Introduction

In the study of lexical retrieval for individuals with neuropathology, investigators have frequently reported a discrepancy between the ability to name items from living (e.g. fruit, birds) and artifact (e.g. kitchen utensils, furniture) categories. Increased difficulty for items from the living domain has been the most frequent "category effect" reported (Laiacona, Barbarotto, & Capitani, 1998; Farah, McMullen, & Meyer, 1991; Bunn, Tyler, & Moss, 1998). Although the category effect may be the result of normal aging versus neuropathology (Coppens & Frisinger, 2005), few investigators have studied it with neurologically intact individuals.

Coppens and Frisinger (2005) studied the confrontation naming skills of 90 neurologically normal individuals in three age groups and observed a category effect (more artifact than living items named) in two elderly groups but not in the younger group. Unfortunately, the younger group was not matched for years of education with the two elderly groups and gender was not matched in any group, both of which could have impacted the results of the study. Capitani, Laiacona and Barbarotto (1999), using a semantic fluency task, observed a gender effect for fruits and tools with females naming more fruits and males naming more tools. Investigators noted that their one-minute time limit might have influenced results and suggested future study using longer retrieval times. In addition, an unequal number of males (n=112) and females (n=154) participated and information related to matching of age and educational levels was not provided.

In summary, given the paucity of well-designed studies related to categorically based lexical retrieval skills for neurologically intact individuals, further study in this area would be beneficial. Effects of age, gender and/or education for category naming, in the absence of neuropathology, could be important for differential diagnosis in disorders such as Alzheimer's disease (Coppens & Frisinger, 2005).

Purpose

The purpose of this investigation was to evaluate semantic fluency for four living and four artifact categories for groups of younger and older males and females matched for education level.

Methodology

Sixty paid participants were recruited from each of six, ten-year age bands: 20-29; 30-29; 40-49; 50-59; 60-69; 70-80 with equal numbers of males and females in each group. The genders were clustered into younger (age: 20-49 years) and older (age: 50-80 years) groups. The average ages of the groups were: younger females: 34.3 years; younger males: 34.7 years; older females: 62.9 years and older males: 62.7 years. All four groups were matched for years of education: younger females: 16.1 years; younger males: 15.5; older females: 15.6 and older males: 16.0. Ten participants in each group had completed

a college degree and five had not. A summary of participant characteristics can be found in Table 1. All participants were native speakers of English; high school educated and had negative histories for neurological disorders. In addition, all were non-hospitalized, demonstrated pure tone air conduction thresholds no greater than 35dB at 500, 1000, 2000 and 3000 Hz in at least one ear and had negative self-reported histories of alcohol/substance abuse and mental illness. All participants scored above the 10th percentile on the *Test of Non Verbal Intelligence – 3rd Edition (TONI-3)* (Brown, Sherbenou, & Johnsen, 1997).

Experimental Stimuli and Dependent Measure

Production of words in four living categories (birds, four-footed animals, fruits, vegetables) and four artifact categories (clothing, kitchen utensils, furniture, tools) (taken from Battig and Montague (1969)) served as the behavior of interest. All participants were instructed to name as many items as possible in each category. A time limit was not imposed. General descriptors (e.g. "children's furniture") were not included in the counts. Duplicate items and equivalent terms (e.g. "peeler" and "potato peeler") were counted only once.

Results

Three-way (i.e., age, gender, education) ANOVAs were conducted for each of the eight semantic categories. The results revealed a significant effect for education on naming articles of clothing (advantage for those with a college degree) ($F_{(1,52)} = 4.46$, $p<.040$) significant effects for gender for the categories of furniture (advantage for females) ($F_{(1,52)} = 5.02$, $p <.029$), fruit (advantage for females) ($F_{(1,52)} = 5.75$, $p<.020$) and tools (advantage for males) ($F_{(1,52)} = 14.50$, $p<.001$) and a significant interaction between gender and age for four- footed animals (advantages for older males and younger females) ($F_{(1,52)} = 12.16$, $p<.001$). An additional 2x3 ANOVA revealed a nonsignificant effect for living versus nonliving categories for all comparisons. Table 2 presents the significant results based on the ANOVA. The means and standard deviations for the significant results have been presented in Table 3.

Discussion

Results revealed significant differences in semantic fluency for two living and three artifact categories based on age, gender and/or education level. There was no significant difference in the overall number of living and artifact items produced. Females named significantly more fruit and furniture items while males named more tools. Older males and younger females named more four-footed animals than did their gender-matched peers. Participants with a college degree had a significant advantage for clothing when compared to those without a degree.

 Capitani, et al., (1999) also found that males named more tools and females named more fruits. They reported that the effect of experience might have influenced the gender difference for the production of tools but indicated that this did not explain the superiority

of females for the production of fruits. They suggested that the one-minute time limit used might have affected their results. Given that a time limit was not imposed in the current study, the differences between genders for the production of items might be more accurate. It is reasonable to speculate that the age and gender differences noted in the present study might be related to sociological factors. It is likely that females have more daily interaction with fruits and furniture while males more frequently use tools. Older males might be more familiar with four-footed animals than younger males due to greater involvement in outdoor activities (e.g. hunting). Younger females may be more likely to encounter a large number of four-footed animals given their increased interaction with young children (i.e. TV/movies/books) when compared to older females. The effect of education on the production of articles of clothing is not as easily explained based on sociological factors. Given that an effect of education was only observed for one of the eight categories, use of more effective lexical retrieval strategies based on level of education seems unlikely. It is possible that individuals with a college degree have greater income levels that afford more opportunities to experience a range of activities involving different types of clothing. Since information related to income levels of participants was not collected, this cannot be confirmed.

Coppens and Frisinger (2005) reported a category effect for their two elderly groups on a confrontation naming task (greater difficulty noted for living than artifact items). Given that a category effect was not found in the present study, it is possible that the lexical retrieval skills used for the semantic fluency task did not elicit the same finding. Further study of individuals completing both confrontation naming and semantic fluency tasks for living and artifact items would be of interest to explore impact of task on the category effect.

References

Battig, W.F., & Montague, W.E., (1969). Category norms for verbal items in 56 categories: A replication and extension of the Connecticut category norms. *Journal of Experimental Psychology Monograph, 80 (3, part 2).*

Brown, L., Sherbenou, R.J., & Johnsen, S.K. (1997). *Test of Nonverbal Intelligence (3rd Ed.).* Austin, TX: Pro-Ed.

Bunn, E.M., Tyler, L.K., & Moss, H.E. (1998). Category-specific semantic deficits: The role of familiarity and property type reexamined. *Neuropsychology, 12*, 367-379.

Capitani, E., Laiacona, M., & Barbarotto, R. (1999). Gender affects word retrieval of certain categories in semantic fluency tasks. *Cortex, 35*, 273-278.

Coppens, P, & Frisinger, D. (2005). Category-specific naming effect in non-brain-damaged individuals. *Brain and Language, 94*, 61-71.

Farah, M.J., McMullen, P.A., & Meyer, M.M. (1991). Can recognition of living things be selectively impaired? *Neuropsychologia, 29*, 185-193.

Laiacona, M., Barbarotto, R., & Capitani, E. (1998). Semantic category dissociations in naming: is there a gender effect in Alzheimer's disease? *Neuropsychologia, 36*, 407-419.

Laws, K.R., (1999). Gender affects naming latencies for living and nonliving things: Implications for familiarity. *Cortex, 35*, 729-733.

Table 1
Participant Characteristics

Group	N	Mean Age	Mean Years of Education	<16 years Education	≥ 16 years Education	Mean TONI-3 score
Young Females	15	34.3	16.1	5	10	77.9
Young Males	15	34.7	15.5	5	10	73.9
Older Females	15	62.9	15.6	5	10	61.2
Older Males	15	62.7	16.0	5	10	68.3

Table 2
ANOVA Significant Effects

Source	SS	df	MS	F	η²	p
Clothing						
Education	750.00	1	750.00	4.46	.08	.040
Furniture						
Gender	364.01	1	364.01	5.02	.09	.029
Fruits						
Gender	190.01	1	190.01	5.75	.10	.020
Tools						
Gender	1491.08	1	1491.08	14.50	.22	<. 001
Four-Footed Animals						
Gender*Age	1274.01	1	1274.01	12.16	.19	.001

Table 3

Means and Standard Deviations for Categories with ANOVA Significant Effects

Dependent Variable	Group	Mean	Standard Deviation
Clothing	No college degree	26.15	2.90
	With college degree	33.65	2.05
Furniture	Females	26.30	1.65
	Males	21.08	1.65
Fruits	Females	22.58	1.11
	Males	18.80	1.11
Tools	Females	20.35	1.96
	Males	30.93	1.96
Four-Footed Animals	Older males	36.15	2.80
	Younger males	26.65	2.80
	Older females	32.30	2.80
	Younger females	22.25	2.80