Aphasia from the inside: The cognitive world of the aphasic patient

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ABSTRACT

The purpose of this study was to analyze the question: how do people with aphasia experience the world? Three questions are approached: (1) how is behavior controlled in aphasia, considering that a normal linguistic control is no longer available; (2) what is the pattern of intellectual abilities in aphasia; and (3) what do aphasia patients’ self-report regarding the experience of living without language. In aphasia, behavior can no longer be controlled through the “second signal system” and only the first signal system remains. Available information suggests that sometimes no verbal abilities may be affected in aphasia. However, an important variability is observed: whereas, in some patients, evident nonverbal defects are found; in other patients, performance verbal abilities are within normal limits. Several self-reports of recovered aphasic patients explain the experience of living without language. Considering that language represents the major instrument of cognition, in aphasia, surrounding information is evidently interpreted in a partially different way and cognitive strategies are reorganized, resulting in an idiosyncratic cognitive world.

KEYWORDS

Aphasia; cognitive world; language; second signal system; verbal abilities

Introduction

Aphasia changes the pattern of intellectual abilities and, ultimately, the perception and interpretation of the surrounding world. As a result, the aphasic patient lives in an idiosyncratic “cognitive world.” “Cognitive world” refers to the experiential dimension of cognition, to the worldview (Weltanschauung) resulting from the specific pattern of an individual’s intellectual abilities (Ardila & Rosselli, 2016). Evidently, brain damage can result in specific patterns of preserved and impaired cognitive abilities. These patients with brain pathology live in quite idiosyncratic “cognitive worlds.” The limitation with aphasia is that, exactly, because of the lack of language, patients cannot communicate the changes in cognition that they have suffered. Because of that, the reports of aphasia-recovered patients are particularly important to understand the aphasics’ cognitive world.

Recently, a growing interest in understanding the internal world of neurological patients has been observed. For instance, Zwijsen van der Ploeg, and Hertogh (2016) explain in their paper “Understanding the world of dementia. How do people with dementia experience the world?” that current theories on subjective experience in dementia emphasize the psychosocial factors that influence subjective experience, but the consequences of neurological deficits are not elaborated upon. They conclude that much more research is required in this area. This observation is also valid for other neurological conditions, including aphasia.

In this article three questions are approached: (1) how is behavior controlled in aphasia, considering that a normal linguistic control is no longer available; (2) what is the pattern of intellectual abilities in aphasia; and, finally, (3) what do aphasic patients’ self-report regarding the experience of living without language. At the end, some tentative conclusions are presented.

Language as a second signal system

During the 1930s, Pavlov (1932/1960) introduced the idea that human behavior is mediated and controlled by two different signaling systems: the sensory information (“first signal system”) and the language (“second signal system”). For instance, we can present an emotional response when we hear an explosion (first signal system); but we can also present a similar emotional response when we hear someone say, “An explosion has just occurred!” (second signal system).
Pavlov assumed that language represents the fundamental difference in brain functioning between man and other animals. Language emerged during human evolution because this form of communication had survival value to the species. Animal behavior is controlled by the external stimuli (visual, auditory, olfactory, information, etc.) and the resulting sensations represent the first signal system. Humans, on the other hand, not only react to the external stimuli, but also have the ability to generalize using a countless amount of language signals of the first system. Pavlov further proposed that the second signal system is an evolutionary result of social activity.

What is important for the current analysis is that the aphasic patient’s behavior is directly mediated and controlled only by the first signal system. The involvement of the second signal system obviously depends upon the individual’s residual language abilities.

**Intellectual abilities in aphasia**

One of the most complex and controversial questions in aphasia is the issue of the patients’ intellectual abilities. In other words, how the pattern of cognitive skills is when language is impaired? This is a question that has been up for discussion for decades (e.g., Bay, 1964, 1974; Zangwill, 1964). Obviously, verbal abilities are impaired; but what about other intellectual abilities, such as nonverbal and conceptual abilities?

This is a question that was extensively analyzed during the 1970s and 1980s and later virtually disappeared from the aphasia literature. In a recent search in PubMed (May 5, 2016) using the terms “intelligence” and “aphasia” in the title/abstract, a total of 135 articles were found. However, only a few of the articles actually analyzed the question of the intellectual abilities in aphasia, and just four of these analyses corresponded to articles published during the 21st century (Baldo, Paulraj, Curran, & Dronkers, 2015; Blazková-Ctrnáctá, Kalvach, Preissová, & Müllerová, 2003; Lee & Pyun, 2014; Maeshima et al., 2002). When using the terms “aphasia” and “cognition,” 213 articles were retrieved. However, again, only a few of them analyzed the question of cognition in aphasia, six of them published during the last 16 years (Butts et al., 2015; Fedorenko & Varley, 2016; Gorno-Tempini et al., 2004; Helm-Estabrooks, 2002; Kang, Jeong, Moon, Lee, & Lee, 2016; Lee & Pyun, 2014); one article was found in both searches (Lee & Pyun, 2014). According to PubMed, only 10 articles have been published during the last 16 years devoted to the analysis of the intellectual abilities in aphasia, out of hundreds of articles published in the area of aphasia (5,762 articles that include the term “aphasia” in the title/abstract have been published since the beginning of the century). There are several potential reasons for this paucity in research: (a) this is obviously a complex and polemic question and results may impact our interpretation of aphasia; if general intellectual impairments were found, it means that aphasia is not just a language disorder but also includes a general intellectual disturbance; and (b) research results can be difficult to interpret; if nonverbal abilities were decreased in aphasia, what does it mean? Several potential explanations could be proposed; for instance: (a) tests that are assumed to be nonverbal may also be partially verbal tests; (b) the decrement in nonverbal abilities may simply reflect some right hemisphere decreased activation due to the left hemisphere pathology; or (c) using a simpler and obvious explanation, it could be proposed that language represents an additional resource to solve nonverbal problems and, hence, the aphasic patient is at a disadvantage in regard to the normal speaking individuals. Evidently, it is not easy to be sure what would be the correct explanation.

Several studies have used the Raven’s Colored Progressive Matrices as a measure of nonverbal abilities (Bailey, Powell, & Clark, 1981; Basso, Capitani, & Luzzatti, 1981; Gainotti, D’erme, Villa, & Caltagirone, 1986; Kertesz & McCabe, 1975; Zaidel, Zaidel, & Sperry, 1981). In a classical study, Kertesz and McCabe selected 163 subjects, 111 aphasics, and 52 controls. The Western Aphasia Battery (WAB) was used as a measurement of the type of aphasia and its severity. The results indicate that Global, Wernicke’s, and Transcortical Sensory aphasics perform poorly on the Raven’s Colored Progressive Matrices. A common side effect to all these forms of aphasia is poor comprehension. Broca’s Transcortical Motor, Conduction, and Anomic aphasics do as well as nonaphasic controls with diffuse brain damage or nondominant hemisphere lesions. Interestingly, the Raven’s Colored Progressive Matrices scores were not related directly to the severity of aphasia. The authors concluded that “nonverbal” intelligence is also impaired in aphasics to a variable extent; however, 42% of aphasics performed as well in Raven’s Colored Progressive Matrices as the control subjects without brain damage. Bailey et al. (1981) selected 134 aphasia cases, on average 5 months, after the aphasia onset (mainly CVA). Most of the cases administered the Schuell test of aphasia, some were given the Raven’s Colored Progressive Matrices, and some the Standard Matrices test. It was found that non-verbal intelligence as measured by correlated in a negative direction with severity of aphasia and positively with recovery from aphasia. Basso et al. (1981) studied 173 left hemisphere patients subdivided according to
presence/absence, type (fluent/nonfluent) and severity (moderate/severe) of aphasia. The Raven Progressive Matrices and four subtests of the Wechsler-Bellevue Performance Scale were administered. Constructive and ideomotor apraxia scores and CT scan data of each subject entered the statistical analysis. The factors significant in producing a low score on Progressive Matrices and Wechsler-Bellevue included aphasia and constructive apraxia.

Also, by using the Raven’s Colored Progressive Matrices, Basso, De Renzi, Faglioni, Scotti, and Spinnler (1973) found that the correlation between scores earned by 33 subjects with left hemisphere damage on the Raven’s, and scores earned on a language test of naming and comprehension, was “practically zero.” In other words, it was impossible to predict analogic thinking ability on the basis of language test performance. Villardita (1985) selected 24 right brain-damaged patients, 24 left brain-damaged patients (10 nonaphasic and 15 aphasic) and 20 controls and administered the on the Raven’s Colored Progressive Matrices. In addition to the total scores, the author analyzed the scores obtained on each of the three sets, where the 36 total items in the test could be categorized on the grounds of cognitive abilities. The first set, which calls for the identification of sameness, posed special problems to damaged right brain patients. The second set, which involves the principle of symmetry, was selectively failed by aphasic patients. The third set, which is more demanding in terms of analogical and conceptual thinking, was poorly performed by left brain-damaged patients, aphasics as well as non-aphasics.

In a more recent study, Gainotti et al. (1986) developed a new set of Colored Matrices, devised to minimize the influence of unilateral spatial neglect without changing the essential features of the original task. The test was administered to 76 normal controls, 74 right brain-damaged patients, 87 aphasics, and 61 nonaphasic left brain-damaged patients, in order to study the effect of laterality of lesions and of language impairment on Raven’s scores. The results show that, if the influence of unilateral spatial neglect is minimized and Raven’s scores are corrected in reference to age, educational level, and lesion size, then: (a) no significant differences are observed between right and left brain-damaged patients; (b) aphasics score worse than non-aphasic left brain-damaged patients; (c) impairment is greater in patients with Wernicke’s and Global aphasia (i.e., in patients with severe language comprehension disorders) than in patients classified as Broca’s, Anomic, or Conduction aphasia; and (d) impairment is greater in patients with semantic-lexical discrimination errors than in patients free from semantic-lexical comprehension.

Taken together all these studies, it can be tentatively concluded that aphasia is associated in some, but not in all the cases, with low scores in the Raven’s Colored Progressive Matrices as a measurement of nonverbal intelligence.

Other analyses of nonverbal abilities in aphasia have been reviewed. Borod, Carper, and Goodglass (1982) investigated the differences in nonverbal intelligence between diagnostic subgroups of aphasics using the Performance tests of the Wechsler Adult Intelligence Scale (WAIS). Ninety-eight right-handed hospitalized males, with unilateral left-hemisphere damage, were selected. They had had an unambiguous clinical diagnosis of Broca’s, Anomic, Conduction, Mixed Non-Fluent, Wernicke’s, or Global aphasia. Group differences were examined using the WAIS Performance IQ (PIQ), subscores for spatial organization (Block Design and Object Assembly), and for verbalizability (Picture Completion and Picture Arrangement). Determined by the impaired performance of the Global aphasics, it was found that there were significant group differences for each WAIS score. With covariance correction for level of auditory comprehension, group differences were eliminated on the verbalizable subtests, but not on the spatial organization subtests. To further eliminate group differences, the levels of constructional apraxia were covaried (assessed with drawings, sticks, blocks). Using demographic, neurological, and linguistic variables, multiple regression analyses confirmed the covaried analysis findings; constructional apraxia was the most predictive variable for both spatial and verbalizability subscores, while auditory comprehension and education level predicted performance on the verbalizable subtests.

De Renzi, Faglioni, Savoiardo, and Vignolo (1966) analyzed the influence of aphasia as well as the hemispheric side of the cerebral lesion on abstract thinking. A modified version of the Weigl Sorting Test allowing 5 criteria of classification was administered to 40 control patients, 40 right brain-damaged patients, 22 left non-aphasic brain-damaged patients, and 45 aphasics. Right and left nonaphasic brain-damaged patients performed no differently from control patients on the Weigl test, while the mean score of the aphasic group turned out to be about one half of that of the control group. In addition, the t-score obtained by aphasics on the Weigl test was found to highly correlate with an auditory verbal comprehension score, while no significant connection was found between the Weigl score and either a visual naming or an ideomotor apraxia score.

It was concluded that the Weigl test is not sensitive to the presence of cerebral damage per se, while it is highly sensitive to the presence of left (dominant) hemisphere lesions associated with aphasia. The authors suggest that
the evidence pointing to a specific defect of “abstract thinking” in aphasics may be interpreted as the consequence of a disruption of “inner language” in these patients; however, an alternative view may be advanced, namely, that the same areas subserving linguistic activities in the left hemisphere are also specialized in carrying out intellectual tasks of a symbolic nature.

Haas, Vogt, Schiemann, and Patzold (1982) analyzed non-verbal intelligence in brain tumor patients. The Aachen Aphasia Test and subtests of the Wechsler Adult Intelligence Scale (WAIS) were used. The statistical evaluation of the data from 43 patients indicated that: (a) Aphasia was an amnestic aphasia, independent of the localization of the tumor within the dominant hemisphere; (b) aphasics have no more intellectual impairment than nonaphasics with similar brain lesions; (c) the severity of the aphasic syndrome does not correlate with the WAIS; and (d) with right-sided tumors, there was correlation between the speech reception subtest and the WAIS scores.

Moving to the articles published during the 21st century, Helm-Estabrooks (2002) selected 13 right-handed, left hemisphere stroke patients (five females and eight males); four linguistic and four nonlinguistic tasks were administered in one session. No significant relationship was found between linguistic and nonlinguistic skills, and between nonlinguistic skills and age, education, or time post onset. Instead, individual profiles of strengths and weaknesses were found. The author concluded that sometimes nonlinguistic tasks are affected in aphasia, but a significant variability is observed.

Some authors (Butts et al., 2015; Gorno-Tempini et al., 2004) have analyzed different types of primary progressive aphasia and concluded that cognitive, genetic, and anatomical features indicate that different progressive aphasia clinical variants may correspond to different underlying pathological processes. In cases of progressive aphasia, there are variations in the specific profile of cognitive disturbances, depending upon the particular subtype of progressive aphasia.

Blazková-Ctrnáctá et al. (2003) selected 41 persons hospitalized after a brain stroke and tested them to correlate the level of aphasia with intelligence scores. As an aphasia test, the Western Aphasia Battery (WAB) was used; to determine the general mental performance as an equivalent of the IQ test, the nonverbal Raven’s and verbal Euro-ADAS tests were used. Correlation between both types of measures was positive and statistically significant, suggesting that aphasia is associated with an intellectual disturbance.

Baldo et al. (2015) observed that the degree of language impairment is strongly associated with the degree of impairment on complex reasoning tasks, such as the Wisconsin Card Sorting Task (WCST) and Raven’s Matrices. Similarly, Kang et al. (2016) have suggested that patients with more severe aphasia show greater impairments to cognitive functions. Lee and Pyun (2014) reported that cognitive tests for working memory and sustained attention are significantly impaired in the aphasic patients.

Finally, Fedorenko and Varley (2016) observed that individuals with global aphasia, despite their near-total loss of language, are nonetheless able to add and subtract, solve logic problems, think about another person’s thoughts, appreciate music, and successfully navigate their environments. The author concluded that many aspects of thought engage distinct brain regions from, and do not depend on, language.

Taken together all these studies suggest that no verbal abilities may be affected in aphasia; however, an important variability is observed: whereas in some patients, evident nonverbal defects are found, in other patients, performance is found to be within normal limits.

Aphasics’ personal reports

Up to this date, there are several books and articles of aphasic patients who have recovered language and explained how their experience was of living without language (e.g., Bay, 1969; Green, 2012; Hale, 2007; Hall, 1961; McGuire, 2012; Mills, 2004; Moss, 1972; Riese, 1954; Rolnick & Hoops, 1969; Schultz, 2010; Segre, 1983; Sies & Butler, 1963; Taylor, 2008; Weinstein, 2008; Wulf, 1979). These reports represent an extraordinarily important source of information to understand the experience of living without language, that is, the cognitive world in aphasia. Although these books are mostly centered on reports of the clinical events and the process of language recovery, sometimes they mention the patients’ internal world. Several in-depth case studies of aphasic patients are also available (Crepet, 1925; Dieguez & Bogousslavsky, 2007; Lebrun, Hasquin-Deleval, Brohaye, & Flamant, 1971; Luria, 1972; Parr, Byng, & Gilpin, 1997; Saloz, 1919).

However, to report on one’s internal world requires unusual introspective abilities and special communication skills. Because of this, it is not easy to find an overt report of a patient’s internal conditions. The following passage is the personal report of an aphasia-recovered patient, expressing in a poem how the world was perceived without language. It is noteworthy that previous to the aphasia, the patient was a professional writer. This report has been selected to illustrate the internal world in aphasia because it directly and clearly refers to the internal experiences, that is, how the patient’s interpretation of the world changed because
of the aphasia (the original Spanish version is presented in the Appendix A of this article).

When Words were Lost

And suddenly words disappeared Only shapes and things remained but I forgot the way to name them. A flash of lightning erased from my memory the language inherited from other centuries that I everyday discovered. I had to re-invent the world around me because that universe was only in the words. I just understood that the silence is just a pause separating what is and what is not. Because it was no longer important to discover the beauty as long as it could not be expressed in words. I just understood that without the words the contemplation is a useless call to the senses that without words become regressive blocking the deepest intelligence. And also, the feeling, the clearest one the highest one, has to be expressed with words

(Ricardo Gaspari, recovered aphasic, Centro Integral del Rehabilitación del Afásico–CIRA- Buenos Aires, Argentina)

In the poem, several important clues to understand the internal cognitive world of the aphasic patient are evident: (a) a particular dimension of the world is lost (language) and only the visuo-perceptual information remained (“And suddenly words disappeared; Only shapes and things remained”); (b) the world is basically understood through language (I had to re-invent the world around me, because that universe was only in the words); (3) the emotional interpretation of the surrounding world is also mediated through language (Because it was no longer important to discover the beauty, as long as it could not be expressed in words); (4) sensory information (“first signaling system”) acquires a particular importance (without the words the contemplation is an useless call to the senses); and (5) (verbal) intelligence is impaired in aphasia (… that without words become regressive blocking the deepest intelligence). Simply speaking, this patient is expressing that his internal cognitive world had significantly changed due to the lack of language.

What could be concluded about human cognition?

First of all, an aphasic individual is not a person without language, but a person, who had language, developed and organized cognition through language, and later in life lost some language abilities, which means that except in the case of global aphasia, the person still maintains some residual linguistic abilities. In this regard, the analysis of cognition in deaf individuals without sign or oral language, or the study of feral children, can represent better models to study cognition without language.

Anyhow, language impairment in aphasia may sometimes be associated with the deterioration of diverse cognitive abilities, such as spatial and conceptual abilities, resulting in an idiosyncratic cognitive world. The deterioration of those cognitive abilities beyond language suggests that they are developed and are normally mediated through language. Numerous authors have expressed the idea that language represents the major instrument of human cognition (e.g., Luria, 1976; Vygotsky, 1934/2012). However, it is also important to bear in mind that there is a crucial dispersion in cognitive abilities—including language—not only in brain-damaged patients but also in normal people (Ardila, Galeano, & Rosselli, 1998). By the same token, there is an important variability in the associated cognitive impairments in case of aphasia (e.g., Bailey et al., 1981; Basso et al., 1981; Gainotti et al., 1986; Helm-Estabrooks, 2002; Kertesz & McCabe, 1975; Zaidel et al., 1981).

In summary,

1. Because of language impairment, aphasia patients live in an idiosyncratic cognitive world. It has been proposed that the surrounding world is known using two different strategies (“signal systems”); in aphasia, only the first one (external stimuli) is available.
2. Nonverbal abilities sometimes—but not always—are affected in aphasia; however, an important variability has been reported.
3. Quite frequently, people without brain pathology interpret the world through language; and language usually represents the major instrument of cognition. In aphasia the cognitive strategies have to be re-organized.

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Declaration of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

References


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**Appendix A. When Words were Lost by Ricardo Gaspari (Spanish version)**

*Cuando se perdieron las palabras*

Y de pronto se perdieron las palabras
sólo las cosas y las formas perduraban
pero había olvidado el modo de llamarlas.

Un relámpago había borrado de mi memoria
el lenguaje heredado de otros siglos
y el que descubría cotidianamente.

Tenía que reinventar el mundo que me circundaba
porque ese universo solo estaba en la palabra.

Y recién supe que el silencio es mera pausa
la que separa el ser del no ser de la existencia.

Porque ya no importaba descubrir la belleza
mientras no pudiera decirlo con palabras.

Y recién supe que sin palabras, la contemplación
es un sordo e inútil llamado a los sentidos
que sin palabras se torna regresivo
se bloquea la inteligencia más profunda.

Y también el sentimiento, el más puro, el más noble
necesita expresarse con palabras