

Running Head: HOMOPHONE NORMS

*Behavior Research Methods, Instruments, and Computers*, 36, 408-420

Free Associations and Dominance Ratings of Homophones for Young and Older Adults

Katherine K. White and Lise Abrams

University of Florida

Please address correspondence to:  
Katherine White, Ph.D.  
College of Charleston  
Department of Psychology  
58 Coming Street  
Charleston, SC 29424

Phone: 352-219-3264  
Email: [kkwhite03@yahoo.com](mailto:kkwhite03@yahoo.com)

## Abstract

Homophones are words that share phonology but differ in meaning and spelling (e.g., beach, beech). This paper presents the results of normative surveys that asked young and older adults to free associate to and rate the dominance of 197 homophones. Although norms exist for young adults on word familiarity and frequency for homophones, these results supplement the literature by (1) reporting the four most frequent responses to visually presented homophones for both young and older adults, and (2) reporting young and older adults' ratings of homophone dominance. Results indicated that young and older adults gave the same first response to 67% of the homophones and rated homophone dominance similarly on 60% of the homophone sets. These results identify a subset of homophones that are preferable for research with young and older adults because of age-related equivalence in free association and dominance ratings.

## Free Associations and Dominance Ratings of Homophones for Young and Older Adults

Ambiguous words have been used in cognitive research to investigate the relative influence of phonology, orthography, and semantics during word recognition and retrieval, with or without context (e.g., Gottlob, Goldinger, Stone, & Van Orden, 1999; Lesch & Pollatsek, 1993; Lukatela & Turvey, 1994; Simpson, 1984; Van Orden, 1987; Vu, Kellas, & Paul, 1998; White & Abrams, 2004). Ambiguous words in these studies include homophones, homographs, and homonyms, or words that share some combination of phonology and/or orthography, but have different meanings associated with them. Although the definitions that are associated with the three different types of ambiguous words are often used interchangeably, this paper uses Webster's definitions (Mish, 1991): Homophones (e.g., *beach*, *beech*) are two words that share the same sound (phonology), but differ in spelling (orthography) and meaning (semantics). Homographs (e.g., *dove* as in "a bird" or "past tense of dive") differ in phonology and semantics, but share orthography. Homonyms share both phonology and orthography, but have multiple meanings (e.g., *ball* as in "a round object often used in sports" or "a fancy dance affair"). A variety of normative studies have provided association norms for homonyms in order to determine which associative meaning is more dominant (e.g., Gorfein, Viviani, & Leddo, 1982; Nelson, McEvoy, Walling, & Wheeler, 1980; Twilley, Dixon, Taylor, & Clark, 1994). These studies ask participants to provide the first word that comes to mind (i.e., to free associate) when they hear or see a word. Participants' responses are then categorized into the most common meanings given (e.g., the primary [i.e., dominant] and secondary [i.e., subordinate] meanings for *ball* are *bat* and *dance*, respectively [Twilley et al., 1994]). Thus, researchers have a variety of norms to access when interested in using homonyms as stimuli.

In contrast to homonyms, few normative studies exist for either homographs or homophones, and therefore the present studies fill a gap in the literature by presenting homophone norms. With homonyms, free associations provide information both on the strongest associations to a homonym and on which meaning of the homonym is dominant (via the first association to the homonym, e.g., responding “soccer” for *ball* indicates that the “round object” meaning of *ball* is dominant). With homophones, however, free associations and dominance ratings must be assessed separately, which no study has done. That is, unlike homonyms that are represented by one word (e.g., *ball*), homophones include two or more words (e.g., *beach*, *beech*), both of which must be separately free associated to.

Existing normative studies of homophones differ, both in their purposes and from the studies presented here. Kreuz (1987) asked college students to subjectively rate 828 homophones for their familiarity (from very common to very uncommon), and later experimentally compared the familiarity ratings to Kucera and Francis’ (1967) frequencies. Kreuz found that although familiarity and frequency ratings were highly correlated, familiarity ratings were better predictors of word recognition latencies. In contrast to familiarity ratings for each homophone, the present study asked participants to choose the more dominant member of a homophone set. Olson and Kausler (1971) obtained college students’ ratings of the orthographic distinctiveness of 139 homophones (i.e., how unique the orthography was between two homophones within a set, e.g., *you* and *ewe* versus *seam* and *seem*), and therefore differs substantially from the dominance and free association norms presented here. Only one published study has asked participants to free associate to homophones: Galbraith and Taschman (1969) presented homophones orally and asked college students to spell the homophone they heard and then to free associate to it. However, their article does not provide the associations, possibly because the

authors were more interested in which word within each homophone set would be spelled and associated to (a measure of dominance), and also because free associations were obtained from only one homophone within a set. Furthermore, Galbraith and Taschman (1969) elicited dominance via auditory presentation of homophones, whereas our study used visual presentation. In an attempt to gather a more complete set of norms for homophones, this paper presents both free association and dominance norms for 96 homophone sets (197 total words) from a large sample of both young and older adults.

Our decision to include both young and older adults in these studies was straightforward: There are no published homophone free association or dominance norms for older adults. Rather, researchers using ambiguous words as a measure to compare processes and performance between young and older adults have referred to norms based on young adults' estimates (e.g., Davis et al., 1990; Rose et al., 1986). For example, Davis et al. (1990) and Rose et al. (1986) examined priming via homophone spelling tests in young and older adults, but they used dominance estimates for the homophones from a pool of younger adults (Galbraith & Taschman, 1969). These studies assume that two cohorts separated by at least 40 years have identical dominance estimates for different meanings of ambiguous words, which is not necessarily true. For example, *genes* might be the more dominant representation of the phonology /jēnz/ for older adults who are more likely to be dealing with health and disease issues in later life; young adults might think of *jeans* because *jeans* are an article of clothing often worn by younger generations. As suggested elsewhere (Bowles & Poon, 1982), investigations of potential age differences in semantic processes should equate age groups on verbal skills. Although it may not always be possible to equate young and older adults on dominance, researchers can control for it by using normative estimates.

Unlike dominance, word frequency estimates by young adults exist for homophones (e.g., Kucera & Francis, 1967) and are a critical issue in research on language and memory because a word's frequency can influence factors such as speed of access to a word's representation (e.g., a high-frequency word is accessed faster than a low-frequency word, Forster & Chambers, 1973). The most popular reference for word frequency estimates is Kucera and Francis (1967), who calculated a word's frequency by how often it appeared in print per one million words (but see also Baayen, Piepenbrock, & van Rijn, 1993; Brown, 1984; Carroll, Davies, & Richman, 1971; Dahl, 1979; Lund & Burgess, 1996; MetaMetrics, Inc., 2003; Thorndike & Lorge, 1944; Zeno, Ivens, Millard, & Duvvuri, 1995). We argue that dominance is an additional variable that is relevant to homophones because dominance may play a role in how quickly a homophone is accessed. Although a homophone's dominance is often closely related to its frequency, sometimes two homophones can have similar frequencies while one homophone is thought of as the dominant one (e.g., *ail* and *ale* have similar Kucera and Francis (1967) frequencies of 0 and 1 words per million, but *ale* is considered dominant). Furthermore, Kruez's (1987) finding that familiarity was a better measure of word recognition than word frequency demonstrates that multiple word characteristics are important to consider or to control for when conducting language research.

In summary, previous normative studies of ambiguous words focused mainly on homonyms, and those studies that used homophones either did not assess or did not report the homophone's strongest associations. Furthermore, none of the studies included norms for older adults. The studies conducted here supplement prior normative studies by presenting the most frequently reported associations for 197 homophones and by including an assessment of homophone dominance, which can be used in comparison with frequency estimates. In addition,

we included both young and older adults to provide researchers with normative stimuli that can be used for cognitive aging studies. Study 1 presents the results of a free association survey where a total of 440 young and older adults were asked to read ambiguous words and to respond to each word with the first word that came to mind (e.g., what is the first word that comes to mind when you read the word *beach*?). Study 2 presents the results of a corresponding dominance survey where the same 440 participants were asked to circle the individual word within each homophone set that they considered to be dominant. Because a larger sample of participants could be obtained through a mailing of the written survey, a written (visual) dominance survey was used (in contrast to auditory [oral] presentation of homophones; see Study 2 Method).

### Study 1: Free Associations

#### Method

*Participants.* Two hundred and twenty young adults between the ages of 17 and 25 ( $M = 19.72$  years,  $SD = 2.30$ ; 150 females, 70 males, with one participant not her reporting age) and 220 older adults between the ages of 62 and 91 ( $M = 73.49$ ,  $SD = 6.86$ ; 111 females, 106 males, 3 unknown, with five participants not reporting ages) completed the surveys. Young adults were recruited from Introductory and Cognitive Psychology courses at the University of Florida and participated for extra credit or partial fulfillment of course credit. Older adults were taken from the Cognition and Aging Lab Participant Pool, a pool that consists of older adults in the Gainesville community who were recruited from the University of Florida Alumni Association, local organizations, and churches. The majority of young and older adults reported English as their native language. Out of the 219 young adults who reported a native language, 92% reported English as that language, with 4% reporting Spanish and 4% reporting some other language. Out

of the 199 older adults who reported a native language, 98% reported English, <1% (1 person) reported Spanish, and <2% (3 people) reported some other language. Young adults had fewer years of education (range = 11-17 years,  $M = 13.95$ ,  $SD = 1.27$ ) than older adults (range = 12-26 years,  $M = 17.23$ ,  $SD = 2.59$ ),  $t(396) = 15.70$ ,  $p < .001$ .

*Materials.* The free association survey included a list of 96 sets of homophones, with 91 homophone pairs and 5 homophone triplets, totaling 197 homophones (one homophone, *cite*, in the *site/sight/cite* triplet was inadvertently left off of the survey, thus making *sight/site* count as a pair instead of a triplet). Homophones were chosen from previous normative studies of homophones (Galbraith & Taschman, 1969; Kreuz, 1987; Olson & Kausler, 1971)<sup>1</sup>. The words were randomly assigned a position (1-197) on the list, with the stipulation that homophones within a set (e.g., *beach/beechn*) were separated by at least 10 other words. Two survey forms were constructed such that one-half of the forms listed one member of a homophone set first and the other half of the forms listed the other member of the homophone set first (for sets with three homophones, two different orderings of the three words were made).

*Procedure.* Adults participating in the written surveys completed the free association survey first. The survey was preceded by a set of instructions informing participants that they would see a list of words and that each word would have a blank next to it. Participants were asked to read and to respond to each word with the first word that came to mind. Participants were also instructed to write "no response" if a response did not immediately and automatically come to mind. On average, a homophone was responded to by 214 older adults and 203 young adults. Two examples that were not included in the test list were provided in the instructions.

Results and Discussion

Results of the free association survey are presented in Tables 1 (young adults) and 2 (older adults). These tables list the homophone in bold font with the total number of participants who responded to that homophone in parentheses. In the columns that follow each homophone, the top four free associates, i.e., responses, for that homophone are listed and are followed in parentheses by the percent of time that response was given (if there was a tie for fourth response, then all responses with that percent are listed in the table). Homophones in Tables 1 and 2 are listed in alphabetical order by the homophone within a set that comes first in the alphabet (e.g., *you* is listed under “e” because it is paired with *ewe*).

Association response percentages were calculated by taking the number of similar responses given for a homophone and dividing it by the total number of responses for that homophone (e.g., out of the 154 young adults who responded to *ail*, “sick” was given by 44 of them). The percentages exclude “no response” responses (e.g., 154 out of 220 young adults gave a response to *ail* and therefore their percentages are calculated using 154 as the denominator). At least 2% of the participants had to give a response in order for that response to be included in Tables 1 and 2.

Responses in Tables 1 and 2 are grouped together if they share strong morphological overlap, including singular and plural forms of a word (e.g., *hill[s]*, *ox[en]*, *mice/mouse*) and present and past tenses (e.g., *owe[d]*, *catch/caught*). In addition, words that are semantically similar and share morphemes were grouped together (e.g., *sing/song*, *row[ing]*, *part[ial]s*). Because these norms will likely be used for research where semantic associations are the measure of interest, four types of responses that were considered not to be useful for this type of research were eliminated from the tables: (1) responses that were semantically associated with another homophone in the set (e.g., *beer* for *ail*) totaled 8% of young adults’ and 2% of older

adults' responses; (2) homophone responses (e.g., *ail* for *ale*) totaled 5% and 4% of young and older adults' responses, respectively; (3) regionally unique responses (e.g., *oaks* for *mall*, which refers to the *Oaks Mall* in Gainesville, Florida) were given by less than 1% of young adults and no older adults, and (4) responses that contained the homophone altered by a simple morphological prefix (e.g., [a]lone) or suffix (e.g., build[ing]) were given for less than 1% of young and older adults' responses. Even though these four types of responses are not listed in the tables, they are still included in the calculation of the total number of responses given for a homophone, as were responses that did not correspond to one of the top four associates.

Descriptive results from Tables 1 and 2 indicated that young and older adults gave the same first response for 66.5% of the homophones, indicating moderate consistency across age groups at least for the strongest associations to homophones. Even when young and older adults did not give the same first response, their top four responses contained at least one shared response between the age groups for 32.5% of the homophones. Indeed, only two homophones (*beech*, *hale*) did not have any overlapping responses between the age groups. Demonstrating this similarity in responses between age groups separated by at least 40 years illustrates the relative stability of norms over time. Furthermore, across all first responses, young (Median = 29;  $M = 33.05$ ,  $SD = 17.23$ ) and older (Median = 31;  $M = 36.79$ ,  $SD = 18.78$ ) adults had similar median and mean association strengths for their first responses. Finally, Figure 1 illustrates the frequency distribution for the number of first association responses for young and older adults. The figure is positively skewed for both young and older adults, suggesting that there was a good deal of variability in first responses within both age groups. For young adults, over one-half of the homophones had first responses that were only given by 11-30% of participants. A similar picture emerged older adults, although their mode was slightly shifted to the right.

Despite the similarity in responses for a large number of the homophones, young and older adults differed in their first responses for one-third of the 197 homophones. One possible explanation for this age-related variability is cohort differences. Certain associations are more available to one age group because of their life experiences; for example, young adults' most frequent associate to "idol" is "Billy", in reference to the rock singer in the 1980s, but that associate is never produced by older adults. Another explanation is vocabulary differences between the age groups. Older adults consistently perform better on vocabulary tests than young adults (e.g., Kemper & Sumner, 2001; Verhaeghen, 2003), suggesting that older adults are more likely to produce unique associations or associations that are unknown to young adults (see also Burke & Peters, 1986). For example, young adults never gave an appropriate associate to "hale", most likely because they did not know what the word meant. Although we did not measure vocabulary level in our sample, the older participants in this study have higher educations and are likely to have larger vocabularies.

## Study 2: Dominance

### Method

*Participants.* The same 220 young adults and 220 older adults that completed the free association survey also completed the dominance survey.

*Materials.* The dominance survey included the same 96 sets (pairs and triplets) of homophones as free association: 90 sets consisted of two homophone words (e.g., *beach, beech*) and six sets included three homophone words (e.g., *write, right, rite*) (note that in the written dominance survey *cite* was included in the homophone set *site/sight/cite*, making this set a triplet). Homophones within a set were typed on the same line, and sets were randomly assigned a position (1-96) on the list. In order to avoid ordering effects of homophones within a set, two

lists were made such that one member of each homophone set came first one half of the time and the other member came first the other half of the time (for sets with three homophones, two different orderings of the three words were made). The word “equal” was typed next to each homophone set to give participants the option of choosing “equal” if they thought that homophones in a set were equal in dominance (i.e., there was no obvious choice for dominant and subordinate).

*Procedure.* Participants completed the dominance survey after finishing the free association survey. A separate set of instructions defined "homophone" and gave participants an example of a homophone pair that was not included in the survey (*sale, sail*). Participants were told that they would see a list of homophone pairs and triplets and that they were to choose the individual word that they felt to be more dominant in the English language. The following definition was given for dominance: "The dominant word in each pair corresponds to the meaning you think of first upon hearing the word; you might think about the sound of the word and which spelling/meaning comes to mind first. It might be a word that you encounter often in reading, talking, watching television, or listening to the radio." The word "equal" was included in each homophone set and participants were instructed to circle "equal" in cases where they considered both (or all three) words to be equally dominant. One example was included to orient participants to the task prior to beginning the survey.

## Results and Discussion

Results of the dominance survey are presented in Tables 3-4. The first column of these tables lists the homophone (note that unlike free association Tables 1 and 2, we do not list the number of participants that responded to each homophone set because rarely did a homophone set get skipped and therefore the response rate was near 100%). The next column includes

Kucera and Francis' (1967) written frequency rating (KF-FREQ) for that homophone. Words that did not have a frequency assigned to them by Kucera and Francis were assigned a zero (0) frequency. The third and fourth columns contain the percent of time that young and older adults chose a homophone as dominant, respectively. Homophone sets are listed alphabetically by the homophone within each set that comes first in the alphabet (similar to alphabetical listing in the free association tables). Note that the percentages may not add to 100% because participants were allowed to rate homophones within a set as equal in dominance. In order to determine the percentage of "equal" dominance in any individual homophone set, the dominance percentages within a set can be summed and subtracted from 100% (e.g., 21% is the remainder after subtracting 59.5% for *aisle* and 19.5% for *isle* from 100%). On average, young and older adults rated 16.73% and 18.63% of the homophones within a set as equal in dominance, respectively.

Tables 3 and 4 report the mean percent of time a homophone was chosen as dominant, for young and older adults. However, the dominance results are grouped into two tables for ease of interpretation. Table 3 includes homophones within a set (e.g., *ail*, *ale*) that were consistently rated as dominant or subordinate by both young and older adults. We defined a homophone as dominant if it was rated as dominant at by at least 50% of the participants in both age groups. Table 3 uses bold font to indicate the dominant homophone in each set. Fifty-eight of the 96 homophone sets are included in Table 3, making 60% of these homophones preferable for language research with young and older adults. The mean percentages for homophones labeled as dominant and subordinate in Table 3 are reported at the bottom of Table 3 and were very similar across age groups.

In an attempt to identify the stimuli that young and older adults gave at least one strong, identical association to and rated consistently for dominance, we compared the association

responses for only those homophone sets that had an obviously dominant and subordinate homophone. The asterisks next to the homophones in Table 3 indicate those homophones (1) that were rated similarly in dominance by young and older adults, and (2) shared an association that was given by at least 29% of young adults and 31% of older adults. These percent cut-offs correspond to the median association strength for each age group; the median was chosen as a cut-off because of the positive skew in free association response percents.

Table 4 includes homophones that (1) did not contain a dominant homophone for at least one of the age groups (as identified above where a homophone had to be rated as dominant by no less than 50% of the participants), or (2) were inconsistently rated across age group (i.e., young adults rated one homophone in a set as dominant whereas older adults rated that same homophone as subordinate). As an example, *altar/alter* are included in Table 4 because older adults were equally likely to rate *altar* and *alter* as dominant, and young adults only slightly favored *alter*. Also, *scent* was favored as dominant by young adults, whereas *cent* was favored by older adults. Researchers are cautioned in using the homophones in Table 4 in research that involves age comparisons because these homophones evidenced disagreement between the young and older adults. However, some of the homophones that show strong dominance for young adults (e.g., *choral/coral*) would be useful for research that involves young adults only.

For the homophones in Tables 3 and 4, we conducted correlations between young and older adults' dominance ratings using the mean percent of time that a homophone was rated as dominant. In addition, correlations were calculated with word frequencies from Kucera and Francis (1967). Frequencies that exceeded three standard deviations from the mean frequency within a table were excluded from the correlations. For the correlations that included the

homophones in Table 3, the homophone *in* was excluded because of its outlying frequency. The correlations that included homophones in Table 4 excluded the homophone *one*.

Correlating young and older adults' dominance ratings for the homophones in Table 3 illustrated an exceedingly high degree of consistency across age group,  $r(119) = .96, p < .001$ . The significant correlations across age group support our claim that dominance ratings for these homophones are fairly consistent between young and older adults. Furthermore, Kucera and Francis frequencies were correlated with both young adults' ( $r[118] = .31, p < .001$ ) and older adults' ( $r[198] = .32, p < .001$ ) dominance ratings. These findings are consistent with and similar to Kruez's (1987) finding of a correlation between familiarity and frequency.

Unlike the correlations reported for the homophones in Table 3, young and older adults were not correlated in their mean dominance ratings for the homophones reported in Table 4,  $r(79) = .11, p > .32$ . Furthermore, there were no significant correlations between frequency and the mean ratings for either young adults ( $r[79] = .01, p > .95$ ) or older adults ( $r[79] = .07, p > .52$ ). These findings support our choice to keep these homophones separate from those in Table 3: The homophones in Table 4 do not show consistent ratings across age group and do not have a strong dominant member within each set.

We conducted a final set of correlations to test whether people's free associations related to their assessment of dominance. No significant correlations were found between the dominance percentages reported in Table 3 and the first association response percentages reported in Tables 1 and 2 for young or older adults, nor for dominant or subordinate homophones. For dominant homophones, the correlation between dominance percentage and first response percentage was .15 for young adults and .04 for older adults ( $ps > .27$ ). For subordinate homophones, the

correlations were .00 and -.03 for young and older adults, respectively ( $ps > .80$ ). Thus, dominance is independent of the association given for the homophone.

### General Discussion

The normative data presented here indicated that free association responses and dominance ratings of homophones showed some consistency between young and older adults, indicated by first association agreement for over two-thirds of the homophones and dominance agreement for over one-half of the homophones. This intermediate consistency is generally consistent with other studies of semantic associations, where age differences sometimes emerge and other times do not, depending on variables such as participant vocabulary and word frequency (Burke & Peters, 1986; Lovelace & Cooley, 1982; Perlmutter, 1978, 1979; Riegel & Riegel, 1964; Scialfa & Margolis, 1986). Prior to demonstrating both age differences and similarities in the present study, researchers were vulnerable to using homophones that had not been normed across age groups, and only tentative conclusions could be drawn about age-related differences because age effects could be attributed to different associations or dominance representations for the homophones. The data reported here indicate that researchers need to be aware of potential age-related differences that may occur from differences in access to meaning for phonologically ambiguous words.<sup>2</sup>

Researchers interested in using homophones in studies of semantic association should find the results of Tables 1 and 2 useful, whether the studies only use young adults or compare age groups. The homophones that were responded to with similar associations from young and older adults offer many promising word stimuli for future research. In fact, only two of the 197 homophones did not have at least one overlapping response by young and older adults. The results of the free association survey should also inform research that is interested in the strength

of associations to homophones; even within first responses, the response rate ranged from 2.5% to 92.8% for young adults and from 5.1% to 91.3% for older adults, suggesting that first responses are not always strong associates.

The results of the dominance survey revealed slightly less consistency across age groups, offering 58 homophone sets that were rated similarly by both age groups. These results might explain conflicting age-related results from priming studies that used homophone frequency estimates rather than age-normed dominance estimates (Davis et al., 1990; Howard, 1988; Rose et al., 1986). Future research that includes young and older adult cohorts and utilizes homophone dominance should use homophones reported in Table 3. Furthermore, researchers might use the homophones in Table 4 if studying only one age cohort. However, because of the problems with homophones listed in Table 4, we do not suggest using these homophone sets if researchers are interested in equating young and older adults on homophone dominance.

Although the data reported here serve to fill a gap in the literature with respect to age-normed homophones, additional normative studies are needed to more precisely specify the independent contributions of frequency and dominance in influencing word retrieval. Given the age differences reported for homophones, age norms are also needed for other ambiguous words (i.e., homonyms and homographs) that are so frequently used in lexical research. Additionally, the homophone studies reported here could be supplemented with studies that ask participants to free associate to and rate the dominance of auditory-presented homophones. Auditory-presented homophones might lend themselves to a more automatic response of the first word that comes to mind (particularly if response times are recorded), and would be comparable to previous norms reported for young adults (e.g., Galbraith & Taschman, 1969), as well as the norms reported here.

In summary, the norms presented in this paper will hopefully lead to more carefully controlled studies investigating lexical ambiguity, word retrieval and recognition, and semantic processes with young and older adults. Because homophones share phonology but differ in semantics and orthography, they are unique research tools that can be used to better understand the interaction of these three variables in language production and comprehension. Homophones can also be used to examine age-related differences in access to phonology, orthography, and semantics, research that is still in its infancy (e.g., Taylor & Burke, 2002; White & Abrams, 2004).

## References

- Baayen, R. H., Piepenbrock, R., & van Rijn, H. (1993). *The CELEX lexical database*. Philadelphia, PA: Linguistic Data Consortium, University of Pennsylvania.
- Bowles, N. L., & Poon, L. W. (1982). An analysis of the effect of aging on recognition memory. *Journal of Gerontology, 37*, 212-219.
- Brown, G. D. A. (1984). A frequency count of 190,000 words in the London-Lund corpus of English conversation. *Behavior Research Methods, Instruments, & Computers, 16*, 502-532.
- Burke, D. M., & Peters, L. (1986). Word associations in old age: Evidence for consistency in semantic encoding during adulthood. *Psychology and Aging, 1*, 283-292.
- Carroll, J. B., Davies, P., & Richman, B. (1971). *The American Heritage word frequency book*. New York: American Heritage.
- Dahl, H. (1979). *Word frequencies of spoken American English*. Essex, CT: Verbatim.
- Davis, H. P., Cohen, A., Gandy, M., Columbo, P., VanDusseldorp, G., Simokle, N., & Romano, J. (1990). Lexical priming deficits as a function of age. *Behavioral Neuroscience, 104*, 288-297.
- Forster, K. L., & Chambers, S. M. (1973). Lexical access and naming time. *Journal of Verbal Learning and Verbal Behavior, 12*, 627-635.
- Galbraith, G. G. & Taschman, C. S. (1969). Homophone units: A normative and methodological investigation of the strength of component elements. *Journal of Verbal Learning and Verbal Behavior, 8*, 737-744.
- Gorfein, D. S., Viviani, J. M., & Leddo, J. (1982). Norms as a tool for the study of homography. *Memory & Cognition 10*, 503-509.

Gottlob, L. R., Goldinger, S. D., Stone, G. O., & Van Orden, G. C. (1999). Reading homographs: Orthographic, phonological, and semantic dynamics. *Journal of Experimental Psychology: Human Perception and Performance*, 25, 561-574.

Howard, D. V. (1988). Implicit and explicit assessment of cognitive aging. In M. L. Howe & C. J. Brainerd (Eds.), *Cognitive development in adulthood: Progress in cognitive development research* (pp. 3-37). New York: Springer Verlag.

Kemper, S., & Sumner, A. (2001). The structure of verbal abilities in young and older adults. *Psychology and Aging*, 16, 312-322.

Kreuz, R. J. (1987). The subjective familiarity of English homophones. *Memory & Cognition*, 15, 154-168.

Kucera, H., & Francis, W. N. (1967). Computational analysis of present-day American English. Providence, RI: Brown University Press.

Lesch, M. F., & Pollatsek, A. (1993). Automatic access of semantic information by phonological codes in visual word recognition. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 19, 285-294.

Lovelace, E. A., & Cooley, S. (1982). Free associations of older adults to single words and conceptually related word triads. *Journal of Gerontology*, 37, 432-437.

Lukatela, G., & Turvey, M. T. (1994). Visual lexical access is initially phonological: I. Evidence from associative priming by words, homophones, and pseudohomophones. *Journal of Experimental Psychology: General*, 123, 107-128.

Lund, K., & Burgess, C. (1996). Producing high-dimensional semantic spaces from lexical co-occurrence. *Behavior Research Methods, Instruments, & Computers*, 28, 203-208.

- MetaMetrics, Inc. (2003). *MetaMetrics word frequency counts* [Database]. Durham, NC: Author. (Available from MetaMetrics, Inc., Developers of the Lexile Framework, attention: A. Jackson Stenner, 2327 Englert Drive, Suite 300, Durham, NC 27713)
- Mish, F. C. (Ed.) (1991). *Webster's Ninth New Collegiate Dictionary*. Springfield, Massachusetts: Merriam-Webster Inc.
- Nelson, D. L., McEvoy, C. L., Walling, J. R., & Wheeler, J. W. (1980). The University of South Florida homograph norms. *Behavior Research Methods & Instrumentation*, *12*, 16-37.
- Olson, G. A., & Kausler, D. H. (1971). Orthographic distinctiveness of homonyms *Behavior Research Methods & Instrumentation*, *3*, 298-299.
- Perlmutter, M. (1978). What is memory aging the aging of? *Developmental Psychology*, *14*, 330-345.
- Perlmutter, M. (1979). Age differences in the consistency of adults' associative responses. *Experimental Aging Research*, *5*, 549-553.
- Riegel, K. F., & Riegel, R. M. (1964). Changes in associative behavior during later years of life: A cross-sectional analysis. *Vita Humana*, *7*, 1-32.
- Rose, T. L., Yesavage, J. A., Hill, R. D., & Bower, G. B. (1986). Priming effects and recognition memory in young and elderly adults. *Experimental Aging Research*, *12*, 31-37.
- Scialfa, C. T., & Margolis, R. B. (1986). Age differences in the commonality of free associations. *Experimental Aging Research*, *12*, 95-98.
- Simpson, G. B. (1984). Lexical ambiguity and its role in models of word recognition. *Psychological Bulletin*, *96*, 316-340.

Taylor, J. K., & Burke, D. M. (2002). Asymmetric aging effects on semantic and phonological processes: Naming in the picture-word interference task. *Psychology and Aging, 17*, 662-676.

Thorndike, E. L., & Lorge, I. (1944). *The teacher's word book of 30,000 words*. New York: Teacher's College, Columbia University.

Twilley, L. C., Dixon, P., Taylor, D., & Clark, K. (1994). University of Alberta norms of relative meaning frequency for 566 homographs. *Memory & Cognition, 22*, 111-126.

Van Orden, G. C. (1987). A ROWS is a ROSE: Spelling, sound, and reading. *Memory and Cognition, 15*, 181-198.

Verhaeghen, P. (2003). Aging and vocabulary scores: A meta-analysis. *Psychology and Aging, 18*, 332-339.

Vu, H., Kellas, G., & Paul, S. T. (1998). Sources of sentence constraint on lexical ambiguity resolution. *Memory and Cognition, 26*, 979-1001.

White, K. K., & Abrams, L. (2004). Phonological priming of preexisting and new associations in young and older adults. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 30*, 645-655.

Zeno, S. M., Ivens, S. H., Millard, R. T., & Duvvuri, R. (1995). *The educator's word frequency guide*. Brewster, NY: Touchstone Applied Science.

## ARCHIVED MATERIALS

The following materials and links may be accessed through the Psychonomic Society's Norms, Stimuli, and Data archive, <http://www.psychonomic.org/archive/>. To access these files or links, search the archive for this article using the journal (*Behavior Research Methods, Instruments, and Computers*), the first author's name (*White*) and the publication year (*2004*).

**FILE:** whiteabrams-BRMIC-2004.zip **DESCRIPTION:** The compressed archive file contains one file: whiteabrams2004norms.xls, containing the norms developed by White and Abrams (2004), as a 101k file generated by Microsoft Excel. There are four worksheets in this file, one for each Table in the paper: (1) Table 1 – young adults' free association norms, (2) Table 2 – older adults' free association norms, (3) Table 3 – dominance norms with agreement across age group, and (4) Table 4 – dominance norms with no consistent agreement across age groups. Each row represents one homophone. Columns are labeled as follows. For Tables 1 and 2: Homophone, N (number of participants that gave an association response to that homophone), Response 1 (the response given by the most participants), Response 1% (the percentage of participants who gave that response). The remaining columns contain the additional responses for each homophone along with their percentage of response. For Tables 3 and 4, each row contains a homophone, its Kucera and Francis (1967) frequency, and the percentage of young and older adults who rated that homophone as dominant, respectively.

**AUTHOR'S EMAIL ADDRESS:** [whitek@cofc.edu](mailto:whitek@cofc.edu)

**AUTHOR'S WEB SITE:** <http://www.cofc.edu/~whitek/>

## Author Notes

A National Research Service Award from the National Institute of Mental Health, awarded to Katherine White as a predoctoral fellowship, supported portions of this research. We would like to thank Kristen Gregersen and Leila Tolaymat for assistance in data collection, as well as Judith Kroll and two anonymous reviewers for comments on an earlier version of this paper. Correspondence concerning this article should be sent to Katherine White, who is now at the College of Charleston, Department of Psychology, 66 George Street, Charleston, SC 29424, Email: [whitek@cofc.edu](mailto:whitek@cofc.edu), or Lise Abrams, Department of Psychology, University of Florida, Gainesville, FL 32611-2250, Email: [abrams@ufl.edu](mailto:abrams@ufl.edu).

## End Notes

<sup>1</sup>. These homophones were also verified for identical phonology in Webster's Ninth Collegiate Dictionary. However, a small number of homophones (e.g., click, clique) may differ in pronunciation across different dialects.

<sup>2</sup>. Although these data limit us to a discussion of between-group differences, potential inter-individual variability in responses suggests that researchers should try to use the first or second strongest associate when possible because these are the words that are given most often and by the most individuals. Inter-individual variability would likely increase with the weaker associates.

Table 1

*Results of the free association survey for young adults*

Homophone (N responses)	Most Frequent Response (%)	Response (%)	Response (%)	Response (%)	Response (%)	Response (%)
<b>ail</b> (154)	sick (28.6)	pain (9.7)	hurt (6.5)	ill (3.2)		
<b>ale</b> (202)	beer (47.0)	ginger (11.4)	drink (6.4)	steak (3.5)		
<b>aisle</b> (203)	church (18.2)	row(s) (10.4)	wedding (8.9)	grocery (7.4)		
<b>isle</b> (196)	island (23.4)					
<b>altar</b> (212)	church (33.1)	wedding (9.9)	boy (8.5)	marriage (8.5)		
<b>alter</b> (214)	change (36.5)	ego (6.5)				
<b>ant</b> (214)	eater (12.6)	bug (10.7)	small (10.3)	bite (7.9)		
<b>aunt</b> (212)	uncle (45.3)	relative (3.3)	family (2.4)	sister (2.4)		
<b>ate</b> (214)	food (41.6)	eat (7.9)	lunch (5.1)	dinner (4.7)	hungry (4.7)	
<b>eight</b> (209)	nine (36.9)	ball (11.5)	number (9.6)	seven (3.3)		
<b>bail</b> (201)	jail (46.3)	out (10.4)	money (8.0)	bond (5.0)		
<b>bale</b> (161)	hay (55.3)					
<b>beach</b> (218)	sand (45.4)	ocean (6.9)	water (6.4)	ball (4.1)		
<b>beech</b> (157)	nut (15.8)	tree (10.8)	wood (3.8)			
<b>bell</b> (211)	ring (46.5)	tower (6.6)	sound (3.3)	ding (2.9)		
<b>belle</b> (186)	beaut(y, iful) (23.0)	southern (10.7)	ball (7.5)	girl (3.8)		
<b>berry</b> (212)	blue (20.3)	fruit (13.3)	juice (8.4)	red (8.0)	straw(berry) (8.0)	
<b>bury</b> (202)	dead, death, die (23.3)	dig (7.9)	ground (6.4)	dirt (5.4)		
<b>billed</b> (187)	money (28.8)	duck (9.1)	pay, paid (8.6)	owe (3.7)		
<b>build</b> (207)	house (33.4)	construct (13.0)	block (5.8)	up (5.8)		
<b>bite</b> (217)	teeth (9.2)	me (6.9)	eat (6.5)	chew (5.5)	dog (5.5)	
<b>byte</b> (204)	computer (58.4)	mega (7.8)	giga (5.4)			
<b>blew</b> (212)	wind (17.9)	away (14.6)	nose (4.2)	out (4.2)		

<b>blue</b> (218)	sky (23.0)	green (11.9)	red (7.8)	color (6.0)		
<b>bold</b> (202)	beautiful (15.9)	daring (7.4)	brave (6.9)	dark (6.4)		
<b>bowled</b> (170)	ball (17.6)	pin(s) (10.6)	over (9.4)	strike (8.8)		
<b>brews</b> (210)	beer (66.3)	coffee (7.6)	witch(es) (3.9)	make(s) (3.4)		
<b>bruise</b> (215)	hurt (14.5)	blue (9.8)	purple (8.9)	pain (7.0)		
<b>brows</b> (198)	eye(s) (63.6)	pluck(ed) (6.1)	face (4.0)	wax(ed) (3.0)		
<b>browse</b> (211)	look (38.5)	shop (11.0)	internet (4.7)	store(s) (4.2)		
<b>carat</b> (208)	diamond (47.6)	gold (28.4)	ring (6.7)			
<b>carrot</b> (215)	orange (22.8)	cake (10.2)	rabbit (9.8)	vegetable (8.4)		
<b>cellar</b> (212)	wine (27.9)	basement (20.8)	door (8.1)	down (6.2)		
<b>seller</b> (198)	buy(er) (43.4)	book (4.0)	best (3.5)	goods (2.0)	merchant (2.0)	vender (2.0)
<b>cent</b> (218)	penny (31.2)	money (22.1)	dollar (15.1)	one (6.9)		
<b>scent</b> (209)	smell (38.3)	perfume (21.5)	woman, women (6.7)	good (4.3)		
<b>sent</b> (205)	mail(ed) (34.1)	letter(s) (10.3)	away (5.4)	package (4.4)		
<b>cereal</b> (215)	breakfast (14.5)	milk (12.6)	food (12.1)	box (5.6)		
<b>serial</b> (216)	killer (45.5)	number (36.6)	murder(er) (4.2)			
<b>choral</b> (194)	sing(er, ing) (26.8), song (11.3)	choir (6.2)	music (4.1)	group (2.1)		
<b>coral</b> (217)	reef (59.0)	sea (6.0)	ocean (3.2)	pink (2.8)		
<b>clause</b> (196)	Santa (33.2) <sup>a</sup>	sentence (9.2)	English (6.1)	pause (5.1)		
<b>claws</b> (212)	cat(s) (19.2)	bear(s) (17.3)	sharp (6.8)	paw(s) (6.4)		
<b>click</b> (201)	mouse (15.4)	clock (13.4)	pen (7.0)	remote (6.0)		
<b>clique</b> (188)	group (33.4)	friend(s) (9.0)	makeup (3.7)	school (3.7)	high school (3.7)	
<b>colonel</b> (196)	army (19.9)	Sanders (13.7)	Mustard (7.7)	chicken (6.6)		
<b>kernel</b> (216)	corn (51.0)	popcorn (34.8)				
<b>crews</b> (198)	ship(s) (21.2)	boat(s) (19.7)	row(ing) (8.5)	work(er) (6.1)		
<b>cruise</b> (220)	ship (41.9)	boat (18.2)	control (5.9)	Tom (5.0)		
<b>days</b> (218)	week(s) (34.9)	night(s) (28.9)	inn (4.6)	month(s) (3.7)	seven (3.7)	long (3.7)
<b>daze</b> (210)	confuse(d) (42.0)	stare (4.8)	daydream(ing) (4.4)	haze (4.3)		

<b>dear</b> (209)	letter (16.8)	John (9.6)	friend (8.2)	mom (7.2)	
<b>deer</b> (212)	doe (20.3)	animal (11.8)	antlers (6.7)	headlights (6.2)	
<b>dense</b> (208)	thick (21.7)	fog (8.2)	heavy (5.8)	stupid (5.8)	forest (4.8)
<b>dents</b> (201)	car (63.7)	teeth (6.0)	dentist (4.0)		
<b>doe</b> (214)	deer (60.3)	John (6.1)			
<b>dough</b> (214)	cookie (27.6)	bread (19.2)	boy (12.1)	nut (10.8)	
<b>dual</b> (205)	two (31.3)	both (3.9)	action (2.4)	mode (2.0)	
<b>duel</b> (209)	fight (35.9)	sword(s) (10.6)	gun(s) (5.8)		
<b>earn</b> (212)	money (60.8)	work (5.2)	wage(s) (4.7)	make (2.8)	
<b>urn</b> (200)	ash(es) (26.0)	dead, death (28.0)	vase (5.5)	churn (3.5)	
<b>ewe</b> (168)	sheep (23.2)	animal (11.9)	lamb (11.3)	deer (3.6)	
<b>you</b> (209)	me (76.1)	are (3.8)	I (3.3)		
<b>fairy</b> (217)	tale (37.0)	godmother (12.6)	tooth (7.8)	dust (5.5)	
<b>ferry</b> (213)	boat (71.4)	ride (2.8)			
<b>fir</b> (175)	tree (54.3)				
<b>fur</b> (216)	coat (35.6)	animal (13.5)	bear (7.6)	soft (6.0)	
<b>flea</b> (216)	dog (22.7)	tick (14.8)	bug (9.7)	bite (6.9)	
<b>flee</b> (211)	run (40.9)	leave (8.5)	escape (7.1)	away (6.6)	
<b>flew</b> (213)	bird (24.4)	(air)plane (18.3)	away (9.4)	over (5.2)	
<b>flu</b> (219)	sick (53.4)	cold (18.7)	shot (3.2)	bug (2.3)	
<b>flue</b> (135)	chimney (10.3)	glue (2.2)	fireplace (2.2)		
<b>gait</b> (152)	walk (29.6)	horse (6.6)	stride (3.9)	trot (3.9)	
<b>gate</b> (210)	open (20.0)	fence (13.4)	way (3.8)	entr(y, ance) (3.8)	door (3.8)
<b>genes</b> (217)	DNA (25.8)	genetic(s) (9.7)	parents (6.5)	chromosome (6.0)	
<b>jeans</b> (215)	blue (42.8)	pants (9.3)	wear (5.6)	denim (5.2)	
<b>gorilla</b> (215)	monkey (28.8)	ape (20.0)	animal (4.7)	banana (3.8)	
<b>guerrilla</b> (205)	war(fare) (51.2)				
<b>grays</b> (179)	hair (16.7)	color(s) (13.9)	white(s) (10.6)	blues (8.4)	
<b>graze</b> (208)	cow(s) (35.1)	grass (16.8)	eat (8.7)	cattle (7.7)	
<b>grisly</b> (200)	meat (2.5)	ugly (2.0)			
<b>grizzly</b> (219)	bear (92.8)				
<b>groan</b> (210)	moan (44.3)	pain (12.9)	noise (3.3)	hunt(ing) (2.4)	sex (2.4)

<b>grown</b> (210)	up (27.6)	tall (9.0)	big (7.7)	adult(s) (7.6)	
<b>hail</b> (206)	storm (18.9)	rain (12.1)	snow (9.2)	ice (9.2)	
<b>hale</b> (166)	[no appropriate responses]				
<b>hay</b> (211)	horse(s) (41.2)	stack (8.6)	bale (7.6)	farm (3.8)	
<b>hey</b> (211)	you (32.3)	hi (21.3)	hello (9.5)	there (5.2)	
<b>hear</b> (214)	ear(s) (21.9)	sound(s) (14.9)	listen (13.1)	noise (11.2)	
<b>here</b> (213)	there (48.4)	now (39.4)			
<b>hi</b> (217)	bye (43.3)	hello (19.8)	there (3.7)	goodbye (2.8)	
<b>high</b> (213)	low (39.0)	sky (3.8)	school (3.3)	heel(s) (3.2)	
<b>him</b> (215)	her (84.3)				
<b>hymn</b> (211)	song (38.9), sing (10.0)	church (25.5)	book (3.8)	prayer (2.4)	
<b>hole</b> (211)	ground (12.3)	golf (8.5)	in one (7.6)	dig (5.2)	
<b>whole</b> (209)	half (11.5)	thing (8.6)	all (8.6)	part (6.2)	
<b>idle</b> (204)	car (16.2)	hand(s) (8.4)	still (7.9)	slow (6.9)	
<b>idol</b> (201)	Billy (26.4)	worship (10.0)	god (6.0)	hero (4.0)	
<b>in</b> (216)	out (78.3)	side (2.3)			
<b>inn</b> (219)	hotel (44.4)	holiday (8.2)	motel (7.3)		
<b>knight</b> (216)	armor (36.1)	shining (8.4)	horse (7.9)	sword (6.0)	
<b>night</b> (220)	day (44.6)	dark (15.5)	time (6.4)	owl (4.5)	
<b>ladder</b> (210)	climb (36.2)	step(s) (9.5)	up (7.6)	tall (6.2)	
<b>latter</b> (194)	later (19.1)	former (10.3)	last (7.7)	before (6.2)	
<b>links</b> (207)	chain (28.0)	golf (10.6)	web(site) (8.2)	internet (7.2)	
<b>lynx</b> (171)	cat (38.6)	animal (12.3)			
<b>loan</b> (211)	money (59.8)	bank (10.5)	shark (7.1)	borrow (3.8)	
<b>lone</b> (197)	ranger (21.3)	star (13.7)	one (4.6)	wolf (3.6)	
<b>mail</b> (219)	letter(s) (19.5)	box (13.0)	envelope (4.2)	stamp (3.7)	
<b>male</b> (211)	female (73.0)	boy (4.3)	man (3.8)		
<b>main</b> (200)	street (32.0)	entrance (7.5)	center (2.5)	land (2.5)	stream (2.5)
<b>mane</b> (210)	horse (66.3)	hair (14.3)	lion (10.5)		
<b>maize</b> (189)	corn (61.3)	rice (2.1)			
<b>maze</b> (202)	lost (13.9)	mouse (11.4)	rat (11.4)	confus(ed, ing, ion) (7.0)	

<b>mall</b> (217)	shop(ping) (55.4)	clothes (9.2)	store(s) (7.8)	rat(s) (6.4)	
<b>maul</b> (167)	hurt (10.8)	bear (10.8)	dog (8.4)	attack (4.8)	
<b>might</b> (202)	maybe (21.8)	strength, strong (15.3)	not (7.4)	could (6.9)	
<b>mite</b> (192)	bug(s) (22.4)	flea(s) (5.7)	dust (5.2)	small (4.7)	tick (4.7)
<b>mind</b> (208)	brain (29.3)	think (9.2)	matter(s) (4.8)	body (4.3)	
<b>mined</b> (194)	gold (25.8)	coal (23.2)	ore (7.2)	diamond(s) (4.1)	
<b>naval</b> (211)	ship (10.5)	academy (9.4)	navy (4.3)	boat (3.3)	army (3.3)
<b>navel</b> (212)	belly (button) (37.3)	orange (20.3)	ring (6.1)	stomach (5.7)	
<b>nay</b> (194)	no (25.3)	yeah (9.3)	say(er) (6.2)	yes (2.6)	
<b>neigh</b> (177)	horse (60.4)				
<b>none</b> (197)	zero (15.7)	some (12.7)	all (10.2)	nothing (10.2)	
<b>nun</b> (206)	church (19.4)	priest (14.1)	black (13.6)	convent (4.4)	
<b>oh</b> (205)	no (30.2)	my (22.5)	yeah (3.4)	god (3.4)	
<b>owe</b> (210)	money (60.5)	debt (8.1)	pay (6.7)	borrow (3.8)	
<b>one</b> (212)	two (53.8)	time (4.7)	alone (4.7)	only (3.8)	
<b>won</b> (212)	lost (25.5), lose(r) (5.2)	prize (8.0)	game (6.6)	ton (5.2)	
<b>pail</b> (211)	bucket (38.4)	water (18.5)	sand (6.2)	beach (6.2)	
<b>pale</b> (212)	white (34.0)	skin (6.1)	sick (5.6)	ale (5.2)	
<b>pain</b> (209)	hurt (28.7)	ouch (10.6)	back (4.8)	ache (2.9)	neck (2.9)
<b>pane</b> (202)	window (68.3)	glass (9.9)			
<b>pair</b> (213)	two (33.8)	shoes (28.6)	socks (8.5)	couple (4.7)	
<b>pear</b> (212)	fruit (49.1)	apple (14.6)	shape(d) (3.8)	green (2.8)	tree (2.8)
<b>pare</b> (125)	fruit (12.6)	apple (8.0)	knife (6.4)	cut (3.2)	
<b>pause</b> (207)	stop (49.8)	wait (7.7)	play (4.8)	break (4.3)	
<b>paws</b> (216)	dog(s) (32.2)	cat(s) (19.9)	claws (4.2)	kitten (3.7)	
<b>peak</b> (210)	mountain (44.8)	top (9.1)	high (3.3)	performance (2.4)	
<b>peek</b> (205)	a boo (21.0)	look (18.0)	see (6.4)	sneak(y) (4.9)	
<b>peer</b> (211)	friend(s) (26.1)	look (14.2)	pressure (8.1)	group (5.7)	
<b>pier</b> (208)	dock (17.8)	fish(ing) (10.1)	one (9.2)	boat(s) (8.7)	

<b>plain</b> (208)	Jane (16.8)	simple (8.7)	boring (6.3)	yogurt (5.3)	bagel (5.3)	
<b>plane</b> (213)	fly (28.2)	air (19.7)	crash (12.2)	flat(s) (2.8)	sky (2.8)	wing(s) (2.8)
<b>pride</b> (197)	prejudice (11.7)	joy (11.7)	flag (5.1)	lion (4.6)	gay (4.6)	
<b>pried</b> (197)	open(ed) (50.3)	pull(ed) (2.5)	crowbar (2.0)	force(d) (2.0)	off (2.0)	
<b>quarts</b> (211)	milk (21.3)	gallon(s) (18.1)	pint(s) (9.5)	water (9.0)		
<b>quartz</b> (208)	watch (20.2)	diamond (16.9)	rock (12.0)	crystal (9.6)		
<b>rap</b> (215)	music (34.9)	song (19.1)	black (3.3)	star(s) (3.3)		
<b>wrap</b> (211)	present(s) (15.2)	up (14.2)	gift(s) (8.5)	cover (5.2)		
<b>real</b> (208)	fake (25.0)	world (10.1)	life (7.2)	true (6.2)		
<b>reel</b> (209)	fish(ing) (49.3)	rod (8.6)	in (5.7)	movie (4.8)		
<b>right</b> (216)	left (34.7)	wrong (33.3)	hand(ed) (13.4)	now (2.8)		
<b>write</b> (209)	pen (21.1)	down (14.4)	paper (7.2)	read (6.2)		
<b>rite</b> (177)	passage (28.8)	aid (9.6)	ritual (6.2)			
<b>ring</b> (218)	bell(s) (19.3)	finger (18.3)	phone(s) (12 .0)	wedding (11.1)		
<b>wring</b> (188)	clothes (10.6)	out (10.6)	neck (10.1)	dry (9.6)		
<b>root</b> (210)	tree (30.5)	plant(s) (18.1)	canal (6.2)	beer (4.8)		
<b>route</b> (213)	road (17.9)	sixty-six (15.5)	bus (7.0)	way (3.8)		
<b>rose</b> (216)	flower(s) (27.3)	red (14.4)	petal (6.5)	thorn(s) (5.5)		
<b>rows</b> (214)	boat(s) (16.9)	columns (15.0)	corn (11.2)	seats (7.0)		
<b>scene</b> (196)	play (19.4)	movie (17.9)	pretty (4.1)	act (3.1)	crime (3.1)	picture (3.1)
<b>seen</b> (186)	saw (39.2)	heard (6.9)	eye(s) (6.5)	look(ed) (4.9)		
<b>sea</b> (217)	ocean (30.4)	water (16.2)	blue (4.6)	waves (3.7)		
<b>see</b> (213)	eye(s) (22.5)	look (13.1)	saw (9.4)	hear (8.5)		
<b>seam</b> (201)	sew (19.9)	clothes (9.5)	pant(s) (8.5)	dress (7.0)		
<b>seem</b> (170)	appear (13.6)	like (9.4)	maybe (5.3)	might (2.4)		
<b>sewn</b> (169)	clothes (17.1)	needle (14.2)	thread (5.2)	together (4.7)		
<b>sown</b> (146)	seed(s) (17.3)	oats (6.8)	reap (5.5)	field (3.4)		
<b>sight</b> (212)	see (22.2)	eye(s) (20.2)	sound (7.1)	vision (6.6)		
<b>site</b> (198)	place (14.1)	construction (12.1)	web(site) (8.1)	build(ing) (6.5)		
<b>sign</b> (207)	stop (34.7)	language (8.7)	up (4.3)			
<b>sine</b> (159)	cosine (52.8)	math (10.7)				

<b>stair</b> (218)	case (17.9)	climb (15.6)	way (10.1)	step(s) (8.7)	
<b>stare</b> (202)	look (25.3)	eye(s) (10.4)	at (9.4)	gaze (7.4)	
<b>steal</b> (205)	take (15.1)	thief, theft (13.2)	money (11.7)	rob(ber) (4.0)	
<b>steel</b> (208)	metal (25.5)	hard (8.7)	iron (5.8)	mill(s) (5.3)	
<b>straight</b> (215)	line (21.0)	narrow (12.1)	arrow (10.2)	forward (7.4)	
<b>strait</b> (194)	water (9.8)	jacket (4.6)	river (3.6)	George (3.6)	
<b>throne</b> (216)	king (69.0)	queen (6.0)	crown (3.2)	chair (2.8)	
<b>thrown</b> (210)	ball (32.9)	away (10.0)	toss(ed) (5.3)	down (3.8)	over (3.8)
<b>thyme</b> (181)	spice(s) (23.8)	herb(s) (17.1)	season(ing) (8.3)	rhyme (8.3)	
<b>time</b> (206)	clock (33.0)	watch (10.7)	out (4.4)	second(s) (3.0)	
<b>toe</b> (217)	foot, feet (45.4)	nail (11.0)	ring(s) (6.0)	big (6.0)	
<b>tow</b> (218)	car (35.8)	truck (33.5)	away (8.7)	boat (4.6)	
<b>vain</b> (187)	mirror (9.6)	conceit(ed) (6.8)	man (2.1)	pretty (2.1)	
<b>vane</b> (163)	weather (22.7)	wind (4.9)	pane (2.5)	rooster (2.5)	
<b>vein</b> (208)	blood (42.3)	artery (14.4)	arm(s) (6.8)	blue (4.8)	
<b>wail</b> (199)	cry (43.7)	scream (6.0)	loud(ly) (3.5)	pain (3.0)	
<b>whale</b> (212)	big (17.9)	ocean (9.5)	blue (8.4)	fish (4.7)	
<b>waist</b> (206)	hip(s) (13.6)	belt (9.7)	small (6.3)	line (5.8)	
<b>waste</b> (210)	garbage (22.9)	basket (19.0)	trash (19.0)	time (4.8)	
<b>weak</b> (212)	strong (56.2)	tired (2.8)	frail (2.4)	sick (2.4)	feeble (2.4)
<b>week</b> (211)	day(s) (30.4)	month (12.3)	seven (10.7)	long (5.7)	
<b>yoke</b> (202)	ox(en) (16.4)	joke (2.0)			
<b>yolk</b> (213)	egg(s) (83.6)				

<sup>a</sup> Although “Santa” has traditionally been linked with *claus* and not *clause*, we cannot be sure whether participants were thinking about a recent movie titled *The Santa Clause* when they responded.

Table 2

*Results of the free association survey for older adults*

Homophone (N responses)	Most Frequent Response (%)	Response (%)	Response (%)	Response (%)	Response (%)
<b>ail</b> (208)	sick (53.9)	hurt (13.0)	ill (9.1)		
<b>ale</b> (218)	beer (71.2)	drink (10.6)	wine (2.3)	brew (2.3)	
<b>aisle</b> (214)	church (33.6)	walk (14.5)	wedding (8.4)	theater (6.7)	
<b>isle</b> (217)	island (24.0)	Capri (7.9)	land (7.8)	water (5.5)	
<b>altar</b> (218)	church (46.0)	wedding (12.4)	marriage (5.1)	worship (3.7)	
<b>alter</b> (219)	change (58.3)	ego (6.4)	sew (2.3)		
<b>ant</b> (216)	insect (19.0)	hill(s) (17.6)	bug (15.7)	bite(s) (6.5)	
<b>aunt</b> (218)	uncle (66.6)	relative (12.8)			
<b>ate</b> (215)	food (31.2)	dinner, dined (11.7)	eat(en) (5.6)	consume(d) (4.7)	full (4.7)
<b>eight</b> (212)	nine (43.9)	number (12.8)	ball (7.5)	o'clock (5.2)	
<b>bail</b> (213)	jail (26.3)	bond (16.4)	out (11.8)	water (7.5)	
<b>bale</b> (217)	hay (81.2)	cotton (4.1)			
<b>beach</b> (220)	sand (45.9)	ocean (14.1)	water (8.2)	ball (4.5)	
<b>beech</b> (195)	tree(s) (60.5)	nut (12.3)	gum (4.6)		
<b>bell</b> (217)	ring (53.0)	tower (7.8)	toll(s) (4.1)		
<b>belle</b> (217)	ball (43.4)	girl (11.1)	southern (4.7)	beaut(iful, y) (3.7)	
<b>berry</b> (218)	fruit (27.6)	straw(berry) (19.8)	blue (15.2)	black (5.1)	
<b>bury</b> (215)	dig (20.0)	dead (19.5)	inter (9.3)	bone (3.7)	grave (3.7)
<b>billed</b> (198)	owe(d) (12.1)	pay, paid (10.1)	charge(d) (8.6)	money (6.7)	
<b>build</b> (216)	house (30.2)	construct (18.9)	erect (7.6)	destroy (5.6)	
<b>bite</b> (219)	teeth (17.3)	chew (16.9)	dog (9.6)	eat (9.1)	
<b>byte</b> (197)	computer (57.9)	mega (5.6)	bit (5.1)	sound (2.5)	
<b>blew</b> (210)	wind (27.7)	horn (8.6)	nose (5.7)	away (5.7)	
<b>blue</b> (218)	sky (18.8)	color (12.9)	red (11.5)	green (10.6)	

<b>bold</b> (210)	brave (15.2)	strong (7.6)	daring (5.3)	shy (5.2)	
<b>bowled</b> (201)	over (29.9)	ball(s) (13.4)	game (11.4)	alley (4.5)	
<b>brews</b> (217)	beer(s) (53.5)	coffee (9.7)	cooks (8.3)	ale(s) (5.9)	
<b>bruise</b> (220)	hurt (35.5)	black and/or blue (13.2)	sore (5.5)	bump(s) (4.1)	
<b>brows</b> (212)	eye(s) (57.1)	forehead (7.0)	face (4.2)	hair (3.8)	
<b>browse</b> (217)	look (33.3)	read (8.8)	book(s) (8.3)	shop (7.0)	
<b>carat</b> (215)	diamond (55.9)	ring (16.8)	gold (7.4)	jewelry (3.8)	
<b>carrot</b> (218)	vegetable (25.9)	orange (12.8)	top(s) (7.4)	stick(s) (7.3)	
<b>cellar</b> (220)	basement (30.9)	wine (12.7)	door (8.2)	down (4.7)	
<b>seller</b> (215)	buyer (69.3)	salesman (2.8)	vender (2.8)		
<b>cent</b> (218)	penny (40.5)	dollar (17.5)	money (16.5)	one (5.5)	
<b>scent</b> (219)	smell (43.9)	odor (25.3)	perfume (15.5)	aroma (2.7)	
<b>sent</b> (213)	mail(ed) (32.4)	letter (10.3)	receive(d) (9.4)	away (3.3)	gone (3.3)
<b>cereal</b> (216)	breakfast (24.1)	oat(s), oatmeal (17.6)	food (11.6)	eat (6.5)	bran (6.5)
<b>serial</b> (215)	number(s) (25.1)	killer (22.8)	story (6.5)	book(s) (3.2)	
<b>choral</b> (217)	sing (40.6), song (11.9)	group (12.1)	music (10.7)	choir (4.6)	
<b>coral</b> (220)	reef (40.4)	sea (18.7)	rock (5.5)	horse(s) (4.6)	
<b>clause</b> (203)	sentence (18.7)	phrase (10.8)	contract (7.9)	paragraph (6.4)	
<b>claws</b> (219)	cat(s) (21.5)	bear(s) 10.0	paw(s) (9.1)	nails (5.9)	
<b>click</b> (212)	clack (18.4)	clock (16.5)	camera (11.8)	snap (7.1)	
<b>clique</b> (198)	group (48.0)	set (5.6)	friends (3.5)	club (2.5)	gang (2.5)
<b>colonel</b> (218)	army (33.1)	Sanders (7.8)	officer (6.9)	major (6.5)	
<b>kernel</b> (218)	corn (82.1)	nut (3.2)	popcorn (2.3)		
<b>crews</b> (216)	ship(s) (18.2)	boat(s) (14.7)	work(ers) (12.6)	row(s, er, ing) (6.1)	
<b>cruise</b> (220)	ship (55.5)	boat (14.2)	sail (7.3)	trip (3.6)	
<b>days</b> (220)	night(s) (49.1)	week(s) (29.6)	years (2.7)	time (2.3)	
<b>daze</b> (207)	confused (11.5)	stun(ned) (8.2)	haze (7.8)	dizzy (6.3)	
<b>dear</b> (219)	love (12.5)	sweet(heart) (7.9)	one (7.7)	letter (6.4)	
<b>deer</b> (218)	doe (32.2)	animal (17.0)	Bambi (6.0)	fawn (6.0)	

<b>dense</b> (217)	thick (50.3)	fog(gy) (15.2)	forest (7.4)	heavy (4.1)	
<b>dents</b> (216)	car(s) (27.0)	fender(s) (14.9)	dings (7.4)	scratches (3.7)	
<b>doe</b> (220)	deer (64.5)	buck (11.4)	fawn (4.6)	stag (2.3)	
<b>dough</b> (219)	bread (42.0)	money (12.3)	nut(s) (7.3)	boy (6.8)	
<b>dual</b> (216)	two (44.0)	double (6.5)	single (4.2)	twice (4.2)	
<b>duel</b> (218)	fight (52.3)	sword (9.2)	pistol(s) (7.4)	gun(s) (2.6)	
<b>earn</b> (219)	money (40.2)	work (20.6)	spend (5.0)	pay (5.0)	wage(s) (5.0)
<b>urn</b> (215)	vase (29.3)	ashes (18.6)	container (5.1)	flower(s) (3.7)	
<b>ewe</b> (213)	sheep (35.7)	lamb (30.1)	ram (9.9)	goat (4.2)	
<b>you</b> (214)	me (78.5)				
<b>fairy</b> (217)	tale(s) (40.5)	godmother (15.3)	elf (7.4)	tooth (3.7)	
<b>ferry</b> (220)	boat (76.9)	water (6.0)	river (4.1)	ship (2.3)	
<b>fir</b> (219)	tree (81.8)	pine (4.2)			
<b>fur</b> (219)	coat (39.8)	animal(s) (21.5)	mink (5.5)	hair (3.7)	
<b>flea</b> (218)	dog (25.7)	bite (13.8)	insect (11.1)	bug (9.6)	
<b>flee</b> (217)	run (57.7)	escape (4.6)	go (4.6)	away (3.2)	
<b>flew</b> (214)	bird(s) (24.3)	plane (6.6)	airplane (5.7)	fly (5.6)	away (5.6)
<b>flu</b> (218)	sick (39.4)	cold (18.3)	ill(ness) (7.8)	shot (6.5)	
<b>flue</b> (211)	chimney (47.9)	fireplace (8.1)	stove (7.1)	pipe (3.3)	
<b>gait</b> (218)	walk (34.1)	horse (24.4)	trot (10.1)	pace (6.0)	
<b>gate</b> (218)	fence (24.3)	open (22.9)	door (7.4)	swing(ing) (6.9)	
<b>genes</b> (192)	DNA (21.3)	heredity (9.9)	inherit (8.3)	body (6.2)	
<b>jeans</b> (219)	pants (39.7)	blue (27.4)	Levis (6.4)	denim (4.1)	
<b>gorilla</b> (215)	ape (48.0)	monkey (15.8)	animal (7.9)	big (4.7)	
<b>guerrilla</b> (215)	war(fare) (27.9)	fighter (10.7)	soldier(s) (3.2)	attack (2.8)	
<b>grays</b> (202)	color(s) (15.3)	blue(s) (10.9)	white(s) (6.5)	black(s) (5.0)	
<b>graze</b> (217)	eat (27.2)	cow(s) (15.7)	grass (13.8)	sheep (5.5)	
<b>grisly</b> (216)	ugly (5.1)	gore(y) (3.9)	awful (3.7)	blood(y) (3.7)	
<b>grizzly</b> (219)	bear (91.3)				
<b>groan</b> (219)	moan (45.2)	hurt (8.7)	pain (6.8)	noise (3.7)	
<b>grown</b> (217)	up (25.8)	adult (18.5)	old (6.9)	tall (6.0)	
<b>hail</b> (219)	ice (10.1)	storm (9.6)	rain (7.8)	hello (7.3)	

<b>hale</b> (203)	hearty (57.7)	healthy (4.9)	strong (2.5)	well (2.5)
<b>hay</b> (218)	bale (13.3)	straw (12.8)	horse(s) (12.4)	stack (8.3)
<b>hey</b> (213)	hello (19.7)	hi (15.5)	you (15.5)	there (11.7)
<b>hear</b> (211)	listen (19.0)	ear(s) (18.4)	sound (13.7)	see (11.4)
<b>here</b> (217)	there (65.9)	now (20.3)		
<b>hi</b> (216)	hello (28.8)	bye (11.2)	there (9.3)	greeting(s) (7.9)
<b>high</b> (220)	low (65.5)	up (4.5)	mountain (3.2)	tall (2.3)
<b>him</b> (218)	her (78.9)	he (3.2)	male (2.8)	man (2.3)
<b>hymn</b> (219)	song (44.7), sing (16.9)	church (18.4)	book (6.0)	music (2.3)
<b>hole</b> (215)	dig,dug (17.7)	ground (8.8)	in one (7.4)	golf (6.5)
<b>whole</b> (214)	all (19.7)	half (15.4)	entire (14.0)	part(ial) (9.8)
<b>idle</b> (203)	lazy (25.1)	busy (12.8)	time (5.9)	hands (4.4)
<b>idol</b> (211)	worship (16.5)	god (10.5)	hero (7.6)	statue (7.1)
<b>in</b> (219)	out (84.1)			
<b>inn</b> (219)	hotel (42.9)	motel (13.7)	sleep (5.0)	country (2.5)
<b>knight</b> (216)	armor (45.9)	king (8.4)	lady (4.6)	sir (4.2)
<b>night</b> (220)	day (71.8)	dark (13.6)		
<b>ladder</b> (217)	climb (40.1)	step(s) (17.1)	up (6.5)	rung(s) (8.3)
<b>latter</b> (206)	last (26.2)	former (9.7)	day(s) (7.3)	after(ward) (6.3)
<b>links</b> (219)	golf (57.6)	chain(s) (11.4)	connect(s, ing) (6.0)	cuff (4.6)
<b>lynx</b> (208)	cat(s) (44.7)	animal (30.3)	fox (7.2)	
<b>loan</b> (215)	money (45.2)	borrow (11.2)	shark (7.0)	lend (6.1)
<b>lone</b> (214)	one (15.4)	ranger (15.0)	wolf (8.9)	single (8.4)
<b>mail</b> (217)	letter(s) (26.3)	man (11.6)	box (8.3)	send (7.8)
<b>male</b> (219)	female (70.8)	man (15.6)		
<b>main</b> (214)	street (27.1)	stream (6.5)	first (5.1)	primary (3.7)
<b>mane</b> (216)	horse (61.2)	hair (16.7)	lion (9.3)	
<b>maize</b> (214)	corn (58.4)	yellow (6.5)		
<b>maze</b> (203)	puzzle (29.1)	lost (8.4)	rat(s) (4.9)	confus(ed, ing, ion) mouse, mice (4.5) (4.5)
<b>mall</b> (217)	shop(s, ing) (54.0)	store(s) (20.3)		

<b>maul</b> (216)	hurt (21.3)	dog(s) (7.4)	hit (6.0)	beat (5.5)	
<b>might</b> (210)	strong (19.5)	maybe (16.2)	strength (12.4)	right (6.2)	
<b>mite</b> (214)	small (20.6)	bug (15.5)	insect (10.7)	little (7.0)	
<b>mind</b> (216)	brain (18.5)	matter (15.3)	think (7.0)	obey (6.5)	
<b>mined</b> (215)	coal (19.6)	dug (16.7)	gold (15.8)	ore (14.2)	
<b>naval</b> (219)	ship(s) (19.2)	academy (4.1)	officer (3.2)	sailor(s) (3.2)	sea(s) (3.2)
<b>navel</b> (217)	orange (38.2)	belly (29.0)	stomach (9.2)	body (3.7)	
<b>nay</b> (215)	no (41.9)	yea (9.8)	aye (4.7)	yes (4.7)	
<b>neigh</b> (209)	horse(s) (72.2)	whinny (3.9)			
<b>none</b> (195)	zero (24.1)	some (21.0)	all (9.2)	empty (6.2)	
<b>nun</b> (206)	Catholic (18.5)	priest (15.5)	church (14.6)	sister (11.7)	
<b>oh</b> (204)	my (21.6)	ah (18.6)	no (17.2)	surprise (3.9)	
<b>owe</b> (209)	debt (26.3)	money (24.4)	pay (14.8)	due (7.7)	
<b>one</b> (215)	two (59.1)	single (11.2)	only (7.4)	alone (2.3)	
<b>won</b> (215)	lost (45.1)	prize (7.4)	game (4.2)	beat (4.2)	
<b>pail</b> (206)	bucket (43.7)	water (23.3)	shovel (3.9)		
<b>pale</b> (216)	wan (13.0)	white (10.2)	light (7.9)	sick(ly) (6.0)	
<b>pain</b> (215)	hurt(s) (34.9)	ache (17.2)	suffer(ing) (5.2)	neck (4.2)	
<b>pane</b> (218)	window (60.4)	glass (35.4)			
<b>pair</b> (220)	two (60.9)	shoes (8.6)	couple(s) (2.8)	one (2.7)	
<b>pear</b> (217)	fruit (44.7)	apple (12.9)	tree (6.5)	shape(d) (5.1)	peach (5.1)
<b>pare</b> (210)	peel (24.8)	cut (15.3)	apple(s) (14.8)	knife (5.2)	
<b>pause</b> (218)	stop (33.5)	wait (24.9)	hesitate (7.4)	rest (4.6)	
<b>paws</b> (218)	dog(s) (26.2)	feet (22.5)	cat(s) (19.7)	hand(s) (2.8)	
<b>peak</b> (219)	top (25.1)	mountain (21.5)	valley (10.5)	bottom (4.6)	
<b>peek</b> (216)	look (43.8)	a boo (19.1)	see (6.9)	seek (3.7)	
<b>peer</b> (214)	equal (25.3)	look (20.6)	friend(s) (6.5)	group (5.6)	
<b>pier</b> (218)	dock (31.3)	boat (13.8)	fish(ing) (10.1)	water (8.8)	
<b>plain</b> (215)	simple (20.5)	fancy (16.3)	Jane (13.0)	ordinary (3.3)	
<b>plane</b> (219)	fly (33.8)	air (17.9)	ride (3.7)	jet (3.2)	
<b>pride</b> (207)	prejudice (22.3)	fall (9.2)	joy (6.3)	ego (3.9)	
<b>pried</b> (212)	open (40.0)	loose (7.6)	force(d) (5.2)	lift(ed) (4.7)	

<b>quarts</b> (218)	pint(s) (43.8)	milk (21.1)	gallon(s) (7.9)	measure (5.5)
<b>quartz</b> (216)	stone (26.4)	watch (14.8)	rock (11.6)	mineral (9.3)
<b>rap</b> (214)	knock (23.4)	tap (14.5)	music (12.6)	hit (6.5)
<b>wrap</b> (215)	present (9.3)	package (9.3)	coat (8.8)	up (8.4)
<b>real</b> (216)	true (16.2)	fake (8.8)	estate (8.3)	false (7.4)
<b>reel</b> (215)	fish(ing) (48.3)	rod (27.0)	movie (3.3)	in (2.8)
<b>right</b> (219)	wrong (50.3)	left (36.5)	correct (2.7)	
<b>write</b> (216)	letter (20.8)	read (14.8)	pen (14.4)	print (3.2)
<b>rite</b> (201)	ceremony (18.9)	passage (16.4)	ritual (11.9)	church (10.5)
<b>ring</b> (219)	finger (26.1)	bell(s) (19.2)	wedding (9.1)	diamond (6.4)
<b>wring</b> (214)	clothes (16.3)	twist (14.5)	hands (9.8)	out (9.8)
<b>root</b> (217)	tree (26.8)	plant(s) (15.6)	beer (5.1)	canal (4.6)
<b>route</b> (219)	road (22.9)	way (17.9)	sixty-six (6.4)	map (5.9)
<b>rose</b> (219)	flower (39.9)	garden (7.3)	smell(s) (6.4)	bush(es) (6.0)
<b>rows</b> (211)	boat (15.7)	corn (15.7)	tiers (8.5)	line(s) (7.1)
<b>scene</b> (208)	picture (19.7)	play (11.6)	view (8.2)	actual (5.8)
<b>seen</b> (208)	saw (27.4)	look (8.7)	observe(d) (6.8)	eye(s) (6.5)
<b>sea</b> (220)	ocean (35.0)	water (14.5)	shore (6.4)	wave(s) (4.6)
<b>see</b> (212)	look (23.6)	saw (15.1)	eye(s) (10.9)	hear (9.4)
<b>seam</b> (214)	sew (42.6)	dress (9.3)	cloth(es, ing) (6.5)	hem (5.6)
<b>seem</b> (188)	appear(s) (25.0)	like (11.7)	maybe (8.0)	is (5.8)
<b>sewn</b> (201)	clothes (6.0)	torn (6.0)	rip(ped) (6.0)	stitch(ed) (5.5)
<b>sown</b> (216)	seed(s) (37.1)	plant(ed) (14.0)	reap(ed) (9.8)	wheat (7.4)
<b>sight</b> (216)	see(n) (28.7)	eye(s) (17.3)	sound (10.6)	view (4.6)
<b>site</b> (214)	place (35.1)	location (10.3)	building (6.1)	house (5.6)
<b>sign</b> (214)	post (7.3)	name (6.2)	omen (6.1)	stop (5.6)
<b>sine</b> (155)	cosine(27.7)	math (16.7)	wave (5.2)	geometry (4.5)
<b>stair</b> (218)	step(s) (21.6)	climb (17.9)	up (11.5)	case (10.6)
<b>stare</b> (214)	look (50.1)	eye(s) (8.9)	gaze (8.4)	glare (4.7)
<b>steal</b> (214)	take (21.6)	rob (19.1)	money (11.7)	thief (10.3)
<b>steel</b> (214)	iron (25.7)	metal (11.2)	strong (7.5)	hard (5.6)
<b>straight</b> (219)	crooked (23.7)	narrow (21.9)	line (15.6)	arrow (11.9)
				vision (4.6)
				billboard (5.6)

<b>strait</b> (215)	water(way) (23.0)	jacket (9.8)	(of) Gibraltar (8.9)	Magellan (3.8)	
<b>throne</b> (216)	king (57.0)	chair (9.7)	seat (8.8)	queen (7.5)	
<b>thrown</b> (218)	toss(ed) (21.1)	ball (19.8)	catch, caught (7.8)	out (6.5)	
<b>thyme</b> (203)	spice(s) (25.1)	herb(s) (24.6)	season(ing) (8.4)	rhyme (3.0)	rosemary (3.0)
<b>time</b> (212)	clock (18.9)	day (10.3)	hour (7.1)	watch (4.7)	
<b>toe</b> (218)	foot, feet (58.7)	nail (17.0)	heel (4.1)	digit (2.3)	finger (2.3)
<b>tow</b> (219)	pull (33.8)	car (15.5)	truck (12.3)	boat (8.7)	
<b>vain</b> (185)	proud, pride (14.1)	conceited (4.9)	self(ish, -centered) (9.2)	haughty (2.2)	person (2.2)
<b>vane</b> (207)	weather (66.7)	wind(s) (5.3)	rooster (3.9)	window (2.9)	
<b>vein</b> (219)	blood (45.4)	artery (24.3)	leg(s) (4.6)	blue (4.2)	
<b>wail</b> (215)	cry (68.3)	moan (3.3)	holler (2.3)		
<b>whale</b> (217)	fish (18.0)	big (13.5)	ocean (11.5)	mammal (6.5)	
<b>waist</b> (214)	belt (15.0)	line (11.7)	hip(s) (8.9)	fat (4.7)	small (4.7)
<b>waste</b> (213)	garbage (12.7)	trash (12.7)	basket (9.9)	not (9.4)	
<b>weak</b> (217)	strong (63.6)	sick (5.1)	tired (2.3)		
<b>week</b> (218)	day(s) (34.9)	seven (20.7)	month (18.9)	time (5.0)	
<b>yoke</b> (219)	ox(en) (32.5)	horse (6.4)	collar (3.7)	harness (3.2)	
<b>yolk</b> (219)	egg (86.7)	white(s) (3.2)			

---

Table 3

*Mean percentage of time a homophone was chosen as dominant in the dominance survey, with consistent ratings across age group.*

Homophone <sup>a</sup>	KF-FREQ	Young Adults <sup>b</sup>	Older Adults <sup>b</sup>
ail*	0	10.5	26.4
<b>ale*</b>	1	70.3	51.8
<b>aisle</b>	6	59.5	75.5
isle	5	19.5	12.7
ant	6	19.1	16.4
<b>aunt*</b>	22	55.9	55.0
<b>bail</b>	7	73.6	57.3
bale*	5	11.4	23.6
<b>beach*</b>	61	96.4	97.3
beech*	6	1.4	0.0
<b>bell*</b>	18	94.5	90.0
belle	1	2.3	4.1
billed	3	13.6	14.1
<b>build</b>	86	66.8	61.8
<b>bite</b>	10	72.7	66.4
byte*	0	14.5	21.8
blew	12	5.9	7.8
<b>blue</b>	143	68.9	64.4
<b>bold</b>	21	86.8	80.0
bowled	23 <sup>c</sup>	7.3	8.6
brews*	4 <sup>c</sup>	7.3	17.4
<b>bruise</b>	3	84.5	68.9
brows*	6 <sup>c</sup>	10.5	16.4
<b>browse*</b>	0	80.0	67.7
carat*	0	6.8	6.4
<b>carrot</b>	1	77.6	87.3
karat	0	0.0	0.0
<b>cereal</b>	17	67.6	67.3
serial	7	12.3	9.5
cite	7	1.8	3.6
<b>sight</b>	86	73.5	70.9
site	64	11.9	10.0
<b>click</b>	2	66.4	75.8
clique*	2	16.8	14.6
crews	36 <sup>c</sup>	5.9	14.1
<b>cruise*</b>	2	85.5	67.3

<b>days</b>	686 <sup>c</sup>	85.4	93.6
daze	0	5.9	1.4
<b>dear</b>	54	56.4	70.5
deer	13	18.6	10.5
<b>earn*</b>	16	93.2	96.4
urn	2	5.5	1.4
ewe	1	0.9	1.8
<b>you*</b>	3286	95.9	94.1
fir*	2	3.6	9.1
<b>fur*</b>	13	89.5	63.2
gait*	8	2.2	6.4
<b>gate</b>	37	92.7	80.9
<b>gorilla</b>	0	79.5	54.1
guerrilla	1	8.6	26.1
grisly	2	7.8	13.6
<b>grizzly*</b>	1	74.0	58.6
groan*	1	27.7	13.2
<b>grown</b>	43	53.2	70.9
<b>hail</b>	10	69.7	65.5
hale	2	10.1	12.3
hay	15	5.5	35.0
<b>hey</b>	19	86.4	50.0
<b>him*</b>	2619	92.3	84.5
hymn*	9	7.3	8.6
<b>idle</b>	13	50.2	68.6
idol	7	28.8	14.1
<b>in*</b>	21,341	76.3	73.6
inn*	9	12.8	12.3
knight*	18	8.6	4.1
<b>night*</b>	411	82.7	91.8
<b>ladder*</b>	19	78.1	67.1
latter	114	10.0	16.4
<b>links</b>	7	86.8	89.5
lynx*	0	5.9	1.4
<b>loan*</b>	46	75.5	58.6
lone	8	10.0	18.2
<b>main</b>	119	90.9	91.8
mane*	0	4.5	4.5
maize*	0	7.3	16.4
<b>maze</b>	6	87.3	59.1
<b>mall*</b>	3	91.3	95.0
maul	0	3.2	2.3
<b>might</b>	672	95.5	96.3
mite	1	3.2	1.8
<b>mind</b>	325	93.6	95.9
mined	59 <sup>c</sup>	3.2	0.5

<b>none</b>	108	82.2	90.5
nun	2	8.2	5.0
<b>pain*</b>	88	89.5	81.4
pane*	3	3.7	4.5
<b>pair*</b>	50	57.5	61.2
pare*	2	0.5	0.0
pear	6	25.6	17.4
<b>pause*</b>	21	69.1	63.6
paws*	3 <sup>c</sup>	14.5	18.2
<b>pride</b>	42	95.4	87.2
pried*	6 <sup>c</sup>	0.9	5.0
<b>real</b>	260	91.3	91.8
reel*	2	4.6	2.7
<b>ring</b>	47	90.9	84.1
wring	2	0.9	3.6
<b>rose</b>	86	68.6	55.0
rows	35 <sup>c</sup>	20.9	24.1
seam	9	6.4	10.0
<b>seem</b>	229	82.7	76.4
<b>sign</b>	94	94.1	99.5
sine	4	4.5	0.0
<b>sewn</b>	1	55.5	54.1
sown	3	14.2	13.2
<b>steal</b>	5	64.1	51.8
steel	45	13.2	17.3
<b>straight</b>	114	90.9	91.4
strait	5	3.2	2.7
throne*	5	19.2	13.6
<b>thrown</b>	40	68.5	74.1
thyme	0	2.3	7.3
<b>time</b>	1599	93.6	84.5
<b>toe*</b>	9	57.5	66.8
tow	1	16.9	12.3
vain	10	20.5	15.5
vane	0	3.2	1.8
<b>vein*</b>	25	55.7	60.5
<b>whale*</b>	0	77.2	70.5
wail	3	10.0	9.1
Dominant <i>M (SD)</i>		78.3 (13.4)	74.8 (14.5)
Subordinate <i>M (SD)</i>		9.4 (6.9)	10.5 (7.7)

<sup>a</sup> Dominant homophones within a set are indicated by bold font.

<sup>b</sup> The responses do not always add to 100% because participants were allowed to rate the homophones as equal in dominance.

<sup>c</sup> Some homophones that are the plural or past tense of another word were not included in Kucera and Francis (1967), and therefore the frequencies are reported here for those homophones' singular or present tense.

\* Indicates those homophones that, for young and older adults, were similarly rated for dominance and had strong and matching first response associations.

Table 4

*Mean percentage of time a homophone was chosen as dominant, with no consistency across age group.*

Homophone	K-F FREQ	Young Adults <sup>a</sup>	Older Adults <sup>a</sup>
altar	5	32.4	36.8
alter	15	40.2	35.5
ate	16	42.9	51.8
eight	104	21.0	11.8
berry	6	45.0	42.7
bury	9	29.5	29.1
cellar	26	38.4	13.2
seller	6	47.0	70.5
cent	158	21.9	33.9
scent	6	35.6	23.4
sent	145	16.0	9.6
choral	2	12.3	46.4
coral	5	68.6	34.1
clause	9	25.6	41.8
claws	1 <sup>b</sup>	54.5	42.3
colonel	37	25.0	35.9
kernel	3	50.9	48.2
dense	9	65.9	46.4
dents	2 <sup>b</sup>	19.1	29.1
doe	1	9.1	75.0
dough	13	71.4	12.7
dual	9	56.6	8.6
duel	5	23.7	73.2
fairy	4	56.9	34.1
ferry	11	17.9	39.5
flea	2	50.7	37.3
flee	1	28.3	37.3
flew	27	38.4	42.7
flu	8	48.9	43.6
flue	0	0.5	0.5
genes	9 <sup>b</sup>	10.0	63.6
jeans	1	67.1	14.1
grays	80 <sup>b</sup>	32.9	33.6
graze	1	45.7	41.4
hear	153	28.2	20.1
here	750	28.2	29.7
hi	6	58.7	29.7

high	497	15.6	48.4
hole	58	14.2	13.6
whole	309	50.7	48.6
mail	47	29.1	28.6
male	37	36.8	27.7
naval	33	43.2	43.6
navel	2	38.6	34.5
nay	2	32.9	37.4
neigh	0	29.2	21.5
oh	119	54.6	27.7
owe	10	28.4	44.5
one	3292	41.8	51.8
won	68	24.1	16.8
pail	4	20.5	28.6
pale	58	55.3	41.8
peak	16	40.9	36.1
peek	0	32.7	33.8
plain	48	27.1	30.5
plane	114	41.3	36.8
peer	8	65.3	40.5
pier	3	19.6	40.5
quarts	3 <sup>b</sup>	44.7	78.2
quartz	1	29.2	10.9
rap	2	45.9	12.7
wrap	5	36.4	75.9
right	613	56.4	35.2
rite	8	0.0	0.0
write	106	28.2	48.4
root	30	35.2	19.5
route	43	41.6	57.7
scene	106	32.9	17.7
seen	279	42.9	58.6
sea	95	15.0	12.7
see	772	46.8	59.5
stair	2	44.5	48.2
stare	14	24.1	20.5
waste	35	43.6	50.0
waist	11	25.9	15.5
weak	32	16.4	8.2
week	275	49.8	50.9
yoke	3	12.8	81.8
yolk	1	74.9	6.4

<sup>a</sup> The written responses do not always add to 100% because participants were allowed to rate the homophones as equal in dominance.

<sup>b</sup> Some homophones that are the plural or past tense of another word were not included in Kucera and Francis (1967), and therefore the frequencies are reported here for those homophones' singular or present tense.

Figure Caption

Figure 1. Frequency distribution for the percent of time a response was given as the first free association for young and older adults.

