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Annals of Physical and Rehabilitation Medicine 52 (2009) 610–622

Original article / Article original

A study of semantic memory after brain injury: Learning newly coined French words

Expertise de la mémoire sémantique après une lésion cérébrale : apprentissage des nouveaux mots de la langue française

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Received 12 March 2009; accepted 8 June 2009

Abstract

Objective. – To investigate semantic memory in brain-injured patients.
Methods. – We used the new word questionnaire (QMN) to assess the ability of 12 brain-injured patients and 12 healthy controls to define French words, which had been admitted to the dictionary in 1996 to 1997 or in 2006 to 2007.
Results. – Despite amnesia or severe executive disorders, the brain-injured patients were able to learn new words and remember those that they already learnt. They successfully selected the relevant phrase in which the new word was placed and were reasonably good at recognizing the right definition from among decoys. In contrast, they had trouble defining the words and compensated for this by giving examples. These problems were correlated with their vocabulary and executive function scores in a battery of neuropsychological tests.
Conclusion. – Our results suggest that frontal injury leads to an impairment in accurate word selection and the scheduling abilities required to generate word definitions.

Keywords: Semantic memory; Newly coined words; Language; Brain injury; Stroke; Brain-injured patients

Résumé

Objectif. – Nous évaluons la capacité à définir des mots entrés dans le dictionnaire en 1996 à 1997 et en 2006 à 2007.
Matériel et méthodes. – Nous utilisons les épreuves du questionnaire des mots nouveaux (QMN) chez 12 patients cérébrolésés et 12 témoins.
Résultats. – Les patients apprennent de nouveaux mots (et conservent des anciens) malgré une amnésie ou un trouble dysexécutif sévère. Ils réussissent à choisir la phrase dans laquelle le mot s'intègre et assez bien leur définition parmi des leurres. Ils ont, en revanche, des difficultés à définir les mots et compensent par des exemples. Ces difficultés sont corrélées aux scores de vocabulaire et de tests sensibles aux fonctions exécutives.
Conclusion. – Ces résultats suggèrent leur lien avec une atteinte frontale entravant la recherche de mots précis, ainsi que la planification d'une définition.

Mots clés : Mémoire sémantique ; Nouveaux mots ; Langage ; Traumatisme crânien ; AVC ; Patients cérébrolésés

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1877-0657/$ – see front matter © 2009 Published by Elsevier Masson SAS.
doi:10.1016/j.rehab.2009.06.005

1. English version

1.1. Introduction

The creation of new words occurs through derivation, composition, abbreviation, borrowing or mutation of the meaning of an existing word; for example, a ''mouse'' is both a small rodent and a computer input device [1]. A distinction is drawn between new forms or new meanings, which can be deduced (''DVD-ROM'', for example) on one hand and new words whose meaning can be deduced by use of the elementary mechanisms of language (notably on the morphological level, such as ''*inexcitable*'' or ''unexcitable'') on the other. The fields from which new words come also differ as the years go by. For example, the lexicon of horses and carriages was extremely present in the 19th century but gave way in the early 20th century to the lexicon of the automobile, which has itself since been modernized. At present, many fields are very fertile in this respect:

- computing and information technology;
- the media;
- the family;
- education;
- the environment.

In France, a word's admission to the dictionary is subject to criteria set by the *Académie française*: the word must be well anchored in usage, used in spoken language, have a utility and comply with the spirit of the French language [4]. The same applies to admission of foreign (and notably English) words to the dictionary: this process is subject to approval by ministerial terminology commissions. If a French equivalent does not exist, the word may undergo a morphological transformation and gallicization by keeping its root and gaining a French affix (e.g., ''*kitchenette*''). However, the original form is sometimes maintained (e.g., ''tuning'', ''tofu'').

Memory, processing speed and attentional disorders are amongst the most commonly reported cognitive sequelae of head injury or stroke [1,7,17]. It is routine practice to screen for cognitive and behavioural dysexecutive syndromes in brain-injured (BI) subjects, although it must be borne in mind that certain subjects may have problems in just one of these two domains [9]. Concerning memory, patients may score very badly in tests of explicit memory (which require the conscious recall or recognition of information) whilst maintaining normal performance levels in various tests of implicit memory [7]. Likewise, these patients can acquire new semantic knowledge relatively normally, including computer-related vocabulary [8], vocabulary from a foreign language [12], new concepts [22] and novel information related to words having appeared after the onset of amnesia [14,23]; this occurs despite major recall problems (notably concerning the context of the learnt words). The nature of this knowledge acquisition is subject to debate in the literature. Authors such as Tulving et al. [12] suggest that learning is more laborious for amnesic patients because they only use their semantic memory – in contrast to normal subjects, who also use episodic memory. In addition to the fundamental debate on whether amnesiacs can learn, it is essential to evaluate a subject's abilities and have appropriate tools for doing so – especially when initiating specific rehabilitation with the goal of developing new tools and strategies.

The few literature studies to have addressed this crucial problem have not used standardized questionnaires or appropriate designs for probing correlations between learning quality and neuropsychological performance levels (notably episodic memory and executive function). We had an opportunity to select BI subjects with severe sequelae being monitored in a neuropsychological rehabilitation and social support centre and to measure their ability to learn words having recently entered the French language.

1.2. Population and methods

1.2.1. Population

Twelve patients participated in this study in 2008 (seven women and five men; mean age: 34 years; lowest age: 23 years). Seven had suffered from head trauma and five had suffered from a stroke at some time between 1997 and 2006. To simplify matters, we shall refer to the these study subjects collectively as ''BI patients''. The mean time since injury was four years and seven months. Subjects presenting major language disorders or an excessively low socioeducational level were not included in the study.

The control group was composed of 12 subjects matched for age, educational level and gender.

1.2.2. The new word questionnaire (QMN)

This questionnaire deals with newly coined French words admitted to the dictionary between 1996 and 1997 and between 2006 and 2007. It features 22 items divided into two groups (11 for each period). We chose these two periods in order to compare words learnt 10 years apart, since the least recent would have been consolidated for longer. The words were selected from the *Larousse* dictionary, since the publishers had kindly informed us that the word selection criteria had not changed over this period. Given that the words had appeared recently, it was not possible to select them according to their measured frequency; the last test of this kind dates back to 1971 (the BRULEX database created by a Belgian group on the basis of the French language treasury). We systematically paired a word from 1996 to 1997 with one from 2006 to 2007, in terms of its shape or meaning. Hence, there were semantic pairings and superficial pairings (Table 1). Other criteria were also applied. We included foreign words (particularly English ones: ''bimbo'', ''blog'' and ''tofu'') in each list, in order to reflect changes in the French language as closely as possible. It is noteworthy that 7 and 19.5% of the new words admitted to the *Larousse* dictionary for the periods 1996 to 1997 and 2006 to 2007, respectively, were derived from English – justifying the higher proportion in our second list. The words concerned a variety of fields, including: