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CASE STUDY

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- A – Study Design
- B – Data Collection
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RECOVERY PATTERNS IN BILINGUAL APHASIA

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SUMMARY

Background:

The purpose of the research was to examine the language outcomes of a unilingual treatment for a bilingual individual with aphasia.

Case presentation:

The patient, a 36- year old male, was born in Poland, but was exposed mostly to English for the 13 years prior to the incident, due to the fact that his family moved to the United States, where English became his everyday language. He started to learn English at the age of 10 at school, and continued studying it until the end of his formal education, at the age of 18. At the age of 31, while still resident in the US, BB sustained a brain injury. A CT scan performed after the injury showed a left-frontal lesion, resulting in Broca's aphasia. A speech-language evaluation revealed impairments in all language skills in both languages, with language production more impaired than comprehension skills. During 8 months of treatment carried out in English, he spent many hours a day working with English texts and computer programs to improve his English skills.

Conclusions:

The results reported above suggest that treatment in one language contributes to the recovery of the non-treated language, pointing up the importance of deficit-specific modifications within the context of constraint language therapy.

key words: receptive skills, expressive skills, unilingual treatment, language generalisation



INTRODUCTION

Since many people in the world have a least a working knowledge of more than one language, bilingualism is an important line of research in clinical and theoretical neurolinguistics. According to the current linguistic and neurolinguistic approaches, the term bilingual refers to those people who use two or more languages or dialects in their everyday lives, regardless of the context of use (Fabbro, 2001:202).

As several neurolinguistic studies suggest, it is inaccurate to consider bilingual persons as “two monolinguals in one person.” Indeed, bilinguals do not necessarily need to have a perfect knowledge of all the languages they know to be considered as such. If the age of acquisition of either language is considered, two separate groups of bilinguals emerge: simultaneous or native bilinguals, and successive or late bilinguals. Simultaneous bilinguals learn their L1 (mother tongue) and L2 (second language) simultaneously and during the period of infancy, whereas successive or late bilinguals learn their L1 and L2 successively at various times.

A major study of bilingualism was written by Uriel Weinreich, a sociolinguist and dialectologist from Columbia University (1953). In his work, he highly emphasises problems faced by bilinguals attempting to maintain two separate language systems. More precisely, Weinreich (1953:9) distinguishes three groups of bilinguals:

- Subordinate bilingualism occurs when the linguistic elements of one of the speaker’s languages are only accessible through elements of the speaker’s other language. This particular type of bilingualism is typical of beginning L2-learners.
- Coordinate bilingualism may occur when two parents represent different mother tongues, and each parent communicates with the child using only his or her native language. Consequently, the child forms two separate linguistic systems and can handle each of them effectively. Since coordinate bilinguals learn L1 and L2 in two various contexts, for example, at home and school, they are thought to have two semantic systems and two codes.
- Compound bilingualism occurs when both parents are bilingual and both parents communicate with the child in both languages indiscriminately. The child will be able to express itself in both languages effortlessly and without an accent, but will never master all the subtleties of either of them. That is to say, the child will not really have a mother tongue. Since compound bilinguals learn both L1 and L2 in the same context, they are thought to have one semantic system but two codes.

The difference between semantic systems refers to the relationship between a word in language A, the corresponding word in language B, and the referents of each. If, for example, a speaker considers a word in language A to have the same meaning or reference as the corresponding word in language B, then he has a compound system (Weinreich, 1953:9). On the other hand, if a speaker perceives a word in language A as distinct in meaning from language B, the system is coordinate.

According to Weinreich (1953:10), the fundamental linguistic problem besetting bilinguals is interference (also called linguistic interference, cross-linguistic interference or transfer), i.e. the detrimental influence of one of the speaker's languages on the other. Interference may be phonological, morphological or syntactic. The most common type of interference is probably phonological, i.e., interference between the sound systems of the speaker's two languages. It is generally accepted that most bilinguals are more fluent in one language than in the other, and the former is called the dominant language. It is usually this language that interferes with the second language, rather than vice versa. Therefore, a speaker for whom language A is dominant may fail to distinguish differences in language B. For example, a speaker for whom English is dominant may recognize incorrectly the difference between Polish "szyk" and "sik," so that both will sound the same to them ("sheek"), though to a native speaker the initial fricatives are distinct phonemes. Furthermore, a bilingual speaker may also substitute phonemes from the dominant to the non-dominant language. However, the most persistent interference occurs in the intonational pattern. As stated by Ansaldo (2008:540) "This feature of language is frequently overlooked in the secondary bilingual situation, primarily because teachers tend to be unaware of the problem or incapable of adjusting students' faulty intonation" (Ansaldo, 2008:540). On the other hand, morphosyntactic interference occurs through attempts at literal translation (i.e., word for word, or morpheme for morpheme), especially in languages which do not seem structurally incompatible to the speaker. Other possible manifestations of this type of interference include attempts to render in one language a distinction that is specific to the other, or false analogies, especially between related languages (Ansaldo, 2008:540).

Given the large number of languages and dialects spoken in the world, and considering that globalization results in the migration of more than a hundred million people each year, it is highly probable that the issue of bilingualism will continue to increase over the years. Also, a growing awareness of bilingualism, bolstered by an increasing number of bilinguals in the world, will lead to a search for empirical research on current theoretical issues, such as:

- the role of cerebral structures underlying linguistic competence, metalinguistic knowledge, pragmatic ability, and motivation in language acquisition, learning and use;
- the exploration of the neuroanatomical and neuropsychological correlates of particular language functions, such as switching, mixing, and simultaneous translation (Ansaldo, 2008:540).

Recovery patterns

Traditionally, the center of attention in the study of bilingual aphasia has been the single case, and such cases remain essential for exploring the causal mechanisms of recovery, especially when combined with neuroimaging data. Recent advances in neuroimaging allow for a complementary approach, in which researchers analyze the relationship between particular brain regions and behaviour

in various tasks in larger samples. The expectation is that where individuals can use their language appropriately, regions associated with good task performance in monolinguals will be the same as those associated with good performance in bilinguals. Further, regions predictive of an appropriate performance on one task relative to another in L1 will also indicate relative task performance in L2. Individual case studies are valuable because of the relative infrequency of certain types of lesions that may be associated with impaired control. Where there is selective recovery of a language, or an inability to speak in just one language, it may be claimed that such a pattern reflects the impaired control induced by the damage to frontal–basal ganglia circuits (Ullman, 2001:105-122).

A variety of recovery patterns in bilingual aphasia have been reported, and the diversity of possible patterns is almost unlimited. However, some form of classification and description of the most frequently encountered recovery patterns is needed to assure coherence for researchers and clinicians. Johann Gesner in 1770 probably provided the first description of dissociation in reading ability in different languages in a bilingual patient, who after brain damage was able to read Latin but not German (Ansaldo, 2008:545). Clinical studies have since shown that bilingual aphasics do not necessarily manifest the same language disorders with the same degree of severity in both languages. Superficially, different case findings indicate instances of shared and divergent representation of components of language in the bilingual brain (Ansaldo, 2008:545).

How the polyglot or bilingual aphasic recovers various aspects and patterns of language has caused controversy. Many studies have presented individual cases, culminating in Pitres' law (1895): recovery of the most familiar language. This stated:

In acquired aphasia with a multilingual patient, recovery comes first and most completely in the language most used just before the injury, whether or not it is the patient's mother tongue (Ansaldo, 2008:545).

By contrast, according to Ribot's law concerning the recovery of the native language,

In a multilingual patient with aphasia, recovery comes first in the person's mother tongue.

However, Ribot's law was applied to the seemingly related problem of older memories in retrograde amnesia. It has been found to be true only in patients who are not truly fluent in the subsequently acquired languages. On clinical examination, public or personal events occurring in close proximity to the onset of amnesia may seem to be disproportionately impaired, and older memories may seem to be more deeply entrenched and consequently spared (Ansaldo, 2008:545).

Pitres proposed that this recovery pattern could occur only if the lesion had not destroyed language centers, but had temporarily inhibited them. He stated that the patient generally recovered the most familiar language because the neural el-

ements subserving it were more firmly associated. But no clear evidence supports the rule being applicable to all cases.

Paradis (1998:417-430) identified six recovery patterns. Languages can be affected in parallel, differentially or selectively.

Parallel recovery occurs when both languages are impaired and restored at the same rate.

Differential recovery occurs when languages recover differentially relative to their premorbid levels.

Selective recovery occurs when one language is not recovered. In blended recovery, patients inappropriately mix their languages. Nearly 30% of cases show a selective pattern of recovery (the patient did not regain one or more of his languages). Paradis cites some of the cases reported by Pitres (1895). One patient of Pitres recovered French and Spanish, but lost the ability even to comprehend Italian. Another patient regained some of his proficiency in French but not in German, English, Spanish or Arabic, all of which he spoke fluently before the injury.

An antagonistic type of recovery pattern occurs when one language recovers to a certain extent first, but begins to regress when the other language begins to recover. The antagonistic pattern of recovery is seen to be the least common. As reported by Paradis (1987:32), sometimes, the first language deteriorates several times in succession, so that each language is only alternately available.

Both languages may eventually recover, but the recovery of the second language may only begin after the first has recovered, which is called the successive recovery of one language after the other.

Less often, there are mixed patterns or mutual interference between the languages seen in the process of recovery (Paradis, 1993:417-430).

These patterns of recovery change over time. It remains impossible to determine the frequency of occurrence of nonparallel recoveries, since information relating to parallel recovery is not generally published. Moreover, it is often difficult to compare the various published cases with each other because of the lack of standardization of assessments, sometimes even between the two languages of the same patient. Only the administration of the Bilingual Aphasia Test makes it possible to measure with much more precision than ever before the residual language capacities of bilingual aphasic patients in each of their languages (Paradis, 1987:33).

Only after the test has been systematically used on large unselected populations of consecutive entries in various collaborating hospitals centers around the world, will it be possible to address specific issues regarding patterns of recovery. These include ascertaining the frequency of occurrence of each pattern of recovery and establishing correlations among the various factors that have been suggested thus far as influencing the pattern of recovery. Such factors are order and mode of acquisition or learning; extent of use; degree of fluency; structural distance between the languages; type and degree of affect associated with each; and type and orientation of the writing system involved" (Paradis, 1987:32).

Whatever the characteristics of the recovered language, whether it is the first acquired, the most frequently used, or the language of the hospital environment, an important question requires an answer: Why is one language recovered and not the other? This question has given rise to three hypotheses (Paradis, 1987:34):

Each language may be represented in a different locus in the brain, and thus a circumscribed injury may concern one language and not the other, or one more than the other.

There is an area in the brain that seems to act as a switch mechanism, which allows the bilingual to shift from one language to the other; an injury in this area, which is believed to be located in the supramarginal gyrus, either blocks the switch in one position and the patient can speak only one language, or causes the switch to become loose, and the patient keeps switching back and forth uncontrollably between languages.

The unrecovered language may be inhibited, rather than lost. Non-parallel recoveries are not caused by the organic destruction of physiologically specialized centers, but due to the functional disturbances, and selective injury is not caused by damage to the stored language itself, but by the incapacity to retrieve what is stored (Paradis 1993:417-430).

A possible interpretation of the first hypothesis is that, while it seems unlikely that languages would be represented in different neuroanatomical areas, it does not seem so implausible for each language to be subserved by neural circuits which are diverse, though inextricably interwoven, within the same general anatomical area. The organic injury in a given area of the brain would contribute to deficits in both languages stored within its limits; a functional disturbance would result in selective recovery when only one of the circuits is affected, in differential recovery when one is affected more than the other, in antagonistic recovery when each is alternately affected, and in parallel recovery when both circuits are equally affected. A mixed recovery, then, would be the result of a failure of inhibition/dis-inhibition between the two circuits (Paradis, 1987:33).

The second has been countered by with two types of clinical evidence – selective and mixed recoveries with no damage to the temporal-parietal area, and injuries to that region with no selective or mixed recovery. It may not be necessary to postulate an anatomically localized switch mechanism at all. The capacity to switch is not specific as far as the bilingual speaker is concerned. As stated by Paradis (1987:13), language switching does not even require any psychological skills peculiar to bilingualism, but is rather a skill that is equally applicable in a large number of operations in which a person asked to switch between modes of response.

The third hypothesis accounts for shifting from one language to the other by the phenomenon of inhibition and disinhibition (Paradis, 1987:13).

In accordance with the general principle that whenever a mechanism necessary for the accomplishment of a given function is activated, the antagonistic mechanism is concurrently inhibited, it is not unreasonable to suppose

that when an element of the language is activated, those elements that are in direct competition with it are simultaneously inhibited. In case of the selection of a word, this entails the inhibition of all synonyms, of all the words within the same semantic field, and eventually, of all other words (Paradis, 1987:13).

Furthermore, in the bilingual speaker, not only must synonyms within one language be inhibited, but also their equivalents in the other language as well.

A differential pattern may occur due to preference for one language over the other. As stated by Paradis (1987:15).

The progressive use of a single language may functionally enhance its network and progressively isolate it from the alternative language. Or, damage to the mechanism for choice or selection of the language, or a disconnection of the link connecting the meanings of words and the coding of language, may cause selective improvement.

Another possibility explaining differential recovery is that the control of one language is impaired if its lexico-semantic system is more impaired than that of the other language; there may be access to the meaning but an inability to select lexical concepts in the nonrecovered language, causing reduced control.

In order to gain a better anatomical comprehension of how multiple languages are represented in the human brain, Roux and Trémoulet examined 12 bilingual patients who underwent surgery for brain tumours. The results of the study showed overlapping of language areas in 5 patients, whereas the remaining 7 had at least one area that was language specific and sometimes task specific. More detailed study made it possible to determine that there did indeed exist specific areas for a particular language, that is differential impairment (Paradis, 1987:13).

Interestingly, Lucas found language-specific sites, as well as shared sites supporting both L1 and L2.

The L1 and L2 representations were similar in total cortical extent but significantly different in anatomical distribution. The L2-specific sites were exclusively in the posterior temporal and parietal regions, whereas the L1 and shared sites could be found throughout the mapped regions. Bilinguals possessed seven peri-Sylvian language zones, in which L2 sites were significantly underrepresented when compared with the distribution of language sites in monolinguals. L1 and L2 sites were functionally distinct (Paradis, 1987:16).

Another report, describing a bilingual aphasic with subcortical lesions, emphasized the deficit in the mother tongue production, in particular, in spontaneous speech and in cross-language translation tasks, where an asymmetrical paradoxical performance was presented. Also, the patient exhibited more problems when

translating into L1 rather than into the L2. These and other recent results verify the three patterns of recovery described in Pitres' book, i.e. parallel, selective and successive recovery. Occasionally, aphasia affects only one language known by the patient. Pitres proposed that dissociation of the languages affected by aphasia was not exceptional. Furthermore, patients tended to recover the language that was most familiar to them before the insult. Pitres referred to Ribot's hypothesis, that the more newly acquired language deteriorates sooner than the old one (Paradis, 1987:13). Consequently, many neurologists tried to contrast Pitres' hypothesis (recovery of the most familiar language) with Ribot's law (recovery of the native language), but no general rule on language recovery in bilingual aphasics has emerged. Typically, auditory and reading comprehension improve almost simultaneously in both languages, but oral language production and writing abilities improve preferentially for the treated language. Further empirical studies have failed to reconcile parallel recovery in many bilingual aphasics, and differential recovery in others. Furthermore, it is estimated that therapy carried out in one language contributes to improvement both in that language (L1) and in the other language (L2) (Paradis, 1987:15).

In research on bilingual recovery patterns, a small number of patients can swiftly eliminate a large number of options. For example, when a given pattern is viewed in the absence of one of the variables, that variable could not be interpreted as contributing to the cause of the symptom, neither alone nor in combination. Therefore, it might be indeed unreasonable to expect a female patient to exhibit pattern X only because the second language was learned after the age of 15 and the injury is anterior, whereas the male patient should exhibit the same pattern only with a posterior lesion, provided that both languages were acquired before the age of 5 (Paradis, 1987:15).

Thus,

if two patients of opposite sexes experience the same recovery pattern, sex is to be ruled out as a possible contributing factor to the particular recovery pattern. If both sex and acquisition contexts are different, then both are to be ruled out. Potential factors can be eliminated in this way one by one until possibly a small number of them remain coextensive with a given pattern. Then it may become more difficult to ascertain whether one of the concomitant variables is the determining factor, whether it contributes to the pattern only in the conjunction with one or more of these variables, or whether it is not contributing in any way but simply happens to be present for any number of reasons (Paradis, 1987:15).

Therapeutic intervention in bilingual aphasia

Since an increasing percentage of the world population is bilingual, language pathologists seem increasingly likely to provide services to bilingual aphasics. Relatively little is known, however, about language therapy in bilingual aphasia. It appears that language proficiency in a bilingual speaker is a multifaceted phe-

nomenon influenced by many variables, such as the age of onset, literacy, usage patterns, and emotional balance. Given that the ultimate goal of any treatment is to provide the highest possible quality of life, the goal of bilingual aphasia therapy is to improve communication in both languages.

Treatment carried out in a bilingual aphasic poses challenges less evident in comparison to treatment of individuals with monolingual aphasia. The possible challenges include, for example, access to assessment and treatment methods in two different languages, and one as-yet unresolved conceptual challenge: whether to provide treatment in only one language, or in both languages (Virion, 1998:22).

Researchers who encourage the inclusion of both languages argue that the aphasic patient should utilise all the communicative approaches available to them. Also, it seems logical that a bilingual speaking environment is the most natural for many bilinguals, and so treatment in both languages is the best option. However, some researchers emphasise the fact that bilingual therapy may cause increased code-switching, or even suppress the recovery of one language. Furthermore, from a neurolinguistic perspective, monolingual language treatment is also recommended for aphasic patients with pathological code-switching, or those exposed to a monolingual environment (Virion, 1998:24).

The intermixed language organisation in bilinguals is not only essential for bilingual therapy, but may also cause treatment in one language to transfer automatically to the untreated language, due to the stimulation of shared neural networks.

This last possibility poses some important research questions. For example, do bilingual aphasics benefit from L2 treatment? How do demographic and aphasia – related factors affect the effectiveness of L2 therapy?

Even precise and specific investigation of the literature does not provide obvious answers to these questions. Thus more detailed research is required.

In formulating our questions, we decided that the influence of L1 therapy on L1 performance was not a significant issue, since this seems analogous to studying the efficacy of aphasia treatment in the monolingual patient's native language. Therefore, our focus was on the results of L2 therapy. Also, assuming the independence of receptive and expressive language skills, we decided to analyse treatment outcomes on receptive and expressive skills independently (Virion, 2008:25).

This systematic study was undertaken in order to examine three vital issues faced by speech pathologists during decision making:

- the outcome when language therapy is provided in the less dominant language (mostly L2);
- the extent of cross-language transfer (CLT);
- the outcome when language is mediated by a language broker (Faroqi – Shah, 2010:12).

In the present study, we had a unique opportunity to examine the recovery patterns between two languages in a bilingual speaker (L1 Polish, L2 English) with aphasia. In this study, the first area of concentration (Focus A) was the effects of

L2 therapy. A secondary goal (Focus B) was to examine the occurrence of CLT in both directions.

Focus A

What is the effect of language therapy provided in L2 on receptive language skills in the treated language (L2) for a bilingual patient with aphasia?

What is the effect of language therapy provided in L2 on expressive language skills in the treated language (L2) for a bilingual patient with aphasia?

Focus B

What is the effect of language therapy provided in L2 on receptive language skills in the untreated language (L1) for a bilingual patient with aphasia?

What is the effect of language therapy in L2 on expressive language skills in the untreated language (L1) for a bilingual patient with aphasia?

MATERIAL AND METHODS

Operational definitions

The term “unilingual treatment” is used here to mean the use of a single language during language therapy. Studies that provided alternate treatments with a separate language for each treatment phase were included. L1 was defined as the first acquired language (the native language), as this is the criterion used by the vast majority of studies. Consequently, L2 was the language acquired later.

Expressive language was defined as a task involving the patient’s verbal output, such as object naming, spontaneous speech, sentence production, production of synonyms and antonyms, and repetition.

Receptive language was defined as a task including auditory or visual modalities, such as auditory discrimination, lexical decisions, and sentence comprehension.

Case presentation

Some details of pre-morbid and post-morbid language background and language history were provided with the patient’s medical history, and others were acquired from a questionnaire (BAT).

The patient, BB, born 25 May 1973, experienced a brain injury in 1998, resulting in various language disturbances in both languages.

The patient was born in Poland, but was exposed mostly to English for the 13 years prior to the incident, due to the fact that his family moved to the United States, where English became his everyday language. He started to learn English at the age of 10 at school, and continued studying it until the end of his formal education, at the age of 18. At the age of 31, while still resident in the US, BB sustained a brain injury. A CT scan performed after the injury showed a left-frontal lesion, resulting in Broca’s aphasia. A speech-language evaluation revealed impairments in all language skills in both languages, with language production more

impaired than comprehension skills. At 14 months after the injury, a re-evaluation revealed non-fluent aphasia with satisfactory comprehension, moderate word-finding problems, and agrammatic spoken output. The patient's condition indicated that his language skills were mostly impaired in English, less in Polish, and Polish was the language that recovered first and showed the greatest improvement.

In the years that followed the patient returned to Poland and continued to use only Polish with his family and friends. During 8 months of treatment carried out in English, he spent many hours a day working with English texts and computer programs to improve his English skills. Before therapy began, a speech therapist diagnosed the patient with the following language disorders:

- Apraxia of speech, involving phonemic errors, substitutions, additions and repetitions, with marked disturbance of prosody. The key elements characterising speech apraxia embrace articulatory substitution errors, often involving consonants; problems with intonation of articulation of required word or phrase, providing a speech pattern with a hesitant quality; and variability in error patterns, i.e. errors in subsequent attempts are not consistent with one another. Also, apraxic utterances are represented by minor deficits, for example, a greater difficulty with initial consonants than with later consonants within a word; increasing difficulty with increasing word length or numbers of syllables; marked disturbances of prosody, slow delivery characterised by starts, stops, and repetitions.
- Anomic aphasia, where the principal defect was in confrontational naming. This can be demonstrated by having the patient name as many animals as possible in 1 minute. Although spontaneous speech is fluent and easily produced, there is an emptiness, which results from a lack of substantive words.
- Memory problems, exerting a negative impact on the patient's abilities to perform various activities.
- Agraphia – words and letters are large and messy with poor spelling, sentences are agrammatic.
- Alexia – no reading comprehension or production in written language.

Methods of evaluation

The patient's language competence was assessed twice with a one-year interval: baseline in 2009, follow-up in 2010.

Bilingual Aphasia Test

The Bilingual Aphasia Test (BAT) makes it possible to assess the patient's pattern of recovery with all the acquisitional, neurological and pathological aspects included, and to compare the results in order to identify the influence or hierarchy of interactive factors. The BAT was designed to evaluate the clinical aspects of language function: content, fluency, auditory comprehension, repetition, naming, reading, writing and calculation. Interestingly, nonverbal skills, such as drawing, and block design, are also tested (Paradis, 1987:19).

The BAT is not designed to distinguish aphasia from the syndromes of confusion, dementia or psychosis, but to determine whether the performance in one

language is better than in the other, and, if it is, to what extent and in what language skill and/or level of the linguistic structure (Fabbro, 2001:202).

Hence, in addition to being used for its primary purpose – namely the assessment of differential recovery in bilinguals and polyglots, which thereby adds to the research data base – it is expected that the Bilingual Aphasia Test will be used to assess the residual language of unilingual aphasics in countries where no standardized test is available for that language. In such cases, items from the Bilingual Aphasia Test may be supplemented with language-independent tasks from other standardized batteries, such as the colour naming test and the cookie theft description of the BDAE (Paradis, 1987:19).

Obviously, no test can assess all aspects of language exhaustively. However, the Bilingual Aphasia Test embraces a substantial number of aspects related to most levels of language structure (phonemic, phonological, morphological, syntactic, lexical, and semantic) and language use (comprehension, repetition, judgment, reading, and writing) in auditory, visual, and oral modalities with the word, the sentence, and the paragraph as units of analysis (Fabbro, 2001:203). Therefore, it can be assumed that the BAT includes enough items to reduce random variability, while at the same time being of a convenient size to administer in two or more languages on consecutive days, if possible in one setting each, or at most in two.

Furthermore, the Bilingual Aphasia Test is not an evaluation of functional communication, but of linguistic abilities in each of the patient's languages. It determines the patient's linguistic competence, as reflected in their linguistic performance. The term "linguistic performance" refers here explicitly to normal language use, exclusive of non-linguistic means of communication. Therefore, the test measures the patient's communicative abilities on the basis of linguistic means. In other words "it is the linguistic component of communicative competence that is measured" (Fabbro, 2001:203). What the patient does with the language (functions, uses) depends on what the patient knows (albeit implicitly and unconsciously) about the language. Since linguistic performance (as opposed to communicative performance) entails the use of the speaker's competence (while communicative performance may or may not involve linguistic competence), it is the patient's implicit knowledge of the grammar of each language that is assessed, not his or her overall communicative ability (Paradis, 1987:20).

Also, the Bilingual Aphasia Test measures the patient's ability to use each language in a unilingual setting. Non-linguistic communicative abilities, as well as code-mixing, can be evaluated independently for various purposes. However, it is important to determine the nature of the patient's pre-morbid language competence, as well as the nature of their dialect and code-mixing, in order to compare the patient's performance to what could realistically have been expected from their pre-morbid abilities.

Furthermore, the Bilingual Aphasia Test is designed to assess the patient's language competence at various levels of spontaneity and formality, ranging from

spontaneous speech to descriptive speech, and from sentence construction on request to metalinguistic grammatical transformations in accordance with a set of instructions and examples (Paradis, 1987:31). For instance, in spontaneous speech the patient is asked to propositionise, that is, to generate sentences from fragments, using the creative aspect of language use, i.e., the production of a sentence without a structural model or vocabulary. In descriptive speech, the patient is involved in the genesis of a sentence, for instance, in verbal planning selection. The test is composed of 32 subtests, which can be grouped to obtain a number of measures of specific abilities, in the oral and visual modalities. Such measures can be obtained separately or in combination. Since the major purpose of the test is to evaluate the patient's linguistic skills, the possible influence of the extralinguistic context has been minimized. Each of the components of the Bilingual Aphasia Test requires a separate score, and the scores are grouped into sections (comprehension, syntax, writing, etc.). Furthermore, the patient's performance in any language can be compared along a number of dimensions in which scores may overlap.

Test of chain words and sentences

Another essential assessment tool is the test of chain words and sentences. The essence of these tests is to monitor the patients' ability to decode the words phonologically and comprehend the written text. Two parts of the test can be distinguished (Ober, 1999:4):

In the first part, a list of chain words, without space between the letters is presented. The task of the examinee is to put a vertical line in the right place so that the proper words are revealed. The test makes impossible to use the graphic features of the next word, thus the patient has no choice but to decode the words phonologically. Reading each letter aloud connects them into a syllable and finds the border of each word.

In the second part, a list of chain sentences is presented (Ober, 1999:6).

The knowledge of syntax will help the patient to separate a sentence within a string of chain sentences. To complete the task correctly, it is necessary to comprehend the text already in the process of reading it, without the benefit of the context of the following sentence.

The lexical material presented in the test of chain words was chosen in accordance with the criteria of the conceptual adequacy of children attending the second class of primary school. All of the words used in the test are nouns determining a particular object. The words are presented in the form of pairs, without space between words in each pair. Each chain word consists of eleven letter characters. A typical set includes 38 chain words (Ober, 1999:7).

The lexical material used in the chain sentences includes 36 short stories. Each story consists of 19 sentences relating to everyday life situations, such as a birthday party. The use of situations that examinees can easily identify helps the patient to activate emotions, stimulate his or her curiosity about the task, and increase the level of his or her motivation.

Treatment tools

- Test of chain words and sentences
- Aphasia tutor
- Letter matching
- Words matching
- Picture naming (nouns)
- Picture naming (verbs)
- Sentences (easiest, harder, hardest)
- Reading comprehension (easiest, harder, hardest)
- Reading exercises
- Words categorization
- Finding the opposites
- Recognizing errors
- Reading and retelling stories

RESULTS

Focus A: Language therapy in L2 **Receptive skills**

The first study explored the effect of unilingual language therapy in L2 on receptive skills in L2. BB exhibited minor improvement in L2 receptive language skills after therapy conducted in L2. Before therapy, he had primarily expressive difficulties with relatively spared receptive abilities; the therapy resulted in only slight improvement, without any significant effectiveness.

After therapy, comprehending and performing complex commands remained difficult for BB. Although the comprehension of separate words was satisfactory, his attempts to form words into a meaningful unit were mostly unsuccessful.

Furthermore, the patient proved unable to overcome problems relating to auditory word recognition. Major obstacles persisted in recognizing the names of letters, numbers, body parts, and directions. Also, the patient had problems with recognizing letters, such as d, b, j, l, and e.

As for the patient's repetition abilities, there was no significant improvement after therapy. It still took considerable effort for BB to repeat single words successfully. In the sentence repetition task, he was able to repeat only one short sentence correctly; longer sentences remained unreachable.

What is more, after therapy, tasks such as reading chain words and sentences still presented severe problems for BB.

Aphasia tutor exercises confirmed the patient's weak performance in receptive skills. In most of the conducted exercises, the results seemed below expectations.

Expressive skills

This section included therapy in L2 for expressive skills in the trained language, i.e. L2.

A thorough and detailed analysis displayed no significant improvement relating to the patient's expressive abilities after therapy in L2.

For example, in the translation task, after treatment in the English-Polish direction, especially the translation of abstract words, there were fewer problems in comparison with the Polish-English direction. Overall accuracy in the English-Polish direction was high. Also, the response time achieved better (but insignificantly better) results, including translation of abstract, cognate and concrete words.

In addition, the synonym task showed no significant difference. The patient was able to point only to the three of five presented words.

Parallel results were found in the sentence production task. After the period of therapy the patient formed only one short sentence, without any chance of producing longer sentences.

As for spontaneous speech, after therapy, the outcome measures showed that BB was producing sentences more comfortably and confidently; however, the sentences he used were mostly very short, while longer constructions were often grammatically ill-formed.

Word production was maintained on a parallel level.

Focus B: the effect of therapy in L2 on language skills in L1
Receptive skills

General outcome measures indicated an effective improvement in BB's receptive skills. For example, the effectiveness of performed commands was higher. The patient completed the exercise completely without any mistakes.

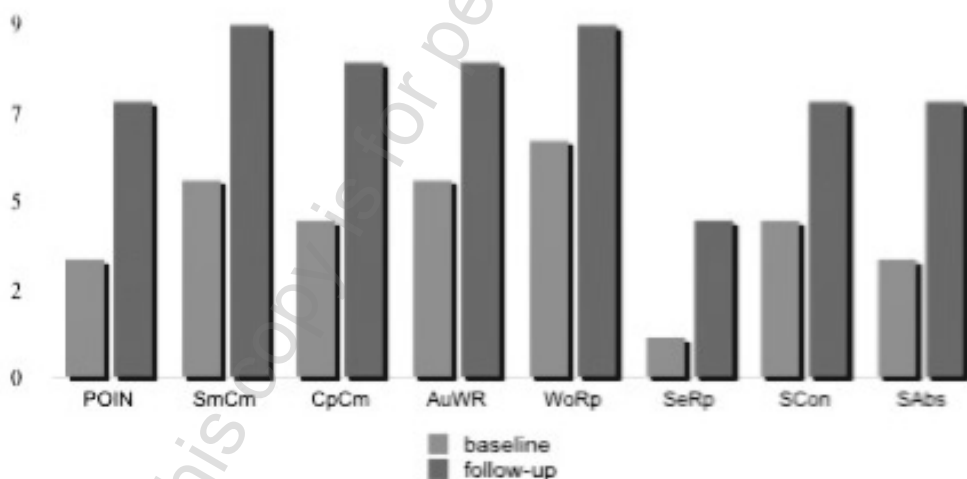


Fig. 1. Results at baseline and follow-up – Polish. Key to abbreviations: POIN – pointing; SmCm – simple commands, CpCm – complex commands, AuWR – auditory word recognition, WoRp – word repetition, SeRp – sentence repetition, SCon – synonyms, concrete, SAbs – synonyms, abstract

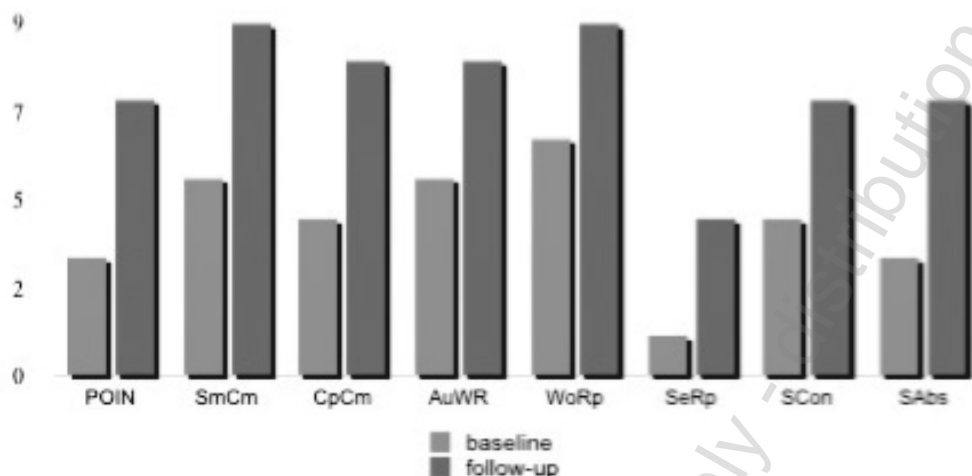


Fig. 2. Results at baseline and follow-up – English. Key to abbreviations: POIN – pointing; SmCm – simple commands, CpCm – complex commands, AuWR – auditory word recognition, WoRp – word repetition, SeRp – sentence repetition, SCon – synonyms, concrete, SAbs – synonyms, abstract

Another significant improvement was detectable in the process of reading and performing complex commands. The reading outcome was mainly disturbed by semantic paraphasias, and occasional language-switching. Also, our results demonstrated effective improvement in both word and sentence repetition tasks. Our analysis revealed that the patient was able to repeat more than half of the presented words without any difficulties.

In the sentence repetition task, the patient was able to repeat short sentences. As for long sentences, some of the words were omitted, but the patient was able to repeat more words in one sentence.

Expressive skills

General outcome measures confirmed significant improvement in most expressive activities, including the Polish-English word translation task. After L2 therapy the patient produced longer and grammatically correct sentences in L1. When conversing in Polish, the number of interferences went down significantly. Even the number of provided synonyms increased from two to four five (adjectives), and three to four (noun).

Interestingly, the patient could swiftly change the topic of conversation, without any stress and confusion, and the number of neologisms and paraphasias effectively went down.

DISCUSSION AND CONCLUSIONS

The results reported above suggest that treatment in one language contributes to the recovery of the non-treated language, pointing up the importance of deficit-

specific modifications within the context of constraint language therapy. The results suggest that the treatment carried out in L2 may not be effective in targeting the patient's L2 receptive and expressive language skills. The participant receiving L2 language therapy demonstrated more noticeable changes in L1 receptive and expressive language skills, despite the absence of explicit therapy in that language, suggesting that intensive treatment results in beneficial, functional transfer of therapeutic gains.

Although the treatment was carried out in English, only after the 6th meeting was it possible to notice a significant improvement in BB's Polish language skills. Before therapy, the patient required about an hour and a half to accomplish 2/3 of the chain sentences test (with the assistance of the examiner), and 1 hour 20 minutes to complete the chain words test. After 6 meetings (each meeting lasted 45 minutes), the patient was able to finish successfully the whole test of chain sentences in 45 minutes (with the assistance of the examiner), and 40 minutes for the chain words test.

Interestingly, during therapy it was possible to notice the process of generalisation of language abilities, although the therapy was mainly based on reading activities. The patient's verbal responses proved to be more dynamic, with longer and grammatically accurate sentence sequences. Moreover, the patient more easily selected the appropriate words and phrases in order to relay a message.

As for English, some improvement was noticed, though to a lesser extent. Before therapy the patient needed about 2 hours to complete 2/3 of the chain sentences test, and about 1 hour and 45 minutes to finish the chain words test. After 2 months the required time to complete a particular test decreased (chain sentences – 1 hour 15 minutes, chain words – 1 hour).

Consequently, not only time, but also the efficacy of performed activities and exercises greatly improved.

These results suggest that the patient underwent a differential recovery, where both languages recovered to varying extents, as predicted.

A bilingual patient with aphasia may experience a differential recovery due to a preference for one language over the other, which, consequently, promotes better functional neural recovery. Also, the progressive use of one language may functionally enhance its network and progressively isolate it from the alternative language, or damage the mechanism for choice or selection of the language. Similarly, the disconnection of the association between the meanings of words and the coding of language may stimulate a selective improvement.

Furthermore, as suggested by Ribot, both the environment surrounding the patient and the therapist may influence immensely the process of language recovery.

Paradis (1987:33) claims that there are two patterns of language deficit and language recovery in bilingual and multilingual aphasics determined in the literature namely, parallel and nonparallel. As for parallel recovery, both (or all) languages reveal alike deficits and recover at a similar rate. However, in case of a nonparallel pattern of recovery, one language undergoes better recovery as the language is less disturbed than the other language.

Theories have been introduced to clarify the nonparallel recovery patterns, focusing on two aspects of the phenomenon: the neural and psychological mechanisms that may give an explanation for the various language deficits.

Green (1998:33) advanced the hypothesis that aphasic bilinguals' ability (or inability) to order the activation and inhibition processes of the languages is responsible for differential patterns when they are observed. Green's model regarding the inhibitory control of resources suggests that it is not the languages that are affected in cases of nonparallel patterns in bilinguals after brain-injury, but rather the ability to access and inhibit them appropriately; a language must be adequately activated in order to be selected and adequately inhibited to avoid potential interference. Similarly, Paradis (1993:178) proposed the activation hypothesis to account for the nonparallel patterns of polyglot aphasia. He assumed that each language requires a threshold of activation to be produced. Stimulation and a component use lower its activation and result in an increased inactivation. In addition, frequent activation of a given component (e.g., a word) may reduce the activation levels of competing candidates, consisting of elements from another language. Also, aphasia may result in an elevation of a particular language or of certain language components; the inactivation of those components will further contribute to high activation, and production in that language will not be possible. Alternatively, differential patterns of deficits and recovery can be clarified by the fact that differential neural networks in the brain are associated with various languages (Virion, 2008:19).

Regardless of whether the differences in the availability among the languages occur temporarily or permanently, several variables have been proposed as potential determiners of the nonparallel pattern.

Furthermore, it is likely that participation in individual therapy may have influenced the therapeutic gains. The patient, as mentioned before, received four hours of an individual course of language therapy throughout the entire study, and the focus of that therapy may have contributed to the received outcomes of the study. For example, the fact that we chose to concentrate only on therapy in English, and only with one patient, might have reduced the patient's motivation and created inner barriers toward the treated language (Paradis, 2000:180).

Other patient variables that might affect the maintenance of language skills are individual motivations and attitude towards the therapy, the presence of opportunities to practice verbal output, and personal/family events. For instance, it sometimes happened that BB experienced some stressful and unpleasant situations just prior to the meeting with the therapist, and this resulted in the patient's performance below his normal abilities. This is the potential drawback of single subject studies, where such aspects may significantly affect the results (Virion, 2008:11).

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