place through direct engagement in objective activities. Galperin investigated the necessary conditions for the gradual transformation of external actions into internal ones—a process that occurs through a series of successive stages, each of which serves as the basis for the next. This general principle guided his method and was present in the gradual formative experiments he conducted (LONGAREZI, 2021). The formative methodology, therefore, is based on two main premises: (i) for students to acquire knowledge and skills with a specific quality, they must carry out certain actions that serve as means of learning; (ii) the student is not initially capable of performing a new action internally and immediately "for themselves." Every internal, ideal action originates from an external one, whether material or materialized (GAL'PERIN & TALYZINA, 1965).

By investigating how mental actions originate and develop, Galperin refined, expanded, and deepened his understanding of the various functional aspects involved in the process of internalization. For the Soviet author, all psychological phenomena and processes follow a single schema that reflects the essence of the assimilation process (PUENTES, 2021). This schema shows that the formation of internal action from external action occurs in four stages: (i) the creation of the orienting basis of the action; (ii) the formation of the material aspect of the action; (iii) the development of its linguistic aspect; and (iv) the transformation of the action into a mental act (GALPERIN, 2009a). These stages, through which the action is carried out, constitute the gradual levels of transformation of an external phenomenon into something increasingly individualized. According to Puentes (2021), it is possible to control action at these fundamental levels of formation, thus allowing its transformation into a skill.

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In this way, Galperin presented a theory that enables the investigation of how to intervene in the process of forming internal action from external action. The major innovation of this proposal lies in the fact that, although it is necessary from the outset to recognize that what is being formed is an ideal concept (such as mathematical concepts, for example)—a theoretical object that cannot be directly perceived by the senses—it is still possible to work with the content of this concept on external planes (materialized, perceptual), using specifically designed schemes for this purpose (SOLOVIEVA & QUINTANAR, 2019). For example, in a learning activity involving mathematical concepts (such as angle, circumference, perpendicular line, among others), the student may carry out various actions, such as recognizing, comparing, classifying, and deducing consequences. Each of these actions involves different operations, such as identifying the essential characteristics of the objects in the given class and verifying whether the analyzed object does or does not possess those characteristics, among others (TALIZINA, 2017). Therefore, without actions, mathematical ideas and concepts cannot exist or be represented, as they cannot be transmitted as ready-made knowledge—that is, they cannot be delivered to students in a finished form. It is essential that students acquire them through interaction with the objects linked to those concepts, which exist in society as part of culture (TALIZINA, 2001).

The school learning process is thus composed of a continuous sequence of actions: listening to and understanding instructions and explanations, reading, writing, adding, subtracting, performing various types of analysis (grammatical, mathematical, historical), among others. These different actions—intellectual, perceptual, verbal, and physical—constitute a significant part of school subjects and are the immediate object of the teacher's instructions. The other part of school content consists of ideas and concepts, which are also formed through actions (GAL'PERIN, 1989a).

From this perspective, teaching and learning cannot exist without actions, as actions are the means (the guiding link) for concept formation, allowing them to be assimilated and used in problem-solving. Therefore, the methodological unit of teaching is always the action (SOLOVIEVA & QUINTANAR, 2018b; TALIZINA,

DOI: http://doi.org/10.14393/OBv9.e2025-28

2019). By emphasizing action as the central link in directing the formation of cognitive activity, Galperin's theory is dedicated to analyzing the structure of action and its functional parts (orientation or planning; execution; and control and correction), as well as the system of cognitive characteristics necessary to plan and guide the process of its formation (SOLOVIEVA & QUINTANAR, 2018b; TALIZINA, 1988, 2000). Thus, from the beginning of learning, the new action must be presented and explained. In this way, the child develops a representation not only of the content and result of the action, but also of the elements that may serve as support for its proper execution. The anticipation of the task, along with the system of necessary orienting elements for its performance, constitutes the plan of the future action, serving as a foundation for its direction (GALPERIN, 2009a).

This action plan is called the orienting basis of action (OBA) and constitutes the instance responsible for guiding the process, ensuring the quality of execution and the success of the action (GALPERIN, 2009a, 2009b). It refers to the elements used by the learner to orient themselves in performing a specific action within a problem situation, allowing continuous monitoring and correction throughout the execution and finalization of the obtained product (NÚÑEZ, 2009; SOLOVIEVA & QUINTANAR, 2019). Although the learner may, on their own, identify the type of orienting basis of action necessary to assimilate the content, if they are unable to do so, it is the teacher's role to provide this guidance, helping them move beyond the trial-and-error approach (GAL'PERIN, 1992; NÚÑEZ, 2009). In this sense, the concept differs from the "orienting basis of action scheme," which refers to a planned, structured orientation systematically developed and worked on with the student. From this perspective, analyses of the psychological content of various school actions have been carried out with the aim of proposing guidelines that help students execute them correctly (SOLOVIEVA & QUINTANAR, 2020b).

When creating guidance in the educational field, it is necessary to consider the specific content underlying each concept—what is within it but cannot be perceived by the senses. The role of the educator is to provide orientation that helps to reveal this content (SOLOVIEVA & QUINTANAR, 2019). For example, instead of simply having the child memorize the multiplication table, it is necessary to

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teach the mathematical concept of multiplication through materialized actions, providing them with an orienting basis for executing the multiplication of quantities using external materialized support such as a slide rule. Only after this stage can the student be led to the reduced version of the action: the multiplication table. The formation of relations such as $2 \times 3 = 6$ and $2 \times 4 = 8$ should be the final result, the outcome of the reduction and automatization of the corresponding arithmetic operations—but it cannot be used as a means for learning these operations (LEONT'EV & GAL'PERIN, 1965). Other examples of materialized manual calculation actions using mediating instruments include the abacus and Napier's bones (ANDRILLAH, SAYIDIMAN & NURHAEDAH, 2023).

The resolution of a problem situation necessarily requires an understanding of the system of characteristics of the new material or of essential properties it carries which, if taken into account, will make it possible to correctly execute the required action (GAL'PERIN, 1989b). To do so, it is necessary to distinguish general, essential data that are concealed behind a variety of particular phenomena (TALIZINA, 2019). Therefore, there are three basic prerequisites for the development of an educational program: (i) to clearly define what is to be taught and learned, delimiting the object of knowledge; (ii) to identify the criteria or essential skills for the appropriation of this object of knowledge, which will later serve to monitor and assess the effectiveness of the teaching process; (iii) to plan and design the course of the learning process, identifying its regularities or, when that is not possible, establishing a hypothetical notion that can serve as a guideline (GAL'PERIN; TALYZINA, 1965; LEONT'EV; GAL'PERIN, 1965).

In this sense, rather than focusing on isolated facts or on solving specific problems, a system of subject knowledge must be presented with its general core, identifying the essential core concepts. For example, in mathematics, these are number and the decimal system, while in grammar, it is the word class. Therefore, the teaching of each subject should begin with the introduction of these core concepts, supported by appropriate guidance (SOLOVIEVA; QUINTANAR, 2010). One example of a core concept in the field of literacy is the concept of the letter,

DOI: http://doi.org/10.14393/OBv9.e2025-28

which cannot be formed through mechanical memorization of the alphabet. When learning to use a system of signs, the first fundamental step is to establish the relationship between the sign and the reality it represents (ELKONIN, 1988). Thus, in teaching letters, the teacher must first propose actions that enable the child to perform an analysis of the sound composition of words and develop guidance regarding the phonemic structure of the language. Only after this should the letters be introduced, emphasizing their function of representing speech sounds, since it is only through this relationship with phonemes that children can access the real meaning of these signs.

Therefore, school practice should be understood as a continuous formative experiment that benefits both the educator and the child by providing essential guidance for "teaching" and "learning" (SOLOVIEVA & QUINTANAR, 2019). In this assimilation process, students not only appropriate the content and structure of concepts and mental skills but also the method by which these contents and structures are assimilated. This fosters generalization, as it allows concepts and actions to be applied in the formulation and solution of new didactic tasks of the same type (PUENTES, 2021).

Galperin's studies aimed to demonstrate the effectiveness of the formative methodology both in facilitating the assimilation and generalization of concepts and in ensuring that this process occurs consciously. This methodology goes beyond the mere formation of specific skills, focusing on the development of general abilities. The conscious aspect can be seen as a positive element in Galperin's theory, especially when compared to other theories of cognitive assimilation (PUENTES, 2021), such as the Montessori method, constructivist and Piagetian learning theories, the associationist theory, among other educational approaches.

3 Theoretical-Methodological Principles of Rehabilitative Teaching in Historical-Cultural Neuropsychology

The approach to the main concepts and methodological assumptions of rehabilitative teaching from the perspective of historical-cultural neuropsychology requires recovering its close articulation with the materialist-historical psychology

DOI: http://doi.org/10.14393/OBv9.e2025-28

of L. S. Vygotsky and A. R. Luria. This entails revisiting the conceptions of historical-cultural psychology regarding the social and historical origin of higher psychological functions, their mediated structure, their systemic and dynamic organization in the brain, as well as its theory of human development and notion of the subject (COELHO, SOTO & HAZIN, 2024). The guiding principles of neuropsychological rehabilitation, which will be discussed below, can only be fully understood in light of this theoretical-conceptual framework.

Vygotsky and Luria sought to understand how natural processes, such as physical maturation and sensory mechanisms, connect with cultural processes to form higher psychological functions (LURIA, 2015). Their scientific efforts to comprehend this synthesis resulted in the foundations of historical-cultural neuropsychology (AKHUTINA, 2013), contributing to the deciphering and analytical decomposition of the internal psychophysiological structure of complex psychological processes such as perception, memory, reading, writing, and calculation. In the past, it was believed that these psychic processes were directly linked to specific areas of the cerebral cortex. Since the nerve cells in these regions do not regenerate after destruction, any lesion in these areas was considered responsible for irreversible damage to these functions. This conception, in turn, fostered a pessimistic outlook regarding the prognosis of patients with focal lesions impairing higher psychic functions (LURIA, 1977), reinforcing the notion of "loss" of psychic function following a neurological event—an idea that still persists in some contemporary conceptions.

With the studies of Vygotsky in psychology and P. K. Anokhin in physiology, it became evident that every "function" or higher psychic process is, in reality, a complex functional system with a mediated structure. This system is composed of multiple brain areas or mechanisms (links of the functional system), which operate in an integrated and coordinated manner. Each area, especially in the cerebral cortex, participates in this functional system and contributes to the execution of psychological activity (LURIA, 1977). This perspective maintains that, following a neurological event, the psychic function is not lost, but there is a disintegration in

DOI: http://doi.org/10.14393/OBv9.e2025-28

the mode of operation of the complex functional system. In this context, functional reorganization becomes essential in the intervention process through rehabilitative teaching.

As an example, Luria (1991) analyzes more deeply the writing process and the links that integrate this functional system. To write a word, a person must first identify the sounds that compose it, that is, perform an acoustic analysis, decomposing the continuous flow of sounds into phonemes, which are the smallest sound units of a language. Each language has its own phoneme system. The distinction of these phonemes is not made solely "by ear," but also involves the participation of articulation, allowing the differentiation of similar sounds. After that, phonemes need to be converted into graphemes. To perform this conversion, it is necessary to have a motor-visual schema of the letters and to ensure the correct spatial arrangement of these elements. However, the writing process does not end there; it also requires a complex movement program, in which each element must harmoniously coordinate with the next. Moreover, the act of writing needs to be goal-oriented, whether it is to record a dictated sentence, copy a passage from a book, compose a letter, or express an idea. The fulfillment of this task depends on the proper maintenance of the corresponding program. The operations that compose the action of writing are flexible and adjust according to the goal, meaning their structure can be reorganized based on the purpose and conditions of the task (LURIA, 1991).

Observing all the operational links involved in the writing process makes it clear that complex psychological functions such as this cannot be localized in isolated areas of the brain. On the contrary, their psychophysiological mechanisms are distributed systemically and dynamically throughout the cerebral cortex. Several brain areas participate in this process, including the frontal lobes (prefrontal and premotor cortex), inferior parietal zones, superior temporal areas, middle temporal regions, anterior occipital areas, as well as the temporo-parieto-occipital regions of both hemispheres and subcortical structures. Each of these areas plays an essential role in the

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system's functioning. Therefore, even limited brain lesions (particularly in the dominant left hemisphere) can affect the normal functioning of the entire functional system. For the same reason, only very extensive lesions cause irreversible damage. In most cases, it is possible to reorganize the activity of the functional system through new pathways (LURIA, 1977).

Spontaneous rehabilitation of higher psychic functions is rare or occurs only to a very limited extent. Patients with focal lesions resulting in difficulties such as language comprehension or word articulation will continue to experience these challenges without specialized assistance. Therefore, a systematic rehabilitative teaching process, grounded in scientific principles, must be conducted. Only through such an approach—an active and rationally organized therapeutic work—will it be possible to restructure the altered functional system and recover the impaired function (LURIA, 1977). The principle of rehabilitation through the reorganization of complex functional systems, developed by Soviet physiology and neuropsychology, forms the foundation of the scientifically based theory for rehabilitating higher psychic functions altered by focal brain lesions. This reorganization is a complex process that involves substituting the lost link with a preserved one and restructuring the entire functional system based on new conditions (LURIA, 1977).

Rehabilitative teaching therefore requires a detailed prior assessment of the specific disturbance to identify the functional link disintegrated by the lesion and its relation to the loss of the skill or habit to be recovered. Based on this diagnosis, appropriate compensation strategies should be defined, focusing on the impaired link rather than addressing all components of the function (LURIIA & TSVETKOVA, 1966; TSVETKOVA, 1972). For example, if a patient has difficulty writing dictated text due to a deficit in analyzing the sound composition of words (acoustic-phonetic link), the intervention should include strategies enabling this operation to be performed via indirect pathways, compensating for the limitation in acoustic recognition. In such cases, methods such as lip reading, identification of kinesthetic sensations associated with word pronunciation, and visual analysis of letters can be used to promote writing rehabilitation—even in the absence of

DOI: http://doi.org/10.14393/OBv9.e2025-28

proper functioning of the temporal (acoustic) areas of the cortex (LURIIA & TSVETKOVA, 1966; TSVETKOVA, 1972). According to Tsvetkova (1972), the structure of any type of activity consists of at least three links: (i) task, (ii) method or process, and (iii) effect. In the given example, there is a task (writing under dictation) and an expected effect (correct graphic representation of the dictated verbal elements). However, the middle link is missing, i.e., the means to achieve the goal are compromised. This must be provided by the intervention program.

Each operation in rehabilitative teaching must be performable by the patient, initially under external control mediated by the therapist, and later under self-control. Activity control is essential for recovering the impaired function, requiring continuous corrections and adjustments by the educator-therapist. For this purpose, it is crucial to highlight successes and errors during task execution and use specialized resources that make feedback clearer and more accessible, such as mirrors—which assist in monitoring motor and speech function recovery—and recorders, which capture the patient's speech, allowing comparison of their production with the initial task to analyze and correct errors. Introduced by P. K. Anokhin, N. A. Bernstein, and A. R. Luria, this approach is based on the idea that a continuous feedback flow (reafferentation) is essential to ensure ongoing activities adjust to training objectives. This corrective process enables the patient to perform complex activities organized in sequential operations, ensuring the specificity of the training and making the direction of rehabilitation activities more effective (TSVETKOVA, 1972).

Thus, the development of intervention programs is not limited to establishing a sequence of operations leading to the desired final action; it is essential to create external conditions that enable the patient to master the methods of executing the altered act. The focus should be on developing strategies that facilitate the internalization of these modes of action, allowing the patient to gain voluntary control over the activities and thereby restore the affected functions more efficiently (TSVETKOVA, 1972; TSVÉTKOVA, 1977). This process demands the involvement of qualified specialists, such as neuropsychologists, who are responsible for assessing the deficits presented by the patient, recognizing the

DOI: http://doi.org/10.14393/OBv9.e2025-28

underlying disorder, and establishing strategies for functional reorganization. Only through an accurate diagnosis is it possible to define effective methods to conduct rehabilitation and restore the compromised capacity (LURIA, 1977; LURIIA & TSVETKOVA, 1966).

4 The Application of Galperin's Formative Methodology in Clinical Intervention Practice

The formative methodology applied in neuropsychological clinical practice and pedagogical practice has points of convergence and divergence. Regarding commonalities, it is noteworthy that both the function to be formed and the one to be rehabilitated require the participation of another person. During the rehabilitative teaching process, the patient needs not only direction but a situation in which the function is necessarily shared between two people: the patient and the educator-therapist (neuropsychologist). Initially, in this joint activity, a large part of the function is executed by the therapist, and gradually, the activity and the mode of execution of the altered operation are transferred to the patient, becoming part of their own skills. On the other hand, the pathological function, unlike that formed under typical conditions, requires greater externalization and the maximum detailing of its structure (TSVÉTKOVA, 1977).

Thus, both educational pedagogical work and neuropsychological intervention and rehabilitation work can be considered formative procedures, albeit with different levels of complexity. The principle of planned stepwise formation can serve as a theoretical and practical basis for the assimilation of the activity being reorganized. This perspective assumes that no type of knowledge, skill, or habit can be transmitted in a finished form; they can only be assimilated if they become part of the learner's repertoire, with active participation in the execution of a specific system of operations. For this, it is essential to rigorously follow the re-educational sequence, beginning with a program that details the structure of the operations, progressing to gradual reduction, and transferring the action from the material level (dependent on external means) to the verbal level

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(TSVETKOVA, 2016). From this perspective, meticulous planning of the rehabilitative teaching process becomes an essential principle in the development of intervention programs. Thus, all elements related to the skill to be rehabilitated must be carefully planned and systematized, supported by a series of specialized external resources (LURIIA & TSVETKOVA, 1966). This is the principle of systematic programming (or systematic external guidance) of rehabilitation for affected functions (TSVETKOVA, 2016). Although rehabilitative teaching programs vary in content, they follow the same construction principles, structured in three parts: (i) orientation toward the activity, (ii) execution of operations, and (iii) control of the activity (TSVETKOVA, 1972). In this context, the orientation stage, which is the object of psychological study within Galperin's formative methodology, plays a fundamental role in neuropsychological clinical practice.

It is the therapist's responsibility to externally provide the appropriate orientation scheme for the required action, allowing the patient to execute it in a planned and controlled manner. This scheme is applied throughout the entire rehabilitation process, encompassing the performance of actions with objects, the precision of articulatory movements, balance functions, visuospatial skills, among others (SOLOVIEVA & QUINTANAR, 2018b). The neuropsychologist intervenes in the parts where the patient cannot access independently, performing the action jointly with them and providing the necessary guidance. This guidance can be material (concrete object), symbolic (materialized), perceptual (concrete or schematized), or verbal, whether oral or written, depending on the specific clinical need. In particular situations, this guidance may also be bodily or gestural, progressively advancing to more complex levels (SOLOVIEVA & QUINTANAR, 2020a, 2020b, 2019).

Presented below is a set of tasks described by Tsvetkova (1977), used in rehabilitative teaching of reading in cases of impairment of the cerebral mechanisms for visuo-verbal retention (objective image) and simultaneous analysis and synthesis, which may occur in cases of amnestic aphasia or semantic aphasia. Clinically, these cases are characterized by difficulties in identifying and recognizing letters (among other perceptual graphic images) due to alterations in

DOI: http://doi.org/10.14393/OBv9.e2025-28

visual perception, which compromise the correct correlation between the optical and spatial representation of the letter, while its acoustic and motor characteristics remain unchanged. The steps of this program are useful only for adult patients who have prior experience with the reading and writing process. For children and illiterate individuals, the rehabilitation program would involve distinct content and processes.

In the first stage, the focus is on the perceptual rehabilitation of isolated letters and their recognition. The patient needs to relearn how to recognize letters analytically, based on their structure and the organization of their elements. Rehabilitative teaching thus involves a series of actions (tasks) aimed at recognizing and naming letters. Among these actions are: (i) writing the letter in the air without visual support, using the already automated motor image; (ii) writing it on paper; (iii) identifying it in a three-dimensional drawing among other letters; (iv) exploring it through touch, using a textured movable alphabet; (v) comparing it visually and synesthetically with other letters (TSVÉTKOVA, 1977). These strategies integrate two fundamental principles: Galperin's formative methodology, which emphasizes the importance of externalizing actions at the beginning of the formative process, and the historical-cultural neuropsychology approach, which guides rehabilitative teaching based on preserved psychophysiological mechanisms. Initially, the patient analyzes letters with very different visual forms (such as O-H, A-B, among others). Subsequently, the patient studies those that are visually SIMILAR in structure (such as O-C, P-D, M-N, among others). Simultaneously, the verbal-configurational analysis method is used, in which the compared letters are examined with emphasis on their general and distinctive characteristics. For example, when verbally analyzing the letters "p" and "b," the patient is encouraged to reflect on their structure: "Both letters have a straight line and a rounded part. What changes is the position of each. The 'p' has the rounded part on top, and the 'b' has it on the bottom. Also, the stroke of the 'p' goes from top to bottom, while the 'b' goes from bottom to top." (TSVÉTKOVA, 1977, pp. 265–266). In this process, letter recognition is

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gradually internalized, moving from an external and materialized execution to a verbal level.

Based on the knowledge acquired about letters, the subsequent stages of rehabilitative teaching may include more complex reading units, such as syllables and words. For identifying letters within whole words, especially in handwritten form, the procedure known as "polychromatic word reading" is employed, in which each letter is presented in a distinct color. This chromatic differentiation assists in the visual discrimination of letters within the word, functioning as additional support for recognition and reading (TSVÉTKOVA, 1977). In this context, colors act as a "cultural prosthesis," helping to minimize the cognitive impairments manifested by the patient (HAZIN et al., 2009; HAZIN, LEITÃO & FALCÃO, 2009). The illustrated program creates conditions that favor active discriminative perception of letters, allowing the reconstruction of an accurate, stable, and generalized image of each one. Preserved aspects of the reading function, such as ocular movement along the line, auditory analysis and synthesis of the read material, and text comprehension, are not the direct focus of intervention but may serve as support throughout the process.

During the structuring of tasks, means that allow for the externalization of the intended actions were selected, enabling the initial work to occur on the external plane before internalization. In this context, a reading component previously automated by the patient — the visual recognition of letters — was externalized and decomposed into a series of materialized operations. Thus, teaching for rehabilitation, based on the formative methodology, should initially rely on external means and gradually "transition from an extensive process, isolating all of its components, to an abbreviated and reduced process" (LURIIA & TSVETKOVA, 1966, p. 7, [our translation]), aiming at the patient's progressive self-regulation.

Throughout the completion of all stages, the educator-therapist questions the patient about how the task was performed, fostering the verbal internalization of the action. In case of error, it is possible to return to the previous stage, for example, again resorting to materialized means for identifying the component

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parts of letters. Notably, in this process, the continuous orientation and regulation of the patient's activity through the therapist's speech is central. The reduction of rehabilitative activity occurs gradually in the later stages of the rehabilitative teaching process. At this phase, the support elements that previously integrated the program, including the range of external auxiliary resources, are progressively withdrawn (LURIIA & TSVETKOVA, 1966). As the patient restores and masters this psychic function, internalizing it, it transforms into an instrument of self-direction and behavior regulation.

Following the principles of the formative methodology, it is possible to teach patients to develop their own reflective orientation skills to overcome difficulties. Patients who initially cannot speak, read, or write gradually resume these activities. In this way, they slowly acquire their own orientation capacities for everyday life and intellectual activities (SOLOVIEVA & QUINTANAR, 2018b). The positive experience of the formative possibilities in clinical practice is reflected in the results of intervention programs developed based on this methodology. Case studies involving clinical work with children of different neuropsychological profiles demonstrate, for example, the effectiveness of this approach in the correction and rehabilitation of visuospatial skills (BORGES & SOLOVIEVA, 2022; HAZIN, SOLOVIEVA & FREIRE, 2019), as well as in the development of activity self-regulation (CAMPOS-GARCÍA, SOLOVIEVA & MACHINSKAYA, 2024; SOLOVIEVA, MATA & QUINTANAR, 2014). In adult clinical settings, the application of this methodology has shown success in rehabilitative practices focused on different types of aphasia (CHASTINET, MORAIS & SOLOVIEVA, 2011; RODRÍGUEZ et al., 2011; SOLOVIEVA & QUINTANAR, 2018a) and agraphia (SOLOVIEVA, PELAYO & QUINTANAR, 2002). These findings reinforce the potential of the formative methodology to be expanded and generalized to other clinical contexts and conditions.

5 Final Considerations

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Based on the above, it is considered that the principles of rehabilitative teaching and Galperin's formative methodology complement each other in the development of intervention practices. Historical-cultural neuropsychology provides a model for understanding the cerebral structure of different psychological processes, identifying the links that compose the complex functional systems involved in reading, writing, calculation, among others, and demonstrating how these systems can be reorganized throughout the rehabilitative teaching process. Similarly, the application of Galperin's formative methodology in clinical practice contributes to the formulation of general methodological principles of rehabilitative teaching. These principles — such as the need to externalize the psychic process, the use of multiple channels of connection for transmitting information to the patient, guiding rehabilitation from the external environment, maximizing the use of appropriate auxiliary supports, and the specific work of internalizing the process — are fundamental to neuropsychological practice, favoring the effective restoration of psychological functions.

Finally, the formative methodology, both in formal teaching and rehabilitation, stands out as one of the psychological methods that reaffirm the fundamental principle of psychology regarding the extracortical origin of higher psychological functions, which emerge from human relationships. Vigotsky (2011) already stated that when the direct — typical — paths of cultural development are interrupted, it becomes necessary to create indirect routes. In this sense, Galperin's formative methodology offers support for the construction, in clinical practice, of new intervention pathways that enable the compensation of difficulties.

Contribuciones de la metodología formativa de P. Ya. Galperin para el diseño de programas de intervención desde la neuropsicología histórico-cultural

RESUMEN

Este ensayo teórico examina la metodología formativa de P. Ya. Galperin y su articulación con la neuropsicología histórico-cultural, destacando su aplicabilidad en la construcción de programas interventivos. Aunque ampliamente utilizada en la educación para la formación de habilidades escolares y conceptos científicos, esta metodología aún es poco explorada en la rehabilitación de los procesos psicológicos. Se argumenta que los principios de la enseñanza rehabilitadora y la metodología formativa de Galperin se complementan en el desarrollo de prácticas interventivas, favoreciendo la reorganización de los sistemas funcionales complejos involucrados en habilidades como lectura, escritura y cálculo. La neuropsicología histórico-cultural ofrece un modelo para comprender la organización funcional sistémica y dinámica de estos procesos psicológicos en el cerebro, mientras que la metodología formativa de Galperin contribuye a la formulación de principios metodológicos generales de la enseñanza rehabilitadora. Elementos como la externalización (materialización) del proceso psíquico, la orientación de la enseñanza desde el medio externo, el uso de soportes auxiliares (prótesis culturales) y la interiorización gradual de las acciones son fundamentales para la rehabilitación neuropsicológica. Ante este contexto, este ensayo teórico tiene como objetivo rescatar los presupuestos teórico-metodológicos de la teoría de Galperin y analizar su aplicabilidad en la formulación de programas interventivos en neuropsicología.

Palabras clave: Intervención neuropsicológica. Rehabilitación neuropsicológica. Metodología formativa. Neuropsicología histórico-cultural. P. Ya. Galperin.

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Received in February 2025
Aproved in October de 2025