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Review article

## Cross-Cultural Neuropsychology: History and Prospects

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**Abstract.** It is proposed that cross-cultural neuropsychology analyzes the influence of cultural variables on cognition from a neurological perspective. It includes three major questions: (1) How are current neuropsychological tests affected by the cultural conditions? (2) Are there differences in the brain organization of cognition depending upon the culture? (3) How is brain pathology manifested in different cultural contexts? A history of cross-cultural neuropsychology is presented emphasizing that the interest in cultural issues is observed since the very beginning of neuropsychology. An analysis of culture is introduced, explaining how culture has been interpreted in different ways, but can be understood as the specific way of living of a human group. Further, it is discussed why culture is important in neuropsychology, followed by an analysis of some cultural variables. Special emphasis in schooling, considering that education represents a major variable affecting the performance in diverse cognitive tests. Several illustrative examples of research in cross-cultural neuropsychology are finally presented.

**Key words:** neuropsychology, culture, cognition, cross-cultural psychology, cognitive testing, cross-cultural neuropsychology

### What is cross-cultural neuropsychology?

Cross-cultural neuropsychology analyzes the influence of cultural variables on cognition from a neurological perspective. It also analyzes the cross-cultural differences in cognitive disturbances associated with brain pathology. Indeed, it is a cross-cultural psychology with a neurological perspective, or a neuropsychology with a cultural emphasis.

Some major questions in cross-cultural neuropsychology include:

(1) How are current neuropsychological tests affected by the cultural conditions? For instance, are the current western neuropsychological instruments applicable to diverse cultural groups, such as Amerindians, or African sub-Saharan inhabitants? This is a practical issue in neuropsychology that requires urgent attention. Without a clear understanding of the effect of culture on neuropsychological



test performance, accuracy and validity of current neuropsychological instruments in a global perspective becomes seriously questionable.

(2) Are there differences in the brain organization of cognition depending upon the culture? For instance, how is the brain organization of written language across different orthographic systems? This is fundamental question from the cognitive neuroscience perspective.

(3) How brain pathology is manifested in different cultural contexts? For instance, are the visual and spatial agnosias equivalent in Eskimos, Amazonian jungle Indians, and European people? The impact to the cultural context on major neuropsychological syndromes is a question partially approached in language-related syndromes (aphasia, alexia, and agraphia) and also dementia, but almost completely overlooked in other syndromes.

The answers to these questions are nowadays quite limited, but these answers are critical to understanding human cognition.

### **The origins of cross-cultural neuropsychology**

The interest in analyzing cross-cultural variables has existed in psychology since the very beginning of scientific psychology. Wundt – regarded as the founder of scientific psychology – wrote an extensive book in several volumes about cross-cultural psychology (*Völkerpsychologie* – Cultural Psychology, Wundt, 1900). This interest continued during the following years in a relatively modest way, and only during the 1970s and particularly the 1980s a significant amount of publications dealing with cross-cultural issues are found in behavioral science areas.

Neuropsychology, as a branch of psychology devoted to the analysis of the normal and abnormal relationships between brain and behavior, appeared later in the history of behavioral sciences. Frequently, Luria is considered as the founder of neuropsychology (Luria, 1946–1970; 1966). Luria, as Wundt, was particularly interested in understanding the impact of culture on cognition. His research about intellectual abilities in Uzbek people during early 1930, particularly his analysis of the impact of education on cognition, represents a major contribution to cross-cultural psychology and neuropsychology (Luria, 1932–1976). This interest on the impact of literacy on cognition has continued by different authors (e.g., Ardila et al., 2010; Scribner, Cole & Cole, 1981).

However, in Western neuropsychology relatively little interest existed toward the analysis of cultural variables in neuropsychology. Matthew's (1992) presidential address during the 1992 meeting of the International Neuropsychological Meeting attracted significant attention and represents a milestone in the analysis of cultural variables in neuropsychology. He stated:

*“...a very limited kind of neuropsychology, appropriate to only a fraction of the world's population, is presented to the rest of the world as if there could be no other kind of neuropsychology, and as if the education and cultural assumptions on which... neuropsychology is based were obviously universals that applied everywhere in the world.”* (Matthews, 1992. P. 421).

Nonetheless, at this historical moment the name “cross-cultural neuropsychology” had not been used yet. This concept is probably first used in the paper “Directions of Research in Cross-Cultural Neuropsychology” (Ardila, 1993). Dur-

ing the following years three major books in cross-cultural neuropsychology were published: Nell, V. *Cross-Cultural Neuropsychological Assessment*. 2000; Fletcher-Janzen, E., Strickland, T.L., & Reynolds, C.R. *Handbook of Cross-Cultural Neuropsychology*. 2000; and Uzzell, B., Pontón, M.O., & Ardila, A. *International Handbook of Cross-Cultural Neuropsychology*. 2007, 2013. A diversity of papers dealing with cultural issues in neuropsychology were also published during this historical moment (e.g., Jacobs et al., 1997; Kennepohl, 1999).

Furthermore, a significant amount of research in cross-cultural neuropsychology is found from the 21<sup>st</sup> century (e.g., Arias et al., 2019; Brickman, Cabo, & Manly, 2006; Byrd et al., 2008; Chiao et al., 2017; Duggan, 2019; Duggan et al., 2019; Fernández, & Abe, 2018; Garratt & Kelly, 2007; Golden & Thomas, 2000; Jacobs et al., 1997; Manly, 2008; Melikyan, Puente, & Agranovich, 2020; Nielsen et al., 2018; Nikolaou & Constantinidou, 2019; Pedraza, & Mungas, 2008; Puente et al., 2000; Rosselli, & Ardila, 2003). Several neuropsychology journals express their interest in publishing papers dealing with cultural issues in neuropsychology, including the *Journal of Clinical and Experimental Neuropsychology*, *Archives of Clinical Neuropsychology*, and *Applied Neuropsychology*.

### What is culture?

Before analyzing the impact of culture on cognition, a definition of culture is required. Harris (1988) in his popular textbook of cultural anthropology defines culture as the set of learned traditions and living styles, shared by the members of a society, including the ways of thinking, feeling, and behaving. Berry et al. (2002) presents a minimal definition of culture as “the shared way of life of a group of people” (page 2). This definition is quite similar to the definition proposed by Ardila (2018): Culture is specific the way of living of a human group.

Culture includes three dimensions:

- (1) ***the internal, subjective or psychological representation of culture:*** thinking, feeling, knowledge, values, attitudes, and beliefs;
- (2) ***the behavioral dimension:*** the ways to relate to others, ways of behaving in different contexts and circumstances, festivities and meeting, patterns of associations, etc;
- (3) ***the cultural elements:*** the physical elements characteristic of that human group such as symbolic elements, clothes, ornaments, houses, instruments, weapons, etc.

Culture represents a particular way to adapt to and survive in a specific context. However, cultural changes are continuously observed. Cultural evolution and cultural changes are found throughout human history, depending upon, (a) new environmental conditions, (b) contact with other cultures, and (c) internal cultural evolution.

### How many cultures?

Dozens of different cultures have been described in anthropology (Bernatzik, 1957; Handwerker, 2016) and contemporary man speaks about 7,000 different languages (Ethnologue).

Culture frequently has been equated with its pertaining country. For instance, the publication “Understanding Cultural Differences: Germans, French and Amer-

icans” (Moiain, 1991) is implicitly assuming that country is equivalent to culture. Indeed, culture only partially can be considered equivalent to country. For example, in Belgium there are two relatively different cultural groups. From the cultural point of view Cuba, Puerto, Rico, and Dominican Republic are quite similar, regardless of their political differences.

Sometimes culture has been equated with language. For instance, the paper “Cultural diversification of communicative gestures through early childhood: A comparison of children in English-, German-, and Chinese-speaking families” (Kwon et al., 2018) truly understands language as culture.

Finally, culture has been considered equivalent to ethnic group. Ethnic group is a category where people identify themselves as belonging to a group based on similarities such as a common ancestor, language, history, society, culture or nation. However, ethnic groups – similar to languages – are quite variables in size. The Chinese Han group represents the largest ethnic group with several hundred million members. It is an ethnic group and also a nation. It constitutes the largest ethnic group with about 18% of the world's population, 1,300 million people (about 92% of the Chinese population). However, smaller ethnic groups can have as little as a dozen members. Pirahã is an indigenous group from Brazil, who lives on the banks of the Maici River, has about 800 members. As a cultural group it is unique in different regards: Pirahã have a very simple kinship system. One strong Pirahã values is no coercion. They appear to be no social hierarchy and the Pirahã people have no formal leaders. Their language is also unique: it is one of the phonologically simplest languages ever described. There is no grammatical distinction between singular and plural, even in pronouns. Pirahã also lacks any unique color terminology, and have specific words only for *light* and *dark*.

However, cultures can be grouped into branches using different criteria, but mainly, their origins (e.g., European cultures, Latin cultures, Anglo-Saxon cultures, Islamic cultures, Amerindian cultures, etc.). Two examples: (1) Huntington (2005) when referring to cultural conflicts distinguished nine major culture groups: Western, Latin American, Orthodox, Buddhist, African, Islamic, Sinic, Hindu, and Japanese. (2) The GLOBE (Global Leadership and Organizational Behavior) study (House et al., 2004) proposed that there are 10 major cultural clusters: Anglo, Latin Europe, Nordic Europe, Germanic Europe, Eastern Europe, Latin America, Sub-Saharan Africa, Middle East, Southern Asia, and Confucian Asia.

### **Acculturation**

The concept of *acculturation* can be understood in different ways (Berry, 2003):

1. The modification of the culture of a group or individual because of contact with a different culture.
2. The process by which the culture of a particular society is instilled in a human from infancy onward.
3. Culture changes resulting from contact among various societies over time. Contact may have distinct results, such as the borrowing of certain traits by one culture from another, or the relative fusion of separate cultures.

If taken the first meaning (“modification of the culture of a group or individual as a result of contact with a different culture”) there are four possibilities, considering both the maintenance and abandon of the own culture and identity.

1. **Assimilation**: abandonment of the own cultural identity for adopting the dominant culture.
2. **Marginalization**: abandonment of the own cultural identity without adopting and/or rejecting the dominant culture.
3. **Separation**: maintenance of the own cultural identity without adopting the dominant culture
4. **Integration**: maintenance of the own cultural identity and adoption of the dominant culture.

### **Why culture is important?**

Patricia Greenfield in her influential paper “You can’t take it with you: Why ability assessments don’t cross cultures” (1997) proposed that there are three major reasons accounting for the difficulty to transfer cognitive tests from one culture to another.

1. **Values and meanings**. There is not always agreement on the value of a given response and the same items may have different meaning in different cultures. For example, in some cultures people may consider that in the Raven’s Progressive Matrices test it is a better response that one following an aesthetic principle (i.e., *the figure that looks better in that position*) than the one according to a conceptual principle (i.e., *the figure that continues the sequence*).

2. **Modes of knowing**. The knower is not always an individual and the distinction between the process of knowing and the object of knowledge is not universal. For example, many cultures do not make a distinction between the process of knowing and the object of knowing. In consequence, questions such as “*why do you think?*” or “*why do you consider?*” may be incomprehensible. The point is not what *I* think or *I* consider; the point is how *it is*.

3. **Conventions of communication**. Functions of questions are not the same in every culture and the relevance of information is not the same in every culture. For example, in many societies (e.g., some rural societies) adults rarely talk with children (“*What about could you talk with a child?*”), and it is supposed that children do not participate in adults’ conversations.

### **Cultural variables**

#### **Patterns of abilities**

Cognitive abilities usually measured in neuropsychological tests represent, at least in their contents, learned abilities whose scores correlate with the subject’s learning opportunities and contextual experiences. Culture provides us with specific models for ways of thinking, acting, and feeling. While basic cognitive processes are universal, cultural differences in cognition reside more in the situations to which particular cognitive processes are applied (Cole et al., 1971). Different cultural environments lead to the development of different patterns of abilities.

#### **Cultural values**

Cultural values such as attitudes toward testing can affect test performance. Consequently, it is not surprising that the members of the cultural group the test developer belongs to usually obtain the best results.

Moreover, testing requires a highly structured and rigid situation. Testing is carried out individually. A whole array of cultural values underlay the testing situation. These are the typical values observed in psychometric-oriented societies, but they are far from modal values in many cultural groups (Greenfield, 1997). For instance, when attempting to test an individuals who pertains to a society with community-based values (e.g., many Amerindian groups), the community often feels the responsibility to contribute, help and participate in the individual's test. Activities are socially carried out with the participation of several people and there is not any apparent reason for the privacy in testing.

Certain specific cultural values underline contemporary psychometric testing. Ardila (2005) have suggested that at least the following values are assumed in psychometric testing:

1. **One-to-one relationship.** There is an examiner and there is an examinee. Hence, it is a one-to-one relationship between two people that very likely never met before, are aliens, and will not meet ever again in the future. In many cultures, activities are carried out in a societal way. This style of behavior can be perceived as contradicting the usual cultural way of living (i.e., different people collaborate in diverse activities).

2. **Background authority.** It implies a subordinate relationship (dominance dimension). Background or situational authority refers to the authority associated with a particular role. In a standard testing situation, the examinee has to follow (obey) the instructions given by the examiner, and hence, the examiner is supposed to have a background or situational authority. It may be not so easy, however, to understand by whom and why this authority was conferred. Why should the examinee obey the examiner?

3. **Best performance.** To do "one's best" may be most significant in a culture highly valuing competition, but not in a less competitive society. Psychometrically oriented cognitive testing has flourished in highly competitive societies, often to the disadvantage of those who do not value or understand the process and outcome applications as is the case with current "high stakes testing" in American educational settings. The examinee will perform at their optimal level. Performance "at best" is only done in those endeavors that are perceived and regarded as extremely important and significant. It is assumed that the examinee has to perceive the testing as a most important and significant endeavor. It may not be clear why it is so important and relevant, as an example, to repeat a series of nonsense digits or to draw an absurd figure.

4. **Isolated environment.** Testing is often done in an isolated room. Doors are often closed and even locked. Usually, no one else is allowed to be present, and in this regard it is a private and intimate situation. Private appointments with aliens may be quite inappropriate in many cultures.

5. **Special type of communication.** It refers to the Intimacy-Formality dimension in interpersonal behavior. Examiner and examinee do not maintain a normal everyday life conversation or social rapport. Examiner uses stereotyped utterances in a rather formal language. Examinees are not allowed to talk about themselves in an informal way. This is a type of formal communication relationship that can be different from any previous type of relationship in the participant's past experience.

6. **Speed.** Time is understood differently across different cultures. Time has frequently been interpreted as a social and cultural construct rather than a natural phenomenon. The main elements of time occur in all human societies, yet with different emphases: sequence and duration, cyclical and linear patterns, and systems of time reckoning. Speed supposes a particular type of time orientation. For many cultural groups speed tests are frankly inappropriate. Speed and quality may be contradictory, and good products are the results of a slow and careful process. Significant differences in attitudes to timed procedures are found across different cultures.

7. **Internal or subjective issues.** It also refers to the intimacy – formality dimension of interpersonal behavior. What does “privacy” mean, and hence, what does it mean to disrespect one’s privacy, is a question that has to be considered within the culture framework.

8. **Use of specific testing elements and testing strategies.** Physical elements (figure, blocks, pictures, etc.) are culture-dependent elements. In a standard neuropsychological evaluation, the examiner uses figures, blocks, pictures, etc., as part of the test materials. These physical elements may be unfamiliar to the client, or at least, not equally familiar for clients with different cultural backgrounds.

### **Familiarity**

Familiarity however, does not only refer to the materials used in testing (figures, blocks, etc.) and their contents (houses, bikes, etc.). Familiarity also refers to the **strategies** used to solve the problems, and the **attitudes** required for succeeding. Competitiveness, for example, in many societies is viewed with suspicion. Cooperation and social ability may be by far more important. Items developed in a cultural context have not the same relevance when translated to another culture (fireplaces, snow, or abacuses, etc., have different levels of familiarity in different countries.) In many world cities, people get oriented using cardinal points (North, South, West, and East) but this is not found in every culture. Some examples: people in Barcelona (Spain) refer to spatial directions: *toward the sea* and *toward the mountain*. People in Colombian cities frequently refer to *up* and *down* implicitly referring to the increase or decrease of street numbers. While, in Guadalajara (Mexico) *down* means towards downtown, and *up* is from downtown.

### **Language**

Language plays an instrumental role in cognition (Vygotsky, 1934–1962). As a matter of fact, it represents the major cognitive instrument. Different languages differ in phonology, lexicon (semantic field of the words), grammar, pragmatic, and reading system. These differences may affect cognitive test performance.

When comparing word meanings, only some few words are found universally across languages. There is a minimal vocabulary found in every language also known as the “Swadesh list” (Swadesh, 1968). Every human, regardless of the environmental conditions, time and cultural factors is exposed to some constant phenomena and conditions (e.g., day, night, sun, moon, person, man, woman, death, etc.)

Language conceptualizes the world in different ways. Example, time is expressed and conceptualized in quite different ways. In Latin languages, time in

actions is expressed in a notoriously more complex way than in Germanic languages. There are much more verb tenses (e.g., two simple past tenses in Spanish; only one in English). In other languages (e.g., Slavic language), verbs have a perfective and an imperfective form.

However, there exist some basic similarities. For example, the basic vocabulary in every language includes some 2–3 thousand words. People use in everyday life some 5 to 8 thousand words and the total number for every language is very similar: about 80 thousand words. While languages can differ in the way they express different events and ideas, a convergence can be found in the deep meaning of the sentences. The distinction between things and actions (nouns and verbs) is found in all languages. Time and place adverbs, as well as verb tenses are highly variable. They are correlated with a whole array of environmental conditions, linguistic idiosyncrasies, and cultural interpretations.

### ***Differences in language use***

Language usage differs according to the cultural (and subcultural) background and strongly correlates with the subject's educational level. Sometimes, test instructions are given in a formal language, which may be very difficult to understand for individuals with limited education. Formal language represents a sort of academic language, most often found in a written form, that many people neither use nor completely understand.

### ***Schooling***

Education plays a double role in test performance:

- (1) school provides some contents frequently included in cognitive tests;
- (2) school trains some learning strategies and develop positive attitudes toward intellectual matters and intellectual testing.

Williams and Ceci (1997) present seven types of historical evidence to support the effect of schooling on “intelligence”:

- 1) the effect of intermittent school attendance;
- 2) the effect of delayed school start-up;
- 3) the effect of remaining in school longer;
- 4) the effect of discontinued schooling;
- 5) the summer school vacations;
- 6) the effect of early-year birth dates;
- 7) cross-sequential trends.

The general conclusion is that school attendance accounts not only for a substantial portion of variance in children's IQ but also apparently some, though not all, of the cognitive processes that underpin successful performance in IQ tests. The magnitude of this influence ranges between 0.25 to 6 IQ points per year of school.

More recently, Ritchie and Tucker-Drob (2018) meta-analyzed three categories of quasi-experimental studies dealing with the educational effects on intelligence: those estimating education-intelligence associations after controlling for earlier intelligence, those using compulsory schooling policy changes as instrumental variables, and those using regression-discontinuity designs on school-entry



age cutoffs. Across 142 effect sizes from 42 data sets involving over 600,000 participants, the authors found consistent evidence for beneficial effects of education on cognitive abilities of approximately 1 to 5 IQ points for an additional year of education. Moderator analyses indicated that the effects persisted across the life span and were present on all broad categories of cognitive ability studied. The authors finally concluded that education appears to be the most consistent, robust, and durable method yet to be identified for raising intelligence.

Greenfield in her influential paper “You can’t take it with you: Why ability assessments don’t cross cultures” clearly points out: “A major (probably *the* major) factor that makes a culture more or less different from the culture conventions surrounding ability testing is the degree of formal education possessed by the participants” (Greenfield, 1997. P. 1119).

### **Examples of research in cross-cultural neuropsychology**

It was mentioned that cross-cultural neuropsychology deals with three major questions. The following study can be an example of the first question: how current neuropsychological tests are affected by the cultural conditions: Ardila and Moreno (2001) selected a sample of 20 right-handed Aruaco Indians (12 male, 8 female; age 8–30 years) from the Sierra Nevada de Santa Marta (Colombia). A brief neuropsychological test battery (visuoconstructive and visuo-perceptual abilities, memory, ideomotor praxis, verbal fluency, spatial abilities, concept formation) was individually administered. In addition, a handedness questionnaire was included. In some neuropsychological tests performance was virtually perfect (Recognition of Overlapped Figures and Ideomotor Praxis Ability test), whereas performance in other tests was impossible (e.g., Block Design using a time limit). It was proposed that two types of variables were significantly affecting performance: (1) educational level; and (2) cultural relevance. Some tests appeared significant and meaningful whereas others were meaningless and even impossible to understand. The appropriateness of current neuropsychological instruments for cross-cultural assessment is discussed.

An example of the second question: how the brain organization of cognition depends upon the culture. Zhang, Zhong-qin, & Ben-yan (2016) point out that reading as an acquired higher nervous function is closely related with culture, so the comparison between Chinese and Western pure alexia could lead to further understanding of visual word form processing mechanism. As the different clinical manifestations of pure alexia in Chinese and Western cultures, the signal distinction of words is the primary cause whereas the plasticity of so-called visual form word area is the neurobiological basis. Chinese and Western reading both present left-hemispheric lateralization, but based on the special feature of Chinese pure alexia, it is inferred that the right hemispheric may play a more outstanding role in Chinese word processing. In fMRI research on Chinese and Western reading, it is indicated that there is hierarchical organization in visual form word area, which is corresponding to hierarchical coding in sublexical processing, but it cannot elucidate some phenomena in Chinese pure alexia such as absence of word-length effect. Chinese word recognition might largely rely on ventral visual pathway, i.e. the whole word processing.

An example of the third question: how brain pathology is manifested in different cultural contexts. Lecours et al. (1988) studied 188 unilateral stroke subjects when administered an aphasia screening test comprising a short interview as well as naming, repetition, word-picture matching and sentence-picture matching tasks. They were either totally unschooled illiterates or they had received school education and thereafter retained writing skills and reading habits. In all tasks, global error scores were greater among left and right brain-damaged illiterate and literate subjects than among their controls. In repetition and matching, these differences were statistically significant for the left but not for the right-stroke groups, irrespective of the literacy factor. In naming, on the other hand, significant differences were found not only for the two left-stroke groups but also for the right-stroke illiterate group although not for the right-stroke literate one. Likewise, some degree of word-finding difficulty and of reduction in speech output as well as a sizeable production of phonemic paraphasias were observed in the interviews of several right-stroke illiterates, clearly less in those of right-stroke literates. These findings lead to suggest that cerebral representation of language is more ambilateral in illiterates than it is in school educated subjects although left cerebral “dominance” remains the rule in both.

Finally, the following examples are illustrative of recent research in the area.

Nielsen et al. (2018) studied the test performance on a Cross-Cultural Neuropsychological Test Battery (CNTB) for assessment of middle-aged and elderly ethnic minority and majority populations in Western Europe. A total of 330 participants were included: 14 Moroccan, 45 Pakistani/Indian Punjabi, 41 Polish, 66 Turkish, 19 former Yugoslavian minority participants, and 145 western European majority participants. Significant differences between ethnic groups were found on most measures. Differences in education explained 15% of the variance. Preliminary multicultural CNTB normative data dichotomized by education and age were constructed using overlapping cells. Applying this normative data across the whole sample resulted in an acceptable number of participants scoring in the impaired range across all ethnic groups. Factor analyses found the CNTB to have a stable and clinically meaningful factor structure.

Ardila (2007) developed a Cross-Linguistic Naming Test fulfilling three criteria: (1) it includes only “universal” words found across different languages (“Swadesh word list”); (2) it includes different semantic categories (e.g., living and nonliving elements); and (3) it avoids as possible the confounding of perceptual difficulties. Six different semantic categories were used: (a) body-parts (10 words); (b) natural phenomena (non-touchable) (5 words); (c) external objects (potentially known through the sight and the touch) (5 words); (d) animals (5 words); (e) colors (5 words); and (f) actions (10 words). A total of 40 color pictures were selected to represent these basic words. This test has two major advantages: on one hand, it is readily available in hundreds of different languages; and, on the other hand, it is not a “fixed” test, but it includes photographs that can be replaced. Several studies has been developed using this Cross-Linguistic Naming Test (e.g., Gálvez-Lara et al., 2015).

Melikyan, Puente, and Agranovich (2020) developed a cross-sectional comparison of neuropsychological test performance in Russian and American rural

adults. They compared 51 American (67% female) and 52 Russian (60% female) healthy rural adults age 18–89 in the following neuropsychological tests; Rey Complex Figure Test (RCFT), Rey Auditory Verbal Learning Test (RAVLT), Trail Making Test A and B (TMT A&B), Stroop Neuropsychological Screening Test, Benton Judgment of Line Orientation Test (JLO), Brief Visuospatial Memory Test-Revised (BVM-T-R), Color Trails Test 1 and 2 (CTT 1&2), WMS-IV Logical Memory Test (LMT), WAIS-IV Digit Span Forward (DSF) and Backward Test (DSB), and Symbol Digit Modalities Test (SDMT). Age and sex distribution did not differ in the two groups, but the Russian group was more highly educated. The American group outperformed the Russian group on TMT B, CTT 2, recognition trials of RCFT, BVM-T-R, LMT, and on DSF. The authors concluded that cultural differences in attitudes to timed activities, experience with timed tests and multiple-choice format, attention to details, and length of digit-words that put differential demand on short-term memory in Russian and in English may mediate observed between-group differences.

### **Conclusion**

Cross-cultural neuropsychology represents a branch of neuropsychology emphasizing the potential effects of cultural variables on the brain organization of cognition. It is a neuropsychology with a cross-cultural psychology approach. Although a relatively significant amount of research is currently available in the area, many questions remain unsolved, including but not limited to, (1) pinpointing the specific variables affecting neuropsychological test performance. We know, for instance, that performance in neuropsychological tests is partially different in Russian and American people; the question is: which are the variables accounting for these differences? (2) Understanding the variations in the brain organization of diverse type of cognition across different cultural groups. Patterns of abilities can be significantly different in different human groups; how these differences are correlated with variations in the brain organization of cognition? (3) Analyzing the similarities and also the potential differences in the clinical manifestation of brain pathology syndromes across-cultures. Currently, it is recognized that there are cultural variations in the clinical manifestation of psychiatric syndromes (American Psychiatric Association, 2013). It seems reasonable to assume that the clinical manifestations of aphasia, agnosia, apraxia, dementia, etc., may also present cultural variations.

Noteworthy, cross-cultural neuropsychology has important practical implications. To understand the cultural variations in cognition is crucial not only from the neuroscience perspective but also from the social point of view. Contact among cultures has been progressively increasing and a significant percentage of the people currently live in foreign countries. The internationalization of neuropsychology clearly depends upon the understanding of cultural variations in cognition.

It can be anticipated that toward the future the interest in cross-cultural issues will continue growing in neuropsychology.

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#### Обзорная статья

## Кросс-культурная нейропсихология: история и перспективы

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**Аннотация.** В статье рассматривается кросс-культурная нейропсихология, которая анализирует влияние культурных переменных на познание с неврологической точ-

ки зрения. Выделены три основных вопроса кросс-культурной нейропсихологии: 1) как культурные условия влияют на существующие нейропсихологические? 2) существуют ли различия в мозговой организации познавательных процессов в зависимости от культуры? 3) как патология мозга проявляется в разных культурных контекстах? Представлена история кросс-культурной нейропсихологии, подчеркивается, что интерес к вопросам влияния культуры наблюдается с момента возникновения нейропсихологии. Проводится краткий анализ понятия «культура» с разных точек зрения, предлагается понимание культуры как особого образа жизни группы людей. Обсуждается, почему учет культуры важен для нейропсихологии, а также анализируются некоторые культурные переменные, имеющие первостепенное значение. Особое внимание уделяется школьному образованию, потому что образование представляет собой основную переменную, влияющую на успешность выполнения различных когнитивных тестов. В конце статьи представлены несколько примеров, иллюстрирующих основные направления исследований в кросс-культурной нейропсихологии.

**Ключевые слова:** нейропсихология, культура, познание, кросс-культурная психология, когнитивное тестирование, кросс-культурная нейропсихология

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