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Naming Patterns in Typically Aging Adults

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INTRODUCTION

Naming consistently reveals an age-related word finding deficit. The task requires an individual to provide lexical information when presented with conceptual information. Stimuli directly activate semantic representations at the semantic network level, then indirectly activate the word name at the lexical level. Aging has not been found to adversely affect semantic memory; other reasons for age-related decline have been investigated, including breakdown in the access route from semantic representation to lexicon, with lexicon and semantic representation both remaining intact (i.e., transmission deficit hypothesis). Others have suggested that naming context may influence ability to retrieve words efficiently with age. That is, some contexts are easier than others: sentence completion is easier than confrontation naming, particularly for objects, and both tasks are easier than definition naming. However, influence of aging on this pattern has not been discerned.

Using descriptive analysis, Hough (1998) identified three distinct performance profiles in a group of typically aging adults on the *Test of Adolescent/Adult Word Finding* (*TAWF*) (German, 1990): 1) normal standard scores (SS) and performance across all subtests; 2) normal SS with specific impairment on Picture Naming: Nouns; and 3) abnormal SS with impaired performance on at least two subtests. The purpose of the current investigation was to confirm these descriptive results in a group of non-neurologically-impaired older adults. Cluster analysis with k-means procedure was used for confirmation of naming patterns on the *TAWF*.

MATERIALS & METHODS

Fifty adults (25M, 25F) between 54 and 75 participated. All: passed a modified pure-tone hearing screening for older adults; had normal or corrected visual acuity; were native English speakers; and right-handed. There was no known history of neurological insult, head injury, psychiatric disturbance, alcoholism/substance abuse, or learning disability/special education placement for any participant. All received the *Mini-Mental Status Examination* (*MMSE*) with no participant scoring < 27 (Table 1). All had normal scores on the *Peabody Picture Vocabulary Test-Revised* (*PPVT-R*) and *Western Aphasia Battery* (*WAB*) (Table 2).

The *Test of Adolescent/Adult Word Finding* (*TAWF*) was administered to all participants. It is a standardized test for examining word retrieval skills in adults, with six subtests: Picture Naming: Nouns, Sentence Completion, Descriptive Naming, Picture Naming: Verbs, Category Naming, and Comprehension. The test was administered/scored according to test procedures.

RESULTS

Overall *TAWF* results (standard scores (SS), mean accuracy percentage) are in Table 2. Hierarchical cluster analysis (HCA) (Ward's cluster method, Squared Euclidean Distance) was performed on these data to confirm presence of subgroups identified by Hough (1998; 2007) (Table 3). HCA partitioned the sample into two groups (36 and 14 participants), differentiating between individuals scoring within/below normal, respectively, and confirming *TAWF* performance, except one participant scoring below normal but clustered into the normal group. Box plots representing group subtest performance scoring above/below normal are in Figures 1 and 2, respectively. A third cluster revealed two distinct subgroups within the sample scoring within normal. Analysis revealed no performance differentials between subtests for one subgroup; however, HCA revealed that participants in the second normal sub-cluster demonstrated specific impairment on Picture Naming: Nouns, with normal performance on other subtests. Thus, HCA partitioned the sample into three distinct groups.

The three subgroups were originally identified by Hough (1998; 2007) via SS and each participant's subtest performance relative to the overall *TAWF* grand mean accuracy percentage (85.1) and one standard deviation below this mean (73.4) (Tables 4, 5, 6). This information, in addition to SS and HCA, confirmed the three *TAWF* patterns. Group One: participants having normal SS and normal accuracy percentages for all subtests (Figure 3). Group Two: participants having normal SS but selective impairment on Picture Naming: Nouns. Mean accuracy percentage on this subtest was greater than one standard deviation below overall *TAWF* grand mean for all participants (Figure 4). Group Three: individuals with SS below normal. Participants exhibited abnormal scores on Picture Naming: Nouns and at least one other subtest (Category Naming) relative to overall *TAWF* grand mean.

A k-means procedure, performed to corroborate findings based on the HCA and mean percentage data, substantiated the HCA, differentiating between the same groups of individuals performing within/below normal. The k-means procedure partitioned the sample into 3 clusters: 27, 9, and 14 participants were designated to Groups One, Two, and Three, respectively, except one participant displaced from Group Three to Group Two from the original analysis (Hough, 2007).

Pearson Product-Moment Correlations between age, gender, education, *PPVT-R* SS, *TAWF* SS and accuracy percentage revealed significant positive correlations between *PPVT-R* and both *TAWF* scores (SS: r = .885; p<.0001; accuracy percentage: r = .758; p<.0001).

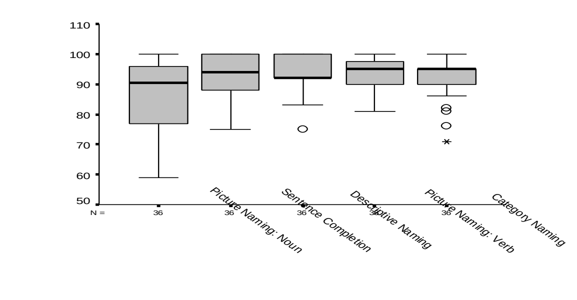

Figure 1: Box plot representing range, upper and lower quartiles, and median scores for participants with standard scores within normal limits on *TAWF*.

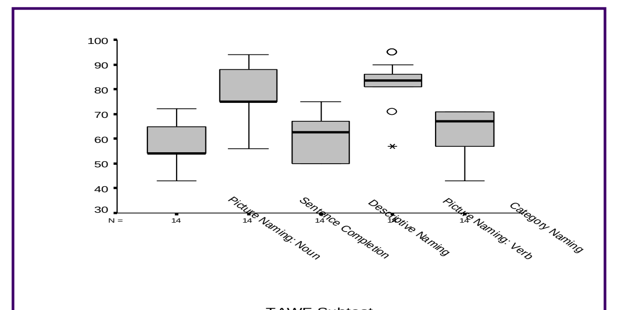

Figure 2: Box plot representing range, upper and lower quartiles, and median scores for participants with abnormal standard scores on *TAWF* (Group Three).

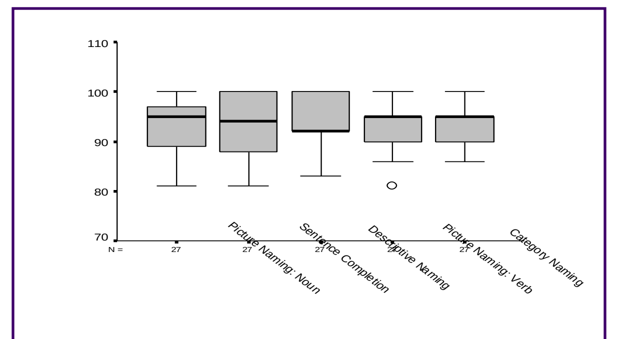

Figure 3: Box plot representing range, upper and lower quartiles, and median scores for the first cluster of participants with standard scores within normal limits on *TAWF* (Group One).

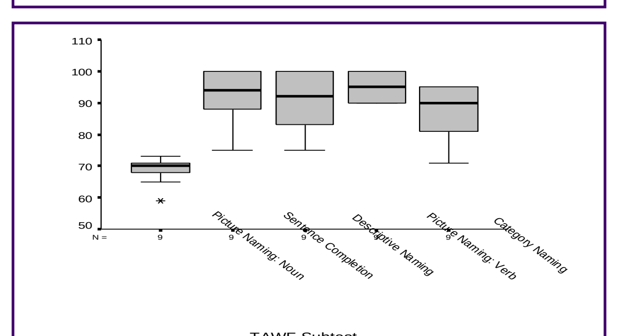

Figure 4: Box plot representing range, upper and lower quartiles, and median scores for the second cluster of participants with standard scores within normal limits on *TAWF* but selective impairment on one subtest (Picture Naming: Nouns) (Group Two).

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  C A S E      0         5        10        15        20        25
  Label  Num  +---------+---------+---------+---------+---------+
        6   òø
       41   òú
       17   òú
       19   òú
       16   òú
       20   òú
       35   òú
       50   òú
        2   òôòø
       14   òú ó
       15   òú ó
        5   òú ó
       12   òú ó
       34   ò÷ ó
       18   òø ùòòòø
       47   òú ó   ó
       37   òú ó   ó
        7   òú ó   ó
       36   òú ó   ó
       22   òú ó   ó
        3   òú ó   ó
       32   òôò÷   ó
       42   òú     ùòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòø
        4   òú     ó                                       ó
       13   òú     ó                                       ó
       43   òú     ó                                       ó
       44   ò÷     ó                                       ó
       11   òø     ó                                       ó
       23   òú     ó                                       ó
        1   òú     ó                                       ó
       21   òú     ó                                       ó
       38   òôòòòòò÷                                       ó
       48   òú                                             ó
        8   òú                                             ó
       40   òú                                             ó
       28   ò÷                                             ó
       30   òø                                             ó
       31   òú                                             ó
       27   òôòø                                           ó
       49   òú ó                                           ó
       24   ò÷ ó                                           ó
       25   òø ùòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòòò÷
       39   òú ó
       46   òôòú
       29   ò÷ ó
       33   òø ó
       45   òú ó
        9   òôò÷
       26   òú
       10   ò÷
```

Table 3. Hierarchical Cluster Analysis Using Ward's Cluster Method for Identification of Subgroups Based on *TAWF* Standard Scores

	Age	Education	*MMSE*
Mean	63.8	12.1	29.1
S.D.	5.7	2.8	1.6
Range	54-75	4-18	27-30
Gender	25 Males	25 Females	

Table 1: Participant Characteristics Including Gender and Means, Standard Deviations and Ranges for Age, Educational Level, and *Mini-Mental Status Examination* (*MMSE*)

	PPVT-R	*WAB*	*TAWF* SS	*TAWF* Mean
Mean	101.9	97.2	98.7	85.1*
S.D.	10.4	2.2	19.6	11.7
Range	88-125	93.9-100	70-157	60-100

Table 2: *Peabody Picture Vocabulary Test-Revised* Standard Scores, *Western Aphasia Battery* Cortical Quotients, and *Test of Adolescent/Adult Word Finding (TAWF)* Standard Scores and Mean Accuracy Percentage across subtests.
*Overall grand mean

Participants	SS	Mean	Picture Naming: Nouns	Sentence Completion	Descriptive Naming	Picture Naming: Verbs	Category Naming
2	111	95.8*	97	100	92	95	95
3	95	91.8	89	94	100	90	86
4	105	89.8	92	81	100	90	86
5	104	94.4	95	100	92	95	90
6	111	96.2	97	94	100	95	95
7	109	91.4	95	94	92	86	90
12	113	95.6	84	94	100	100	100
13	102	89.2	81	88	92	90	95
14	116	94.8	92	100	92	95	95
15	123	96.4	95	100	92	95	100
16	146	99	100	100	100	100	95
17	157	100	100	100	100	100	100
18	105	89.6	92	88	92	86	90
19	135	99	95	100	100	100	100
20	128	97.4	97	100	100	95	95
22	93	89.2	89	94	83	90	90
32	102	89.4	89	81	92	95	90
34	113	95.4	89	88	100	100	100
35	100	95.2	100	94	92	95	95
36	102	90.2	89	94	92	81	95
37	109	91.4	92	88	92	90	95
41	111	96.2	97	94	100	95	95
42	105	89.6	95	81	92	90	90
43	102	89	84	88	92	86	95
44	100	87.8	81	81	92	95	90
47	109	91.4	97	88	92	90	90
50	123	96.2	100	94	92	100	95
Mean:	112.2	93.4	92.7	92.5	95.0	93.3	93.8
S.D.:	14.9	3.6	5.6	6.6	3.9	5.1	4.1
Rg:	93-157	87.8-100	81-100	81-100	83-100	81-100	86-100

*Mean percentage of accuracy across all subtests

Table 4: Mean Percentage of Accuracy on *TAWF* Subtests for Group One: Participants with Normal Word Retrieval Scores

DISCUSSION

Results confirmed presence of three distinct patterns of performance on the *TAWF* identified by Hough (1998; 2007) with non-neurologically-impaired adults: 1) normal SS and performance across subtests (54%); 2) normal SS with impairment on Picture Naming: Nouns (18%); and 3) abnormal SS with impairment on two subtests (Picture Naming: Nouns, Category Naming) (28%). Word retrieval patterns of these groups may represent variances in naming among typically aging adults. Performance variability between individuals increases with advancing age on naming. However, significant relationships were not observed between age and *TAWF* or *PPVT-R*.

Group Two and Three subtest patterns revealed lowest and highest performance on Picture Naming: Nouns and Verbs, respectively. Object picture naming is the easiest naming task for normally developing children. Picture naming declines with age regardless of naming objects or actions; others have found decline in noun naming with inconclusive verb findings. Better performance on Verbs than Nouns may relate to increased verb usage with age. Verbs do not involve as much specificity as needed for nouns. Increased noun specificity requires more interaction between semantic representation and the lexicon during noun production. As one ages, this interaction may be less accessible or disrupted by a transmission deficit.

Variables and predictors have been examined for identifying neurologically healthy individuals at risk for cognitive decline including naming impairments. Current *TAWF* findings should be considered relative to identified predictors of decline or successful aging.

Participants	SS	Mean	Picture Naming: Nouns	Sentence Completion	Descriptive Naming	Picture Naming: Verbs	Category Naming
1	90	87.6*	73	100	83	100	82
8	109	89	68	100	92	90	95
11	95	85.6	71	94	92	95	76
23	98	89	70	94	100	100	81
28	95	83.8	59	100	75	90	95
38	93	88.6	65	88	100	95	95
40	90	85	68	75	92	95	95
48	90	87.6	70	88	100	90	90
Mean:	95	87.0	68	92.4	91.8	94.3	88.6
S.D.:	6.4	2.0	4.3	8.6	9.0	4.2	7.8
Rg:	90-109	83.8-89	59-73	75-100	75-100	90-100	76-95

*Mean percentage of accuracy across all subtests

Table 5: Mean percentage of accuracy on *TAWF* subtests for Group Two: Participants with a selective word retrieval impairment

Participants	SS	Mean	Picture Naming: Nouns	Sentence Completion	Descriptive Naming	Picture Naming: Verbs	Category Naming
1	90	87.6*	73	100	83	100	82
8	109	89	68	100	92	90	95
11	95	85.6	71	94	92	95	76
23	98	89	70	94	100	100	81
28	95	83.8	59	100	75	90	95
38	93	88.6	65	88	100	95	95
40	90	85	68	75	92	95	95
48	90	87.6	70	88	100	90	90
Mean:	95	87.0	68	92.4	91.8	94.3	88.6
S.D.:	6.4	2.0	4.3	8.6	9.0	4.2	7.8
Rg:	90-109	83.8-89	59-73	75-100	75-100	90-100	76-95

*Mean percentage of accuracy across all subtests

Table 5: Mean percentage of accuracy on *TAWF* subtests for Group Two: Participants with a selective word retrieval impairment