The Effects of Age, Educational Level, and Stimulus Length on Naming in Normal Subjects

Guylaine Le Dorze and Julie Durocher
École d'orthophonie et d'audiologie
Université de Montréal

Key Words: naming, aging, education

Abstract
A study was conducted on 136, non-narcoleptic, French speaking, independent adults in good health. Subjects were between 25 and 85 years of age, had a minimum of 4 years of education, and were divided into nine groups based on education and age. They were administered a naming task comprised of 40 monosyllabic, 40 bisyllabic, and 40 polysyllabic words. An analysis of variance on correct responses revealed significant main effects for age, educational level, and stimulus length (number of syllables). Significant interactions also were found between age groups and stimulus length and between educational level and stimulus length. The results are discussed in terms of a decline in the retrieval of phonological information from the lexicon associated with aging.

Résumé
Une étude a été menée auprès de 136 adultes autonomes, normaux, francophones, en bonne santé. Les sujets étaient âgés de 25 à 85 ans et comptaient au moins 4 années de scolarité. Ils ont été divisés en neuf groupes fondés sur la scolarité et l'âge. Chaque a reçu une tâche de dénomination comportant 40 mots monosyllabiques, 40 disyllabiques et 40 polysyllabiques. Une analyse des différences dans le taux de réponse a révélé que l'âge, le niveau de scolarité et la longueur du stimulus (nombre de syllabes) ont des effets importants sur l'exactitude des réponses. D'importantes interactions ont également été constatées entre les groupes d'âge et la longueur du stimulus ainsi qu'entre le niveau de scolarité et la longueur du stimulus. Les résultats ont été examinés relativement à la diminution au niveau de l'accès lexical associée au vieillissement.

Introduction
Anomia is a central feature of both aphasia (Goodglass & Kaplan, 1979) and the linguistic deficits of patients with senile dementia of the Alzheimer type (SDAT) (Bayles, Boone, Tomodea, Slauson, & Kaszniak, 1989; Bowles, Obler, & Albert, 1987). Clinical tools, such as the Boston Naming Test (BNT) (Kaplan, Goodglass, & Weintraub, 1983), have been developed in the English language for the assessment of anomia. These have been used clinically and in research for the study of anomia in both pathological and normal populations. Because similar instruments do not exist for the French language, one goal of this work was to obtain information on naming in normal French speaking subjects that could be used to study different language pathologies in this population. In developing a standardized test for anomia, one of the first objectives was to test a large number of normal individuals in order to determine the effects of age and educational level on their performance in a naming task. A second objective was to include a wide range of items varying in difficulty, similar to the BNT, so that the test could be used with patients with severe as well as mild anomia.

A frequent complaint of elderly individuals is the loss of the availability of words. Although some literature on naming ability in normal subjects exists, the phenomenon of word-finding difficulty is not well understood. Moreover, findings reporting the effects of age on naming have not been consistent. In many studies of normal individuals performing a picture naming task, significant differences have been reported between subjects in different age groups (Ardila & Rosselli, 1989; Bowles et al., 1987; Dordain, Nespolour, Bourdeau, & Lecours, 1983; Fattori, 1990; Nicholas, Obler, Albert, & Goodglass, 1985). Other studies have reported only non-significant tendencies in the same direction (Borod, Goodglass, & Kaplan, 1980; Flicker, Ferris, Crook, & Bartus, 1987; Van Gorp, Satz, Kiersch, & Henry, 1986; Villardita, Culvera, Cupone, & Mejia, 1985), while still others found neither significant differences nor tendencies (Riand & Lecours, 1990). These discrepancies in results may be attributable to different methods of investigation, for example, differences in the definition of age groups and in the number of test items used. In the Nicholas et al. (1985) study, subjects were between 30 and 79 years of age, while Van Gorp et al. (1986) used subjects that were 59 to 80 years plus. The definition of the oldest group varied considerably across studies: Dordain et al. (1983) had subjects over the age of 50 as the oldest group, Ardila and Rosselli's (1983) oldest group was 76 years and up, and...
Naming in Normal Subjects

Farmer (1990) had subjects between 60 and 69 years of age as the oldest group.

The number of stimuli used to test the effects of variables has differed across studies and possibly been insufficient in some of them. For example, the BNT was often used in its entirety (Borod et al., 1980; Farmer, 1990; Labarge, Edwards, & Kostevich, 1986; Nicholas et al., 1985), but sometimes only a subset of items was selected. As a case in point, 15 items were used in the Villardita et al. (1985) study, 20 in the Flicker et al. (1987) study, and 60 items in the Van Gorp et al. (1986) study.

Nevertheless, when found to be significant, the effect of age has been interpreted by most authors as a sign of normal cognitive decline (Albert, 1984; Albert, Duffy, & Naeser, 1987; Obler & Albert, 1981). Few studies have investigated the possible causes of anoma in elderly subjects. However, a recent study by Au, Albert, and Obler (1989) suggests that the mild anoma in elderly individuals does not appear to be associated with a general decline of other cognitive processes. They based this conclusion on the results of a regression analysis showing a decrease with age in the involvement of different measures of memory, attention, and visual perception with naming scores. They interpreted these findings to mean that elderly subjects were experiencing an anoma of a linguistic origin, but they did not specify what "linguistic" meant in this particular context.

The effect of education on normal subjects' performance on a naming task has received much less attention in the literature. In some studies, researchers have reported the mean years of education of their subject groups (e.g., Nicholas et al., 1985). But in other studies, the education of the subjects could not be studied independent of age (e.g., Borod et al., 1980; Labarge et al., 1986). Nevertheless, some studies have shown significant effects of educational level on naming performance (Ardisa & Rosselli, 1989; Au et al., 1989; Dordain et al., 1983; Nicholas, Brookshire, MacLennan, Schumacher, & Porrazzo, 1989). One study suggested that a high level of education can offset the effects of aging on neuropsychological tests (Borstein & Suga, 1988).

Farmer (1990) has shown that years of education do not influence naming performance. This finding may be related to the relatively high level of education (mean 14.6 years) of the subjects in this study. Beland and Lecours (1990) also reported no effect of education on naming, but the variables of age and educational level were confounded in this study such that elderly subjects were less educated, while younger subjects were more educated. These variables were also confounded in a study by Speedie, O'Donnell, Rabins, Pearson, Poggi, and Rothi (1990). They reported that subjects having a superior level of education performed less well than subjects with a lower level of education. In this study, however, the better educated subjects were older than the less educated subjects. This brief overview of studies suggests that it is important to take educational level as well as age into consideration when studying naming in elderly subjects. However, age norms for naming tests that have been published thus far have not controlled for the education variable.

Another variable influencing naming performance is the difficulty level of the naming task. The objective of the current study was to have a wide range of difficulty of test items. Variables such as word length, word frequency, and word familiarity can be used to define the difficulty level. For the French language there is no standardized set of pictures, such as the Snodgrass and Vanderwart (1980) collection in English, that includes word familiarity as a measurable dimension of the stimuli. Moreover, not all stimuli appropriate for a test appear in Beaudot's (1989) word frequency list—the most recent list for the French language compiled in Canada. Furthermore, the Beaudot list provides frequencies for written occurrences of words and not frequencies for pictures. This may explain why the Beaudot list is incomplete for the type of stimuli required by a naming task.

Because familiarity data was unavailable and because word frequency alone would not define the level of difficulty of all of the stimuli, word length was chosen as a measure of item difficulty. Although a crude measure, this choice was also motivated by the observation that word length and word frequency are correlated with one another (Zipf, 1974). Moreover, in one study that tested the effects of this variable on normal subjects a significant correlation was found between naming latencies and stimulus length (Carroll & White, 1973). Word length is also one of the variables known to affect the performance of aphasic individuals on a naming task (Goodglass, Kaplan, Weintraub & Ackerman, 1976; Howard, Patterson, Franklin, Morton, & Orchard-Lisle, 1984; Venes cited in Williams, 1983). Based on previous literature, it was hypothesized that all three variables, age, educational level and word length, would influence the number of correct responses adults would make on a confrontation naming task.

Method

Subjects
One hundred and forty-three (143) normal healthy subjects residing in their own homes were recruited to participate in the study. They had a minimum of 4 years of education and were between 25 and 85 years of age. They were native speakers of Quebec French and had sufficient vision to read.
newspaper. They answered a questionnaire on their health, including questions on their vision, neurological disease, and any other health problems. Subjects reporting to be under medication for hypertension, diabetes, or heart disease were not excluded from the study. Subjects reporting neurological problems were excluded, as well as one subject reporting cataracts. Subjects were not specifically screened for dementia or hearing impairment.

In order to study the effects of age and educational level, 9 groups of subjects were defined. There were three age groups: (1) young subjects, between 25 and 44 years of age; (2) middle-aged subjects, between 45 and 64 years of age; and (3) elderly subjects, between 65 and 85 years of age. There were three levels of education: (1) low, 4 to 10 years of education, which corresponds to an incomplete elementary or high school degree; (2) intermediate, 11 to 15 years of education, which corresponds to a completed high school degree plus some years in college; and (3) high, 16 years of more of education, which corresponds to a completed university degree.

Table 1 presents the number of male and female subjects in each of the groups defined by age and educational level. A minimum of 5 female and 5 male subjects were included in each group for a total of 71 females and 65 males. Table 1 also presents the mean age and the mean number of years of education for each group. The mean ages did not differ significantly for the three young groups \( F(2) = 1.89, p > 0.10 \), the three middle-aged groups \( F(2) = 1.54, p > 0.10 \), and the three elderly groups \( F(2) = 0.50, p > 0.10 \). Mean years of education did not differ for the three low level groups \( F(2) = 2.01, p > 0.10 \), for the three intermediate groups \( F(2) = 0.04, p > 0.10 \), and for the three high groups \( F(2) = 2.64, p = 0.08 \).

### Materials

The subjects were administered a naming task consisting of 120 unambiguous line-drawn stimuli 40 of which were associated with monosyllabic words, 40 with bisyllabic words, and 40 with polysyllabic words (3 or 4 syllables). Examples are provided in Figure 1. Care was taken in the selection of stimuli to exclude synonyms. The order of presentation of the stimuli was randomly determined.

### Procedures

#### Data collection

First, information was given to each subject concerning the objective of the study and a consent to participate was obtained.

Figure 1. Examples of stimuli: fraise (monosyllabic), ceinture (bisyllabic), sous-marin (polysyllabic).

---

Table 1. Mean age, mean education in years and standard deviations (in parentheses), and number of females and males in each subject group.

<table>
<thead>
<tr>
<th>Age</th>
<th>Educational Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low</td>
</tr>
<tr>
<td>Young Group</td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>36.2 (4.9)</td>
</tr>
<tr>
<td>education</td>
<td>8.8 (1.6)</td>
</tr>
<tr>
<td>female/male</td>
<td>5/5</td>
</tr>
<tr>
<td>Middle-aged Group</td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>53.1 (6.7)</td>
</tr>
<tr>
<td>education</td>
<td>7.7 (2.0)</td>
</tr>
<tr>
<td>female/male</td>
<td>7/9</td>
</tr>
<tr>
<td>Elderly Group</td>
<td></td>
</tr>
<tr>
<td>age</td>
<td>72.0 (5.1)</td>
</tr>
<tr>
<td>education</td>
<td>7.5 (1.7)</td>
</tr>
<tr>
<td>female/male</td>
<td>10/12</td>
</tr>
</tbody>
</table>
Naming in Normal Subjects

obtained. Next, the general health questionnaire was com­
pleted. Then, testing was undertaken. Subjects were tested in
French. They were instructed to name each picture. They
were told that 5 seconds would be allowed for a response.
The 5 second time limit was chosen to keep testing time to a
minimum. The entire session was recorded with a Sony
TCM-5000 tape-recorder. An orthographic and phonetic
transcription of the verbatim responses of each subject was
made following the testing.

Data coding

Two researchers verified all of the transcriptions indepen­
dently by comparing the audio tape to the written transcript.
Disagreements were resolved with a third listener. Then, the
researchers identified the five second boundary for each
stimulus with a stopwatch and coded the first response pro­
duced within the five second boundary as follows: (1) cor­
rect response, (2) visual error, (3) phonological error, (4)
circumlocution, (5) lexical substitution, and (6) other
response, including no response, hesitation, and comment.
Each of these major categories was further subdivided into
subcategories for a total 30 different response types. Further
detailed studies of error types would thus be possible.

For the purposes of this study, only the total number of
correct responses was considered. The definition of a correct
response included: immediate correct response, delayed cor­
rect response (defined as a response produced after 3 sec­
onds but before 5 seconds), adequate synonym, and elabo­
rate correct response (self-corrected response and correct
response with a personal comment, such as “c’est pas facile,
‘ta,” i.e., “that one is not easy”).

Reliability

Two coders were each responsible for approximately half of
the subjects’ responses. Inter-judge and intra-judge reliabil­
ity of coding (of all of the different types of responses) was
determined by a random selection of 20% of the subjects’
responses with a unit-by-unit agreement index (NA+D
X 100%) (Hegde, 1987). Intra-judge reliability was assessed
in this manner at two-week intervals. Agreement for coder 1
was 98% and for coder 2, 96%. Inter-judge reliability
obtained from another randomly selected 20% of the sub­
jects’ responses (half coded by the first coder and half coded
by the second coder) was 94%.

Analyses

Data was analysed with 3 X 3 X 3 analysis of variance pro­
cedure using age and educational level as independent vari­
ables and stimulus type as the repeated variable. Total num­
ber of correct responses was the dependant variable.

Stimulus type Educational Level

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Low</th>
<th>Intermediate</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monosyllabic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>36.80 (2.4)</td>
<td>38.47 (1.4)</td>
<td>38.64 (1.3)</td>
</tr>
<tr>
<td>Middle-aged</td>
<td>34.50 (3.4)</td>
<td>37.79 (1.8)</td>
<td>37.56 (1.7)</td>
</tr>
<tr>
<td>Elderly</td>
<td>34.86 (2.9)</td>
<td>36.50 (2.3)</td>
<td>35.64 (2.9)</td>
</tr>
<tr>
<td>Bisyllabic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>36.40 (2.5)</td>
<td>38.11 (1.8)</td>
<td>38.21 (1.7)</td>
</tr>
<tr>
<td>Middle-aged</td>
<td>32.63 (3.5)</td>
<td>35.86 (3.2)</td>
<td>35.17 (3.3)</td>
</tr>
<tr>
<td>Elderly</td>
<td>30.23 (4.7)</td>
<td>32.92 (3.3)</td>
<td>32.55 (3.2)</td>
</tr>
<tr>
<td>Polysyllabic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>30.30 (3.6)</td>
<td>35.89 (3.8)</td>
<td>35.64 (3.1)</td>
</tr>
<tr>
<td>Middle-aged</td>
<td>25.63 (3.5)</td>
<td>33.50 (4.1)</td>
<td>32.89 (3.8)</td>
</tr>
<tr>
<td>Elderly</td>
<td>24.86 (4.5)</td>
<td>29.33 (3.1)</td>
<td>28.55 (4.8)</td>
</tr>
</tbody>
</table>

Rejection level for all analyses was set at $p = 0.05$. When
appropriate, post-hoc testing was done using Tukey’s
Honestly Significant Difference (HSD) test (Daniel, 1987). If
sample sizes were unequal, the smallest $n$ was used in the
equation for calculating HSD (Daniel, 1987). Rejection level
for these comparisons was also set at $p = 0.05$.

Results

Table 2 shows the mean number of correct responses for
each stimulus type, age group, and educational level. Table
3 presents the ANOVA results for the main effects of age,
educational level, and stimulus type.

Main effects

There was a significant main effect of age. Young subjects
produced the most correct responses, followed by middle­
aged subjects, and then by elderly subjects. Post-hoc tests
revealed that all subject groups differed significantly from
one another (HSD=$n=43$)=0.99, for comparisons with the
young subjects; HSD($n=45$)=0.97, for comparisons with the
elderly subjects).

There was a significant main effect of education. Subjects
with a lower educational level produced fewer cor-
### Table 3. ANOVA results for age, education and stimulus type.

<table>
<thead>
<tr>
<th>Main Effects</th>
<th>m</th>
<th>sd</th>
<th>F</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Young</td>
<td>36.80</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle-aged</td>
<td>33.92</td>
<td>4.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elderly</td>
<td>31.32</td>
<td>5.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>31.24</td>
<td>5.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>35.72</td>
<td>3.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>35.19</td>
<td>4.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stimulus type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monosyllabic</td>
<td>36.72</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bisyllabic</td>
<td>34.54</td>
<td>4.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polysyllabic</td>
<td>30.65</td>
<td>5.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Means for the significant interaction between age groups and stimulus types.

<table>
<thead>
<tr>
<th>Age Groups</th>
<th>Monosyllabic</th>
<th>Bisyllabic</th>
<th>Polysyllabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Young</td>
<td>38.14</td>
<td>37.74</td>
<td>34.51</td>
</tr>
<tr>
<td>Middle-aged</td>
<td>36.60</td>
<td>34.52</td>
<td>30.65</td>
</tr>
<tr>
<td>Elderly</td>
<td>35.49</td>
<td>31.51</td>
<td>26.96</td>
</tr>
</tbody>
</table>

Table 5. Means for the significant interaction between educational level and stimulus types.

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Monosyllabic</th>
<th>Bisyllabic</th>
<th>Polysyllabic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>35.15</td>
<td>32.31</td>
<td>28.25</td>
</tr>
<tr>
<td>Intermediate</td>
<td>37.73</td>
<td>36.02</td>
<td>33.40</td>
</tr>
<tr>
<td>High</td>
<td>37.42</td>
<td>35.49</td>
<td>32.67</td>
</tr>
</tbody>
</table>

ject groups were affected by stimulus length in that fewer correct responses were produced as the length of the stimulus increased. This effect of length, however, was more pronounced as a function of age. Post-hoc tests revealed that all differences between means were significant with two exceptions: the monosyllabic versus bisyllabic words for the young subjects and the middle-aged versus the elderly subjects for the monosyllabic stimuli (HSD[n=43]=1.31, for comparisons involving the young subjects; HSD[n=45]=1.28, for comparisons involving the elderly subjects).

There was a significant interaction between stimulus type and educational level (F(4,254)=15.21, p=0.0000) (see Table 5). For each of the educational level groups, a significant decrease in the number of correct responses occurred as the stimulus increased in length. This effect was more pronounced for the subjects with a low level of education. Subjects with an intermediate or a high level of education did not differ significantly from one another, although both groups demonstrated sensitivity to word length. Post-hoc tests revealed that all of the pairs of means were significantly different except between the intermediate and high education groups for all of the stimuli (HSD[n=43]=1.30, for comparisons involving the high educational group; HSD[n=45]=1.28, for comparisons involving the intermediate educational group).

The interaction between age and educational level was not significant (F(4,127)=0.78, p=0.54). The three-way interaction between age, education and stimulus length also was not significant (F(8,254)=0.96, p=0.47).

Further Examination of the Effects of Stimulus Length

In order to further understand the effect of stimulus length, post-hoc correlational analyses with word frequency were performed. Frequency values were attributed to each one of the 120 stimuli on the basis of Beaudot’s (1989) list and converted into logarithmic values (log(10)) based on the finding that there is a linear relationship between naming
The Effects of Stimulus Variables on Confrontation Naming

Stimulus length was found to be a significant variable. Increased stimulus length, in terms of the number of syllables in a word, produced a significant decrease in the number of correct responses. This suggests that stimulus length is an index of difficulty. Item difficulty is, in all likelihood, not only due to length alone, but also relates to other stimulus variables, such as word frequency. The post-hoc correlational analyses showed that word length and word frequency were moderately correlated in this study. As well, both of these variables were associated, weakly to moderately, with the subjects' performance (i.e., fewer correct responses were produced for rarer and longer words). Because a number of the stimuli (i.e., those not appearing in the Beaudot list) were attributed a low frequency value there may be a certain bias in these results. The correlation found here between frequency and naming is smaller than that reported by Carroll and White (1973). Their correlations were r=0.57 for response latencies and word frequency (as defined by the Kucera and Francis [1967] word count) in young and college educated subjects. The subjects in this study were a more diverse group in terms of education and age, and the number of correct responses rather than latencies was examined. These factors may account for the differences in results.

The degree of correlation between subject performance and stimulus variables appears to be greatest for the oldest subject group. This suggests an increase in sensitivity with age to lexical variables of word frequency and word length. Taken together, these results are suggestive of changes in the processes of lexical retrieval with increasing age.

Table 6. Correlational analyses (r values) between word frequency, word length and the number of correct responses produced by the three age groups.

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Frequency</th>
<th>Young</th>
<th>Middle-aged</th>
<th>Elderly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Length</strong></td>
<td>1.0</td>
<td>-0.28</td>
<td>-0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Frequency</strong></td>
<td>1.0</td>
<td>0.38</td>
<td>0.41</td>
<td>0.46</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

The results of this study revealed significant main effects of education, stimulus length, and age, as well as significant interacting effects of age and stimulus length and of education and stimulus length on naming in a sample of 136 French speaking subjects. These findings are discussed under the following broad headings: (1) the effects of education, (2) the effects of stimulus variables, and (3) the effects of age. Theoretical issues concerning the nature of aging are addressed along with some clinical applications of the findings.

The Effects of Education on Confrontation Naming

This research corroborates the results of other studies that demonstrate the effect of education on the performance of a naming task by normal subjects (Ardila & Rosselli, 1989; Au et al., 1989; Dottin et al., 1983; Nicholas et al., 1989). However, the results of this study show that only subjects with the lowest level of education (i.e., those not having completed high school) differed from the remaining two subject groups (intermediate and high education levels). This may indicate that the stimuli used in this study are relatively well known by individuals who have competed high school. The absence of an interaction between age and education suggests that, at least with respect to naming, a higher level of education does not offset the effects of aging, which has been suggested by Bornstein and Suga (1988). While educational level is an important variable to consider when examining naming scores, it may only be crucial in distinguishing subjects with a lower level of education.

It is possible that variables other than education influenced a subject's performance. For example, an individual's investment in language skills as measured by reading habits might affect performance and might compensate for a lower level of education. Level of employment may be a variable to consider. There may be differences associated with the type of employment (white collar versus blue collar). Further studies should examine these possibilities.
The Effects of Aging on Confrontation Naming

These results for French speaking subjects support a number of previous studies demonstrating the effects of age in other populations (Ardila & Rosselli, 1989; Bowles et al., 1987; Dordain et al., 1983; Farner, 1990; Nicholas et al., 1985). The age of our subjects varied across the adult life-span from 25 to 85 years. Such a wide age span was not employed in some studies that found no significant difference between groups (Labarge et al., 1986; Van Gorp et al., 1986; Nicholas et al., 1989). Other studies that did not find age effects (Béland & Lecours, 1990; Flicker et al., 1987; Villardita et al., 1985) used a smaller sampling of naming behavior, which could explain why significant differences were not found. It is also possible that test items were too simple or did not cover a sufficient range of difficulty.

Because our subjects were not screened specifically for dementia or hearing-impairment, a certain degree of caution must be exercised when considering this effect of age. Despite the fact that all subjects were living independently, some of the elderly subjects may have been experiencing early manifestations of dementia. It is also possible that some degree of undetected hearing impairment also may have affected the general linguistic functioning of some subjects. These factors could explain why elderly subjects scored poorer than the other subject groups. However, there were also significant differences between the young and middle-aged groups suggesting that changes in naming may occur relatively early in adult life and that this may be a manifestation of the normal aging process. Villardita et al. (1985) found an erosion of some cognitive abilities in the area of memory, but not for naming, in a middle-aged group. Further studies are needed to determine more precisely at what age the decline in naming abilities is likely to begin in normally aging adults. It is also important to distinguish this decline from any type of communication impairment.

The underlying nature of the decline in naming can be addressed in the context of this study. Although no definitive answers are forthcoming, some light may be shed on this question. Confrontation naming can be conceived of as involving the activation of conceptual or semantic information concerning a particular object and the activation of presentations. This basic dichotomy is present in current theories of information processing and memory (Klatsky, 1988), which could explain why significant differences were not found. It is also possible that test items were too simple or did not cover a sufficient range of difficulty.

The age of our subjects varied across the adult life-span from 25 to 85 years. Such a wide age span was not employed in some studies that found no significant difference between groups (Labarge et al., 1986; Van Gorp et al., 1986; Nicholas et al., 1989). Other studies that did not find age effects (Béland & Lecours, 1990; Flicker et al., 1987; Villardita et al., 1985) used a smaller sampling of naming behavior, which could explain why significant differences were not found. It is also possible that test items were too simple or did not cover a sufficient range of difficulty.

Because our subjects were not screened specifically for dementia or hearing-impairment, a certain degree of caution must be exercised when considering this effect of age. Despite the fact that all subjects were living independently, some of the elderly subjects may have been experiencing early manifestations of dementia. It is also possible that some degree of undetected hearing impairment also may have affected the general linguistic functioning of some subjects. These factors could explain why elderly subjects scored poorer than the other subject groups. However, there were also significant differences between the young and middle-aged groups suggesting that changes in naming may occur relatively early in adult life and that this may be a manifestation of the normal aging process. Villardita et al. (1985) found an erosion of some cognitive abilities in the area of memory, but not for naming, in a middle-aged group. Further studies are needed to determine more precisely at what age the decline in naming abilities is likely to begin in normally aging adults. It is also important to distinguish this decline from any type of communication impairment.

The underlying nature of the decline in naming can be addressed in the context of this study. Although no definitive answers are forthcoming, some light may be shed on this question. Confrontation naming can be conceived of as involving the activation of conceptual or semantic information concerning a particular object and the activation of phonological information about the word associated with the object. This separation of meaning (semantics) and sign (phonology or orthography), basic to linguistics (Lyons, 1970), postulates into two different basic processes involved in lexical access, access to semantic and phonological representations. This basic dichotomy is present in current theories of information processing and memory (Klatsky, 1988), language production (Garrett, 1982), and anomia in aphasia (Lassers, 1989). Another important distinction is between structure, or the representation of information in long term memory, and activation, or the retrieval of information. This distinction is also integrated and discussed in the previously cited theoretical models.

It appears unlikely that the decline in naming occurs because the representation of information is affected. Stibhouse (1988) favours the view that the structural organization of semantic knowledge remains intact in aging. His review of the psychometric literature on vocabulary scores shows that receptive vocabulary increases with age. This observation may signify that, while information about words increases with age, naming failures occur because of a difficulty in the retrieval of the information. Support for this general idea also comes from a study of spontaneously occurring tip-of-the-tongue (TOT) episodes in adults (Burke, Wernlely, & Martin, 1987). These authors found that TOTs happened more frequently in older subjects for object names and for polysyllabic words. They concluded that this difficulty constituted a retrieval problem because spontaneous recovery was frequent (i.e., subjects found the words at a later moment in time).

Although speculative, we also propose that our older subjects were experiencing more retrieval failures rather than problems related to degraded representations. The greater sensitivity of the elderly subjects to the effects of word length may reflect their decreased ability to retrieve phonological representations in the lexicon. This inference is based on the idea that word length information is presumably stored in phonological representations (Garrett, 1982).

In this study, other stimulus variables, specifically related to semantic retrieval, were not examined. Thus we cannot rule out the possibility that semantic retrieval becomes problematic with aging. More studies of stimulus variables related to semantic retrieval, such as word familiarity, are needed in order to explore this possibility.

It is possible that if subjects had been allowed more time to respond, older subjects may have been capable of producing more correct responses. Further studies could measure the time involved in confrontation naming to determine if age causes only a slowing in the process of naming. A study of production errors will also allow the examination of this issue in that different error types may reflect different problems with the naming process. For example, delayed correct responses may be due to the slowing of retrieval, while circumlocutions might reflect a problem in phonological retrieval. It would also be useful to compare the errors produced by healthy individuals with those produced by persons with aphasia and persons with cognitive impairment. Similar or different proportions of error types to...
one or the other of these clinical populations may also help in indicating more precisely the cause of naming problems.

Clinical Applications

The stimuli used in this study could be used eventually for the clinical examination of anomia in French speaking Canadians. The data from these normal subjects provide norms for comparison with other clinical populations. It is important that both education and age are considered in clinical studies. Moreover, studies of the reliability and validity of the stimuli and procedures used in this study need to be undertaken. All of these factors need to be considered in the development of an instrument for the diagnosis of language impairment in French speaking Canadians. It is hoped that this study has made a significant first step in advancing this goal.

Acknowledgements

We thank Chantal Pits and Geneviève Boivin for their assistance in data collection, Francine Giroux for her help in data analysis, and Brigitte Rolland for the preparation of the stimuli. Thanks is extended to the subjects who participated. Helpful comments on the manuscript given by John Ryalls and ISLP A reviewers were also appreciated. This research was supported by CAFIR (Comité d’Attribution des Fonds Internes de Recherche) funds of the University of Montréal and the FRSQ (Fonds de la Recherche en Santé du Québec) through a team grant to the first author (#9001448) and a scholarship to the second author.

Address all correspondence to: Gayline Le Dorez, Ph.D., École d’orthophonie et d’audiologie, Faculté de médecine, Université de Montréal, C.P. 6128, succ. A, Montreal, Québec H3C 3T7 Canada.

References


