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19th International Science of Aphasia Conference - Venice

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Language and working memory in a bilingual Turkish-German individual with aphasia

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Introduction

Bilingual aphasia assessment has been under scientific enquiry for more than a century. However, it was only recently that bilingual persons with aphasia (PWA) speaking less commonly studied language pairs came under the spotlight, see for instance Kambanaros and Grohmann (2011) for Greek-English and Knoph (2011) for Farsi-Norwegian. There is still a need to document linguistic and other cognitive aspects of bilingual aphasia with other understudied language pairs, such as Turkish-German. To date, Turkish-German bilingual aphasia has received scant attention. For example, Arslan and Felser's (2017) examination of two Turkish-German PWA pointed to different patterns of syntactic impairment, which was explained in terms of onset of bilingualism and language dominance. The goal of the present case study is to understand the value of verbal working memory (WM) assessment in addition to language assessment in PWA, who often present with WM deficits (Murray, Salis, Martin, & Dralle, 2018). Research from monolingual aphasia suggests a complex relationship between WM and language processing and has highlighted the importance of assessing WM abilities in this population (Martin, Minkina, Kohen, & Kalinyak-Fliszar, 2018). To our knowledge, no previous studies have explored WM capacity for L1 and L2 in bilingual aphasia. Comparing L1 and L2 WM performances in PWA would make a significant contribution to our understanding of the relationship between WM and language processing. Furthermore, such a comparison could also provide clinical insights into the use of WM tasks in bilingual aphasia assessment.

Methods

Participant

HK is a 59-year-old illiterate Turkish-German bilingual woman who had been suffering from aphasia for 16 months prior to our initial examination. Her husband reported that she was fluent in both the languages pre-morbidly, with Turkish being more proficient than German. Her aphasia resulted from a traumatic brain injury and subsequent intracranial haemorrhage that damaged large areas of her left hemisphere, including most parts around the perisylvian fissure. Her clinical reports indicated that she had been suffering from global aphasia in both languages prior to our examination.

Materials and Procedures

Language assessment tasks we administered included: (1) the Aphasia Check List in German (ACL; Kalbe, 2002); (2) a complete short screening version and subtests of the long version of the Bilingual Aphasia Test in Turkish (Örkurt & Paradis, 1987); (3) the long version of the BAT in German (Lindner & Paradis, 1987);

(4) the naming part of the LEMO test (De Bleser, Cholewa, Stadie, & Tabatabaie, 1997) in German; and (5) the Token test (De Renzi & Faglioni, 1978) for both German and Turkish, administered twice. The WM assessments included the forward and backward repetition digit span in both languages and the forward pointing digit span in German (i.e., Wechsler Intelligence Scale-4; Petermann, 2012). WM span was defined as the number of items in the longest success trial. Additionally, we calculated: (i) item recall in terms of the proportion of digits correctly recalled independently of their serial position relative to the total number of items recalled; (ii) serial order recall scores (i.e., the proportion of correct items recalled in correct position relative to the overall number of items recalled). For between-language statistical comparisons chi-square and Fisher exact tests were used.

Results

Table 1 illustrates the assessment results. The ACL indicates a severe spoken language deficit in German. Results from the BAT suggest that HK's syntactic comprehension is severely affected in both languages. Her auditory word comprehension and word repetition abilities mimic the results of syntactic comprehension, although there is a suggestive trend that German is worse than Turkish overall. This trend is comparable to the Token test results. She virtually failed to respond to the German Token test (6%) whilst the Turkish version was better (38%), although still severely impaired. A similar pattern was also observed in her object naming ability, which was better in Turkish (100%) than in German (30%). Note that in Turkish we only administered the short screening version of the BAT naming. Regarding the results from the WM tasks, HK's performance was below average in both forward and backward digit span in both languages. Her forward digit span was similar in both languages, but her backward digit span was higher in Turkish than German; in the latter she failed to respond to the task at all. Furthermore, item recall was higher in Turkish (94%) than German (73%); a difference was present for serial order recall, albeit smaller than item recall. However, cross-language comparisons for WM scores were not statistically significant.

Discussion

To our knowledge, this is the first study to document language abilities and WM abilities in a Turkish-German bilingual PWA. We showed that HK presents with low WM capacity and exhibits severe syntactic and lexical processing difficulties in both the languages. Severity of her aphasic symptoms in German overextends those in Turkish. For instance, this is evidenced by the results in the Token test and the BAT (naming and repetition). We believe that worse performance in German than Turkish represents both different extensions of impairments and premorbid bilingualism profile (i.e. language imbalance). We found no difference between the languages for WM capacity as indexed by forward digit span. Differential performance in L1 and L2 item and serial order recall measures may be associated with the difference in the participant's residual lexical abilities. This is in line with language-based models of WM (e.g., Martin & Saffran, 1997), proposing that retention of item information is closely dependent upon language abilities.

However, considering that digits are high frequency words in both languages, the digit span task may not be sensitive enough to discern language-specific WM problems.

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Table 1. Assessment outcomes in Turkish and German

	Turkish (L1)	German (L2)	Significance test <i>p</i>
Language tests			
BAT (%)			
Spontaneous speech			
Pointing to objects	100*	30	.01
Simple, semi-simple commands	100*	0*	
Complex commands	100*	N.A.	
Auditory comprehension of words	55	30	.18
Syntactic comprehension	39	36	.63
Naming objects	100*	30	<.01
Repetition of words & non-words	58*	39	.21
Repetition of sentences	66*	N.A.	
Series	100	N.A.	
Verbal fluency (no max.)	0*	Data not collected	
Semantic opposites	0*	Data not collected	
Token (%)	38	6	<.01
LEMO Naming (%)	Data not collected	30	
WM tasks			
Forward digit span (repetition)			
Span	3	3	
Item recall (%)	94	73	.15
Serial order recall (%)	77	60	.44
Backward digit span (spoken)			
Span	2	N.A.	
Forward digit span (pointing)			
Span	Data not collected	2	
Item recall (%)	Data not collected	75	
Serial order recall (%)	Data not collected	44	

Note. N.A. = Not possible to administer; * = BAT short version; bold indicates a statistically significant difference; results of the language tasks were analyzed by using Chi-square test ($p < .05$, two-tailed); scores in the WM tasks were analyzed by Fisher's exact test ($p < .05$, two-tailed).