Lexical representation in french dysphasic subjects: A priming task for verbs

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1. OVERVIEW

Dysphasia, a language learning disability, is generally characterized as a linguistic deficit that affects a person's ability to use morphological rules productively, in the absence of neurological lesions, low I.Q., psychotic disorders, or articulatory or hearing disability. Royle (1996) found that the frequency of a given verb was a good predictor of the French dysphasic subject's ability to produce a verb form, inflected or not. Dysphasic subjects showed difficulty producing novel verbs but less so when producing frequent verbs. Royle proposed, in agreement with Kehayia (1994), that dysphasics do not inflect verbs but lexicalize them *whole chunk*, without internal morphological structure. A frequently used form will then be more accurately produced than an infrequent form, regardless of its regularity (Ullman and Gopnik, 1994; Gopnik, 1994).

Our investigation verifies the effects of transparency and frequency lexical access on visual decision tasks in French. Following Kehayia and Jarema (1994) we expected to find transparency effects when priming transparently related forms of the same verb paradigm in French (eg. LOUE \lu\ *rent* primes LOU+ER \luE\ *to-rent* more than BOIT \bwa\ *drink* primes BOIRE \bwaÂ\ *todrink*). One of the most robust effects found in simple lexical decision tasks is the frequency effect. We expected frequency to have a strong effect in French, especially during simple lexical decision tasks. We present results from two lexical decision tasks in French, one simple and one primed.

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2. METHODOLOGY

2.1. Subjects

Subjects were recruited as follows. Controls were French-speaking adults, living in the province of Québec, between the ages of 21 and 35 and with at least thirteen years of formal education. Dysphasics came from a pool of subjects from the Genetic Dysphasia Project directed by Myrna Gopnik at McGill University.

2.2. Method

A simple visual lexical decision task and a primed visual lexical decision task (PsyScope 1.1 © 1993-1996, Cohen, MacWhinney) was administered to the subjects. Dependant variables were latency (reaction time) and type of response (YES or NO) and were recorded on a computer. The subjects were asked to decide if a string of letters on the computer screen was a real word. During the simple lexical decision task, the subjects saw a mask (######) for 300 milliseconds and then saw a word or non-word which stayed on the screen until s/he responded. During the primed lexical decision task the subjects saw a mask for 300 milliseconds, followed by a *prime*, i.e. a morphologically related or unrelated word or a non-word, which was presented for 200 milliseconds. The subject subsequently saw the target which stayed on the screen until s/he responded.

2.3. Stimuli

The lexical decision tasks used the following stimuli: frequent regular verbs (eg. LOUER \lue\ *to rent*); infrequent regular verbs (eg. TROQUER \tÂoke\ *to barter*); frequent irregular verbs (eg. DORMIR \doÂmIÂ\ *to sleep*); and infrequent irregular verbs (eg. TEINDRE \te)dÂ\ *to dye*).The simple lexical decision task used the 3rd person singular (3ps) present, (the stem of regular verbs), infinitive, imperative / 2nd person plural (2pp) present, and 3ps imperfect past forms. The priming lexical decision task included the 3ps present, the infinitive, the imperative / 2pp present, and the 3ps imperfect forms. All forms were primed by themselves or by the 3ps present. The 3ps form was also primed by the infinitive form and by a graphically similar but not morphologically related form (e.g. SORT – DORT \soÂ\ – \doÂ\). Fillers and non-words modeled on the target stimuli were added to the tasks. The priming task was divided into two sections to reduce learning effects.

3. HYPOTHESES

We proposed that the frequency of a lexical item should have a significant effect on reaction time in simple lexical decision tasks. During the priming task, the frequency effect should be less strong and the transparency effect should dominate. Transparent paradigms should show stronger priming effects than opaque paradigms. Due to their specific deficit with morphology, dysphasic subjects should be sensitive only to frequency effects, throughout both tasks.

4. RESULTS AND DISCUSSION

4.1. Simple lexical decision task: control grou

The average error rate for all stimuli with controls was 6% (4 – 9%). For test stimuli the error rate was 7% (3-12%). Frequent irregular verbs showed an error rate of 2%, frequent regular verbs, 3%, infrequent regular verbs, 6%, and infrequent irregular verbs, 21%. The reaction times for each group of stimuli, averaged over 15 subjects, are given in Table 1.

Table 1 – Reaction times (milliseconds) for controls in the simple lexical decision task

Verb	Frequent Regular	Frequent Irregular	Infrequent Regular	Infrequent Irregular
Form	Average	Average	Average	Average
3ps pres	558	562	597	598
Inf	568	563	590	594
Imp – 2pp pres	567	569	598	633
Imperf	612	562	614	668

Frequent irregular verbs show little differences in the reaction times for different forms. They all seem to be accessed whole-chunk. Frequent regular verbs show longer reaction times for the imperfect tense, a fact indicating a different strategy for word recognition, most likely decomposition. The infinitive does not show this pattern. Infrequent verbs show no significant differences between reaction times of various forms.We therefore find signs of frequency effects in regular and irregular verbs as well as a slight transparency effect with regular frequent verbs during the simple lexical decision task.

4.1.1. Simple lexical decision task: dysphasic subject

All subjects show high levels of error. DS.04 (16 years old) rarely scores over 50% correct across all verbs, his performance seeming arbitrary. CA.01 (46 years old), scores better on frequent verbs. His performance is also better on the infinitive and the 3ps present forms. The present is unmarked for tense and the infinitive is the citation form in French. These could be stored whole-chunk by a dysphasic subject. Infrequent verbs and infrequent forms (imperfect) seem to be recognized less accurately.

Table 2 – Correct responses for the simple lexical decision task CA.01 / DS.04

Verb	Frequent Regular	Frequent Irregular	Infrequent Regular	Infrequent Irregular
Form	Correct	Correct	Correct	Correct
3ps pres	67 / 44	78 / 67	67 / 22	44 / 11
Inf	89 / 33	89 / 56	78 / 11	44 / 11
Imp – 2pp pres	89 / 22	78 / 44	67 / 0	44 / 33
Imperf	44 / 22	33 / 33	11 / 0	22 / 0

An analysis of CA.1's reaction times (Table 3) for different stimuli reveals no significant differences in reaction time between forms in the same group. CA.1 does not seem to pattern like controls.

Table 3 – Reaction times (milliseconds) for CA.01 in the simple lexical decision task

Verb	Frequent Regular	Frequent Irregular	Infrequent Regular	Infrequent Irregular
Form	Average	Average	Average	Average
3ps pres	—	685	732	—
Inf	749	685	697	—
Imp – 2pp pres	694	—	—	—
Imperf	—	—	—	—

4.2 *Priming task: control grou*

During the priming tasks, the overall error rate for 25 subjects was 4.8% (0.7 – 11.08%). The error rate for test stimuli was 5.5% (1.4 – 10.2%). Stimuli showing high levels of error in the simple lexical decision task were not included in this task.

Table 4 – Reaction times (milliseconds) for controls in the primed lexical decision task

	Verb	Frequent Regular	Frequent Irregular		Infrequent Irregular	Infrequent Regular	
	Prime / Target	Average	Average	Diff.	Average	Average	Diff.
1	3ps pres / 3ps pres	490	530	40*	496	520	34
2	3ps pres / Inf	519	566	45	535	554	19
3	3ps pres / Imp – 2pp pres	501	544	43*	527	605	78*
4	3ps pres / Imperf	533	607	71*	530	601	71*
5	Grapheme / 3ps pres	628	654	26	607	653	44

* $p \leq .05$

Results on the priming task for controls show almost no transparency effects. Regular and irregular verbs do not show significant differences in reaction time for identical priming conditions. Frequency effects were more robust. Table 4 illustrates priming effects for morphologically related primes: reaction times are always fastest subsequent to presentation of a related morpheme. Presentation of a grapheme prime slows down recognition of the target. Priming conditions between frequent and infrequent regular verbs show large differences in reaction time. Excluding graphemic priming, all but the second condition are statistically significant. The same pattern is found with irregular verbs. Here, the differences in reaction times are significantly different in the third and fourth condition. The first condition, although not significant from a statistical point of view, follows the same pattern. Frequency is a strong factor in verb recognition, even during a priming task.

4.2.1. Priming task: dysphasic subject

CA.01, the 44-year-old dysphasic subject showed high levels of error during the priming task (Table 5). Except for frequent regular verbs in the unmarked and in the imperative / 2pp present forms, the error levels are above normal and in many cases only at chance level.

Table 5 – % correct responses for the primed lexical decision task CA.01

	Verb	Frequent Regular	Frequent Irregular	Infrequent Regular	Infrequent Irregular
	Prime / Target				
1	3ps pres / 3ps pres	100	71	71	71
2	3ps pres / Inf	71	85	44	57
3	3ps pres / Imp – 2pp pres	100	57	14	57
4	3ps pres / Imperf	71	44	44	44
5	Grapheme / 3ps pres	73	82	38	36

Due to high levels of error, only a few items in the frequent verb groups were analyzed statistically. In frequent regular verbs the differences between the 3ps priming itself and other forms is not significant (Table 6). Irregular verbs primed by an opaquely related form (eg. DORT – DORMIR) show inhibitory effects, as much as the presentation of a graphemically related but semantically unrelated prime. This is apparent when comparing condition 2 for both regular and irregular verbs. There is a significant slowing of reaction times for opaque verbs.

Table 6 – Reaction times (milliseconds) for CA.01 in the primed lexical decision task

	Verb	Frequent Regular	Frequent Irregular	
	Prime / Target	Average	Average	Difference
1	3ps pres / 3ps pres	592	—	—
2	3ps pres / Inf	565	880	315*
3	3ps pres / Imp – 2pp pres	686	802	116
4	3ps pres / Imperf	—	—	—
5	Grapheme / 3ps pres	914	805	91

* $p \leq .05$

4. CONCLUSION

We found high levels of error especially with infrequent verbs, in both simple and primed lexical decision tasks in dysphasic subjects. However, they showed less difficulty on unmarked (3ps present) and citation (infinitive) forms. We also found inhibitory effects from opaquely related forms in the same morphological paradigm. This leads us to propose that dysphasics do not use morphological rules to recognize words but use fall-back procedures, such as analogy and *wholechunk* access, to recognize and access all verb forms.

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