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## Age-related differences in idiom production in adulthood

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### Abstract

To investigate whether idiom production was vulnerable to age-related difficulties, we asked forty younger (ages 18-30) and forty older healthy adults (ages 60-85) to produce idiomatic expressions in a story-completion task. Younger adults produced significantly more correct idiom responses (73%) than older adults (60%) did. When older adults generated partially correct responses, they were less likely than younger participants to eventually produce the complete target idiom (Old: 32 % / Young: 70%); first-word cues after initial failure to retrieve an idiom resulted in more correct idioms for older (24%) than younger (15%) participants. Correlations between age and idiom correctness were positive for the Young group, and negative for the Older group, suggesting mastery of familiar idioms continues into adulthood. Within each group, scores on the Boston Naming Test correlated with performance on the idiom task. Findings for retrieving idiomatic expressions are thus similar to those for retrieving lexical items.

### Introduction

A primary focus of work on language in aging has been on the difficulties that older adults have with the retrieval of single lexical items. Substantial portions of daily speech consist, however, of idiomatic utterances and fixed expressions, in addition to new propositions (Van Lancker Sidtis, 2008). In this paper, we address the question of whether idiom production is compromised for older adults in the same way lexical retrieval of single words is.

### Idioms: The Production Process

An idiom is a formulaic phrase with cohesive, often inflexible, ties among its words that has a meaning by convention that cannot be derived from its constituent parts (Nunberg, Sag & Wasow, 1994). Examples are '*has someone in the palm of one's hand*' (to control them), '*kick the bucket*' (die), '*save for a rainy day*' (to save something for when it is needed in the

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<sup>2</sup>If the participant read the scenario aloud and then stopped part-way through to read silently, the examiner completed reading it aloud.

### Declaration of Interest

The authors report no additional declarations of interest.

future). These characteristics of idioms render them unique and different from simple words by their multi-word make-up and other formulaic phrases (e.g., ‘*how are you?*’) by their conventionally accepted figurative meaning.

Idioms range in their transparency (how easily the figurative meaning can be inferred from the literal meaning), syntactic flexibility (how much word order can be altered without losing the idiomatic meaning), as well as compositionality (the degree to which the meaning of the individual words contribute to the phrase’s figurative meaning), with each of these variables having a range of gradation that is not easily specified (Cacciari & Tabossi, 1998; Moon, 1998; Nunberg, Sag & Wasow, 1994; Tabossi, Fanari & Wolf, 2008; Titone & Connine, 1999; Vega-Moreno, 2001, 2005). Although the characteristics of idioms do vary, their canonical nature both in composition and in meaning suggests parallels between their production and that of single words. Both idioms and words have meanings that cannot be determined from their constituents. Idioms have been described as akin to ‘giant words’ due to their distinctive unitary figurative meaning, and a focus of research on idiomatic expressions has been on how they are represented in the lexicon (e.g., Qualls et al., 2003; Swinney & Cutler, 1979).

Investigations of idiom production have been motivated by questions regarding these parallels and how the process of producing idioms differs from that of novel word productions (Cutting & Bock, 1997; Sprenger et al., 2006; Kuiper, van Edmond, Kempen & Sprenger, 2007). However, in contrast to numerous studies on age-related retrieval difficulty of single words, age-related changes in idiom production have not been studied to date. We briefly review characteristics of age-related changes noted for single-word retrieval, which shape our predictions about the retrieval and production of idiomatic expressions in younger vs. older adults.

### Lexical Retrieval and Aging

Word-production difficulties associated with advancing age are widely acknowledged (e.g., reviews in Burke & MacKay, 1997 and MacKay & Abrams, 1998). Naming difficulties have been reported in adults as early as in their 50’s, with the steepest decline noted in adults in their 70’s and above (Au, Obler, Joung & Albert, 1990; Au, Joung, Nicholas, Obler, Kass & Albert, 1995; Goral, Spiro, Albert, Obler & Connor, 2007; Kavé, Knafo & Gilboa, 2010). Older adults have more difficulties than younger adults with picture naming or naming to description for nouns (Bowles & Poon, 1985; Burke, MacKay, Worthley & Wade, 1991; Evrard, 2002; James, 2004), as well as for verbs (Nicholas, Obler, Albert & Goodglass, 1985; Ramsay, Nicholas, Au, Obler & Albert, 1999)

Older adults’ errors on naming tasks reveal a higher incidence of the ‘tip-of-the-tongue’ phenomenon (TOT), characterised by a sensation of knowing the word and even recalling specific details about the word, while the word itself is ‘temporarily inaccessible’ (Burke et al., 1991, p. 542; Cross & Burke, 2004). Word-search strategies distinguish younger and older individuals as well. On studies of lexical retrieval in healthy aging, older adults produced more circumlocutions and augmented correct responses than younger adults (Nicholas, Obler, Albert & Goodglass, 1985), as well as more reformulations of words in a picture description task (Schmitter-Edgecombe, Vesneski & Jones, 2000).

The role of aging in the lexical-retrieval process is described by the *Transmission Deficit Hypothesis* (TDH) which posits that age-related difficulties with lexical retrieval arise from a weakening in the interconnections of the lexical architecture, reducing either the rate or strength of priming of the interconnections between the lexical item (lemma) and its phonological form (lexeme), leading to a transmission deficit (Burke et al., 1991; Fraas et al., 2002; MacKay & Burke, 1990; Rastle & Burke, 1996). The resultant difficulty in word

retrieval is found for both nouns and verbs (Au et al., 1995; Barresi et al., 2000), with particular difficulty for proper nouns. As proposed by the TDH, the richer semantic network of common nouns provides a word-retrieval advantage over that for proper nouns, which have lexical-to-phonological connections that are not strengthened by semantic redundancy (Thornton & Light, 2006; James, 2004; Fogler & James, 2007).

While the TDH is not designed to test retrieval of multiword utterances, because some authors have argued that idioms behave like single lexical items (e.g., Swinney & Cutler, 1979), we used the TDH to motivate our hypotheses. Thus we expected production difficulties for idioms comparable to those for single words. Specifically, we reasoned that if idioms show a similar vulnerability to age-related changes within the context of the TDH, older adults might have difficulty either with the retrieval of specific words within the idiomatic expression or with the entire expression itself. In keeping with the greater number of circumlocutions and augmented correct responses reported for lexical retrieval of single words in older compared to younger adults (Nicholas, Obler, Albert & Goodglass, 1985), we anticipated the retrieval process for idioms would show a similar pattern. In this regard, we anticipated that the older adults would require multiple attempts to produce the idiom as they searched for the fixed expression.

In age-related naming failure of single words, cueing the initial sound or syllable of a word has been shown to aid its retrievability (Abrams, White & Eitel, 2003; Barresi et al., 2000; James & Burke, 2000; Nicolas et al., 1985). This improved performance on naming tasks when participants are given a phonological cue suggests that faulty access to the store of phonological word-forms underlies word retrieval difficulties and tip-of-the-tongue phenomena, as does reports of the partial recall of a word's characteristics (e.g., Au et al., 1990; Borod, Goodglass & Kaplan, 1980; Bowles & Poon, 1985; Cohen & Faulkner, 1986; Connor, Spiro, Obler & Albert, 2004; Heine, Ober, & Shenaut, 1999). Corroborating evidence for a breakdown in the connection between the lexical and phonological levels is supported by electrophysiological measures of phonological retrieval in an implicit naming task that demonstrated longer response latencies and greater cognitive effort in older than in younger adults (Neumann, Obler, Gomes & Shafer, 2009). This evidence for partial recall during naming led us to predict that older adults would produce proportionately more partial responses on an idiom-production task than younger adults. Based on Levelt's model (Levelt, et al., 2000) which posits a superlemma for idiomatic expressions encompassing the individual lexical items that make up the idiom, we reasoned that like the breakdown between the lemma level and its phonemes for single words, age-related difficulties for idiom production may result in a breakdown between the superlemma and its constituent lexical items. This led us to predict that an initial-word cue could facilitate retrieval in the older adults.

In the present study we thus examined idiom production in older and younger adults to determine if idioms show age-related difficulties parallel to the deficits in naming for single words. Applying the logic of the Transmission Deficit Hypothesis, we expected greater vulnerability to idiom retrieval difficulty with age, perhaps suggesting a weakening of the activation of the idiomatic expression and its constituent parts. Within this theoretical framework we anticipated evidence of fewer correct productions, as well as more reformulated and partially correct responses for the older as compared to the younger adults. That is, we expected older adults to evidence retrieval difficulty for the individual lemmas as well as weakening of their components' interconnections.

Based on the research on age-related word retrieval difficulties and on the characteristics of idioms, then, we made the following predictions:

1. If, as with single-word production, idiom production declines with advancing age, then younger adults would outperform older adults on our task.
2. In the course of searching for correct idioms, older adults would require more attempts to produce them and produce proportionately more partial responses than younger adults.
3. Both groups -- particularly the older adults -- if unable to produce the correct idiom, would benefit from an initial word cue.

## Method

### Participants

Eighty participants took part in the study. All were native monolingual speakers of American English. A screening questionnaire was administered to assess background, health, and language history and to insure the participants were monolingual (not fluent in another language by each participant's self report). Criteria for selection excluded anyone with a neurological history of head injury or stroke, or any history of speech, language, or reading difficulties. The *Mini Mental State Exam* (MMSE, Folstein et al., 1975) was administered to the older participants; we included those who received a score of 26 or higher. The forty younger adults, 18-30 yrs., (M=25.3, SD=2.97) and 40 older adults, 60-85yrs. (M=72.3, SD=7.89) were matched for educational attainment (Old: M=15.8, SD =2.12; Young: M=15.9, SD=1.45) and gender (males =Young, 12; Old, 11). For seven participants (three older, four younger) data were included only for accuracy, not for the more detailed analyses, due to technical difficulties with the recording of their responses.<sup>1</sup>

### Stimuli and Materials

We wanted to ensure that the idioms we selected were equally familiar to our two participant groups. In the pre-piloting phase of our investigation, seventy-five idioms were selected from dictionaries phrase books, Internet sources and language therapy workbooks. Sixty-five of these idioms were common American English idioms and 10 were translations from other languages or dialects of English, which served as foils (e.g., 'That's money for old rope' – an easy way of making money). Prior to the study, a group of 17 younger (18-30 year old, M= 25.3yrs) and 23 older (60-78 year old M = 68.95) monolingual American-English speaking volunteers matched for age and education with our respective study groups had rated the idioms for familiarity on a 7-point Likert scale: 0 as 'not familiar at all' to 6 as 'highly familiar.' For the study, 40 idioms were selected as a result of these ratings that had received mean scores above 3.5 in familiarity and did not differ in familiarity between the two groups by more than one point (i.e., all 40 of the selected idioms were judged equally familiar by younger and older raters).

Although we considered alternative ways to elicit the target idioms (e.g., pictures as stimuli), we ultimately chose to create scenarios to place the idioms in more 'naturalistic' setting. Thus, each of the forty task idioms was elicited by a scenario consisting of 2 to 5 sentences, with the idiom expression required to complete the sentence at the end of the scenario: e.g.,

Stimulus: 'We tried to keep the party a surprise from my parents, but my sister had to open her big mouth and...'

Target Response: '*let the cat out of the bag*'.

<sup>1</sup>Omission of these participants did not significantly change the means or standard deviations for demographics of age, education or gender for either of the groups. For the study group without these participants, the means were as follows: age - Young: 25.4(2.8); Old: 72.1(7.7); education - Young: 15.8 (1.3); Old: 16.1(2.1); gender - Young: 25F, 11M; Old: 26F, 11M.

The resulting scenarios were then recorded by a native speaker of Standard American English and presented both auditorily (i.e., played on a CD player) as well as in writing (i.e., provided in large print (Arial font, 40 point) so the participant could read along with the recordings). These stimuli were piloted on a group of 16 individuals not involved either in rating the idioms or in the study group of 80 individuals (6 younger, M=23.5 yrs.; 10 older, M=77.4 yrs) to ensure that the scenarios elicited the desired idiom and adjustments to the scenarios were made if necessary. In addition, a set of 12 instructional items with progressively fewer cues was developed to familiarise the participants with the task and highlight that idioms, rather than literal responses, should be selected to complete the scenarios.

## Procedure

The participants were tested individually and their responses were recorded on a Sony digital audiotape or a Panasonic MP3 digital recorder. Following discussion of what idioms are and administration of the practise items, the participants were directed to listen to each of the forty-recorded scenarios and read along silently. At the end of each scenario, the participant was instructed to produce an idiom that best completed the scenario. The participants were permitted to reread the story as needed. If a participant gave no response or had difficulty responding, the examiner offered a series of prompts. First, the examiner repeated all or part<sup>1</sup> of the scenario designed to target the idiom. If the participant was still unsuccessful or gave a literal response (e.g., *teasing her* for *pulling her leg*) instead of an idiom, the examiner provided a reminder to use an idiom. If the response was an off-target idiom (e.g. *putting his foot in his mouth* for *pulling her leg*), the examiner encouraged the participant to continue generating responses by saying, ‘anything else?’ or ‘can you think of a different idiom?’ There was no time limit on this task. When it was clear that the participant was unable to generate more responses, the examiner gave the first substantive word of the idiom as a cue (e.g., *pulling*), consisting of the first word(s) up to and including the first substantive (noun, verb, adjective, or adverb) (referred to below as an ‘examiner word cue’).

The responses of the participants were noted on the response sheet during the session and the complete audio recordings were later transcribed for further analysis. The participants’ initial and subsequent responses to each scenario were analysed for accuracy. Overall accuracy was rated by classifying their responses as **correct** (*let the cat out of the bag* or the equivalent *spill the beans*), **partial** (*let the goose out of the bag*), or **incorrect** (*ruin the surprise* or no response). As an additional step, when the participant failed to produce a correct response but was able to generate the idiom after the examiner gave the first substantive word (e.g., the word *let*, for *let the cat out of the bag*), the response was scored as **correct-after-cue**.

All the responses from the participants were compiled and variations listed without group assignment for each of the idiomatic expressions. The responses were scored by three native American-English speaking speech-language pathologists (SLPs) blind to the age of the participants whose data they scored. Specifically, in order to calculate inter-rater reliability, one SLP (who was also an examiner) first classified all responses into the categories above. Two additional SLPs (not involved in the data collection) classified one tenth of the response sheets and then tabulated all instances of differences in the three classifications of the responses recorded. Inter-rater reliability was 94%, so the classifications of the first SLP were used for the analyses that follow.

## Results

### Prior to an Examiner Word Cue

**1. Correct Responses**—In accordance with our first hypothesis, an independent samples t-test for *correct responses* yielded a significant group difference for the production of appropriate idiomatic expressions for the scenarios. On the forty-item list, younger adults correctly produced more idioms ( $M=29.18$ ,  $SD: 5.7$ ) than the older adults ( $M= 24.05$ ,  $SD=5.2$ ) ( $t=4.2$ ,  $p < .001$ ). Within each of the two groups, overall responses on this idiom-production task yielded a moderate and significant correlation between accuracy and age. On a Pearson product-moment correlation coefficient, accuracy was positively correlated with age for the younger group ( $r = .325$ ,  $p < .05$ ), and negatively correlated with age for the older group ( $r = -.315$ ,  $p < .05$ , see Figure 1). In addition, a portion of the participants (22 in each group) completed the *Boston Naming Test* (Kaplan, Goodglass & Weintraub, 1983) permitting a comparison of naming performance on single-word items with accuracy on the idiom production task. Pearson's product-moment correlation between the two tasks revealed a positive and significant correlation ( $p < .01$ ) for both groups (older group,  $r = .54$ , younger group,  $r = .61$ ).

**2. Multiple and Partial Responses**—The correct responses of the participants to the idiom production task that included multiple attempts before producing the correct idiom were analysed for group differences. In view of our need to use proportions for these analyses, we used an arcsine transformation with weighted percentages to compare the group data on multiple and partial responses for the statistical analyses; the percentages reported below are prior to the transformation. Contrary to the first part of our second hypothesis, the older group did not produce proportionately more multiple attempts en route to their production of correct idioms (Old & Young = 12.9%;  $t = -.413$ ). However, in accordance with the second part of this hypothesis, older adults did produce proportionately more partial responses than the younger adults did (Old = 4.6%; Young = 2.5%;  $t = 3.32$ ,  $p < .01$ ).

### Following an Examiner Cue

**3. Correct Responses after an Examiner Word Cue**—When given the first word of the idiom as a cue, older adults had more 'correct-after-cue' responses than did younger adults (Old: 23.9%; Young: 14.8%,  $t = 4.46$ ,  $p < .001$ ). As could be expected from our pre-pilot rating procedure whereby we selected materials equally familiar to the younger and older groups, when the correct productions prior to an examiner word cue were summed with the correct-after-cue responses for each participant, the mean group production scores were not significantly different (Young:  $M = 35.89$ ; Old:  $M = 34.50$ ) (See figure 2).

### Post-hoc analyses

In a post-hoc analysis, we explored group differences on those productions *prior to an examiner cue* that contained part of the idiom and led to an incorrect response vs. those that led to a correct response. We asked whether the older group was less successful at generating the idiomatic expression after producing part of the idiom than the younger group. In our analysis we examined not only the partial responses for the two groups that were not correct (hereafter, Partial→Inc) but also those partial responses produced en route to a spontaneously produced correct response (partial→cor). Although the participants' productions containing part of the idiom constituted a small percentage of the responses overall (Young: 6.7%; Old: 7.3%), 35 and 31 of the older and younger adults, respectively, produced at least one partial response. (See table 1.) We compared the two types of partial responses (those resulting in a correct response and those not resulting in a correct response) between the two groups. Of the two types of partial responses, 70% of all the partial

responses given led to a correct response for the younger adults compared to only 32% for the older adults. A Mann-Whitney U test confirmed that the difference was significant: partial→cor, Old: Md = .33 Young: Md = 1.00,  $U = 235$ ,  $z = -4.02$ ,  $p = 0.001$ ,  $r = .51$ . (See figure 3).

A frequency count of the first substantive word within the Partial→Cor and Partial→Inc responses was performed. We focused on whether the spontaneous production of this word would result in successfully producing the idiom, and whether any group differences were present. For both groups, over 50% of the partial responses contained the first substantive word. However, for the older participants, 84% of the Partial→Cor responses contained the first substantive word vs. only 57% of the Partial→Inc ones. For the younger participants, the pattern was reversed. Of Partial→Cor responses, 53% included the first substantive word compared with 75% of the Partial→Inc ones.

## Discussion

In this study, we investigated idiom production and asked whether retrieval of idioms shows age-related differences analogous to those of single words. Our findings confirmed our first prediction that older adults experience retrieval difficulty with idioms, as with single words: the older adults in our study produced significantly fewer correct idiomatic expressions than the younger adults, even though the target idioms had been selected to have equal familiarity for both groups. Accuracy for both groups was moderately correlated with age, positively for younger adults and negatively for older adults. Contrary to our second prediction – that older adults would require more attempts to produce the target idiom than the younger adults – the older group did not produce more multiple attempts en route to the production of their target idiom responses than their younger counterparts. However in line with our prediction, they did produce proportionately more partial responses than the younger adults. In accordance with our third prediction, when participants were not successful in the production of an idiom, both groups benefitted from an examiner word cue, with older participants making relatively better use of the cue.

Recall the Transmission Deficit Hypothesis (TDH), as an explanation for idiom retrieval difficulties in older adults. According to this hypothesis, aging can weaken the strength or rate of priming of a network of interconnected nodes whose activation spreads linearly and sequentially within and between the semantic, phonological and articulatory systems (Burke et al., 1991; Fraas et al., 2002; James et al., 2007; MacKay & James, 2004; Neumann et al., 2009; O’Hanlon, Kemper & Wilcox, 2005; Rastle & Burke, 1996). Our findings suggest that weakening of these interconnections, which are essential for priming and activation to occur effectively, affects not only single-word production but also the production of idioms in the older group. Namely, we found greater difficulty for older adults than younger adults with producing idioms, with a negative correlation between age and accuracy of production (before cues), as well as larger proportion of partial responses that did not lead to a successful response in the older compared to the younger group. Although the TDH was created to explain lexical retrieval problems for single words in the elderly, its application to idiomatic expressions is suggested by the parallels in the retrieval process for idioms and their mutual vulnerability to the effects of aging. Moreover, in this task, memory-related factors were minimised in that there was no time constraint on performance and participants had the written scenarios in front of them. Therefore, age-related cognitive slowing – which has been proposed to account for age-related performance differences -- cannot explain the group differences we found.

Furthermore, the older adults were significantly less successful than the younger adults in generating a target idiom following a partial response. The presence of partial responses,

albeit a relatively small portion of the total responses elicited, of course indicates that the retrieval process for idioms – for both age groups – is not always ‘all or none.’ In this regard, partial responses may show a parallel to the tip-of-the-tongue phenomenon for single words, whereby part, but not all, of the idiom’s information is available. For this small subset of the items, younger adults were more successful (70%) than older adults were (32%) at eventually producing the correct idiom if their production included any substantive from the idiom; by contrast the older adults (85%) were more successful than younger adults (53%) in a subset of these instances, namely in generating the idiom if they could produce the first – rather than any – substantive, suggesting a more unitised representation of idioms for older adults.

The words of the idiomatic expression may be analogous to the phonemes of a single word in that they are components of the whole, they may prime the word or idiomatic phrase, yet neither the individual phonemes nor the words of the idiomatic phrase in isolation disclose the overall meaning of the whole (word or idiom). However, the greater tendency for older adults – compared to younger adults – to produce partial responses that did not result in correct idioms suggests an age-related problem with retrieving the words of the idiomatic phrase. A partial production of the idiom could be due to a failure to retrieve the phonological form of individual words or a reduction in the strength of the bonds among the words that comprise the idiom’s superlemma. Currently the available data do not dissociate these two possibilities.

In addition, a parallel between word retrieval and idiom retrieval is evident in the participants’ responses to cueing. That is, it is known that word retrieval in older adults tends to be facilitated by phonemic cueing (Nicholas et al., 1985). In the current study, age-related differences in the accuracy of producing idioms were eliminated once the first substantive was presented as a cue. Furthermore, in the case of a partial response, older participants were more successful in producing the target idiom if they spontaneously generated the first substantive. It is hard to know how much such a self-cue is ‘semantic’ or strictly lexical (in the case of more opaque idioms). Nevertheless, we posit that as the first phoneme of a word holds particular status vis-à-vis the word (e.g., Abrams, White & Eitel, 2003), so the first substantive holds particular status vis-à-vis the idiom. Of course only a study of whether cuing of other substantives within the idiom, along with non-substantive initial words, could test whether this is the case.

The greater retrieval difficulties that our older adults had, compared to our younger adults, in the relatively spontaneous production of equally familiar idioms, must be considered in light of the likelihood that the two groups are at different stages in their acquisition of idioms, as suggested by the correlations presented in figure 1. This difference in their stage of acquiring the idioms, we propose, entails somewhat different processes in producing them. For our younger participants the process of idiom acquisition reported for older childhood and adolescence (e.g., Chan & Marinellie, 2008; Nippold & Duthie, 2003; Nippold & Rudzinski, 1993) appears to develop further, well into young adulthood, as the correlation between increased accuracy and age seen in our younger-adult group suggests. For this group, then, partial responses may reflect that particular idiomatic expressions are still gaining in strength as units. This could also explain why the younger adults benefit only minimally from a first-word cue: if the idiom has not been fully acquired, partial information is not going to facilitate retrieval.

We argue that the older participants, by contrast, had achieved the unitisation of the idiom sometime in middle age, and by the time we test them, the connecting bonds among its constituents are weakening. For the older participants, we propose, in the case where there is a breakdown between ‘knowing’ what the target idiom is that they want to express, i.e., what



Levelt & Meyer (2000) would call ‘locating the superlemma of the idiom’, and producing it, the first substantive successfully triggers the entire idiom, both when they produce a partial production that includes the first word and when they are provided with the first word. In the case of unsuccessful production, a breakdown among the idioms’ constituent parts thwarts the ability of partial responses to trigger a correct production. This hypothesis about age-related differences is supported by Hyun et al. (in preparation) who found that even within the relatively narrow interval of idiom familiarity tested in this study, there was a positive correlation between it and production accuracy for the younger adults; by contrast, for the older adults, syntactic flexibility of the idiom was the largest predictor of production success. It is unclear the extent to which a problem retrieving individual words contributes to age-related problems retrieving idiomatic expressions, a problem that bears further study.

Older adults, we conclude, have difficulties with idiom production that are quite similar to their difficulties with single-word retrieval. In light of the relative semantic opacity of many idioms, it would be interesting to determine in future studies the extent to which they may behave more like proper nouns than common nouns. As well, our data point to an interesting lifespan trajectory of acquiring, and then losing, the ability to produce idiomatic phrases. Further study of subgroups of older adults as well as age groups not included in the current study, adolescents and the middle-aged, is clearly warranted.

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## Appendix

### Idiomatic Expressions

1. Kicked the bucket
2. Pulling his leg
3. Skeletons in the closet
4. Gotten up on the wrong side of the bed
5. A close call/shave
6. Couch potato
7. Neck of the woods
8. Bit their heads off
9. Turn over a new leaf
10. Got cold feet
11. Wrapped around her little finger
12. Skating on thin ice
13. It’s raining cats and dogs

14. Fall through the cracks
15. Put in his two cents
16. Butterflies in her stomach
17. Break a leg
18. Dressed to the nines/kill
19. A piece of my mind
20. Save for a rainy day
21. Taking a turn for the worst
22. Hit the road
23. The coast was clear
24. Talking to a brick wall
25. Let the cat out of the bag
26. Teach an old dog new tricks
27. We're all ears
28. Eyes were bigger than his stomach
29. Dead as a doornail
30. Under the weather
31. Head over heels
32. Sick as a dog
33. Kill two birds with one stone
34. A change of heart
35. Out on a limb
36. On the wrong foot
37. Showing her the ropes
38. A second wind
39. In the nick of time
40. Giving her the cold shoulder

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### Age and Accuracy Correlations by Group

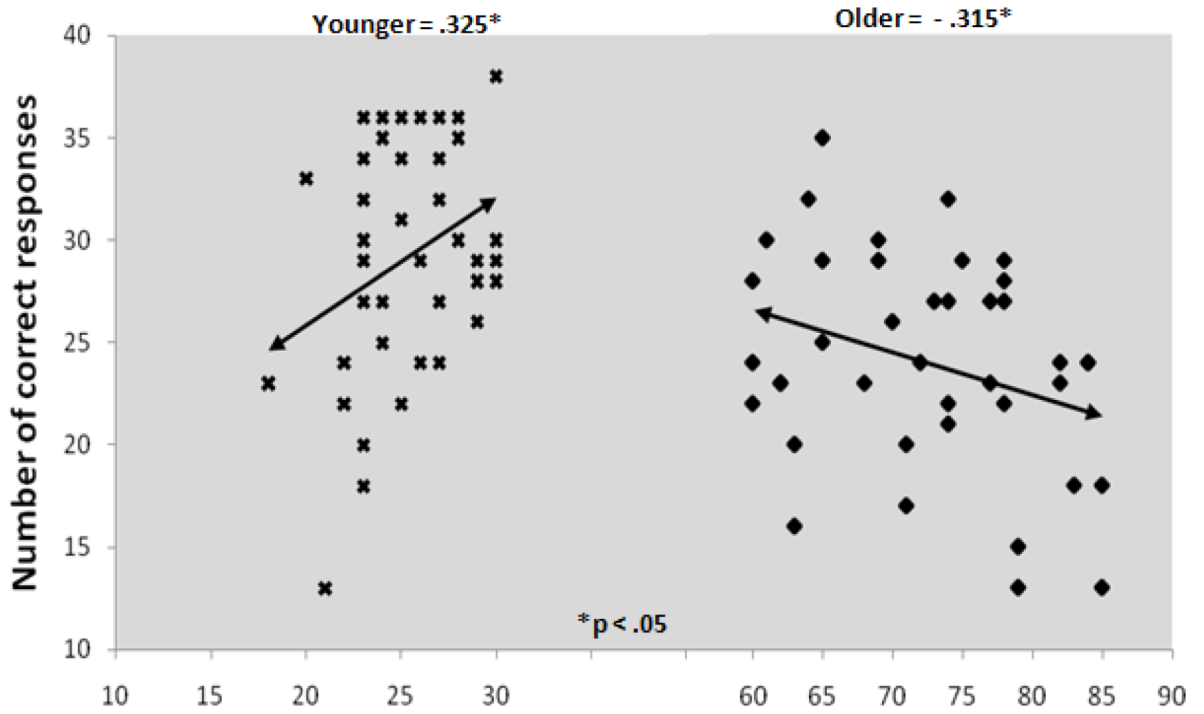
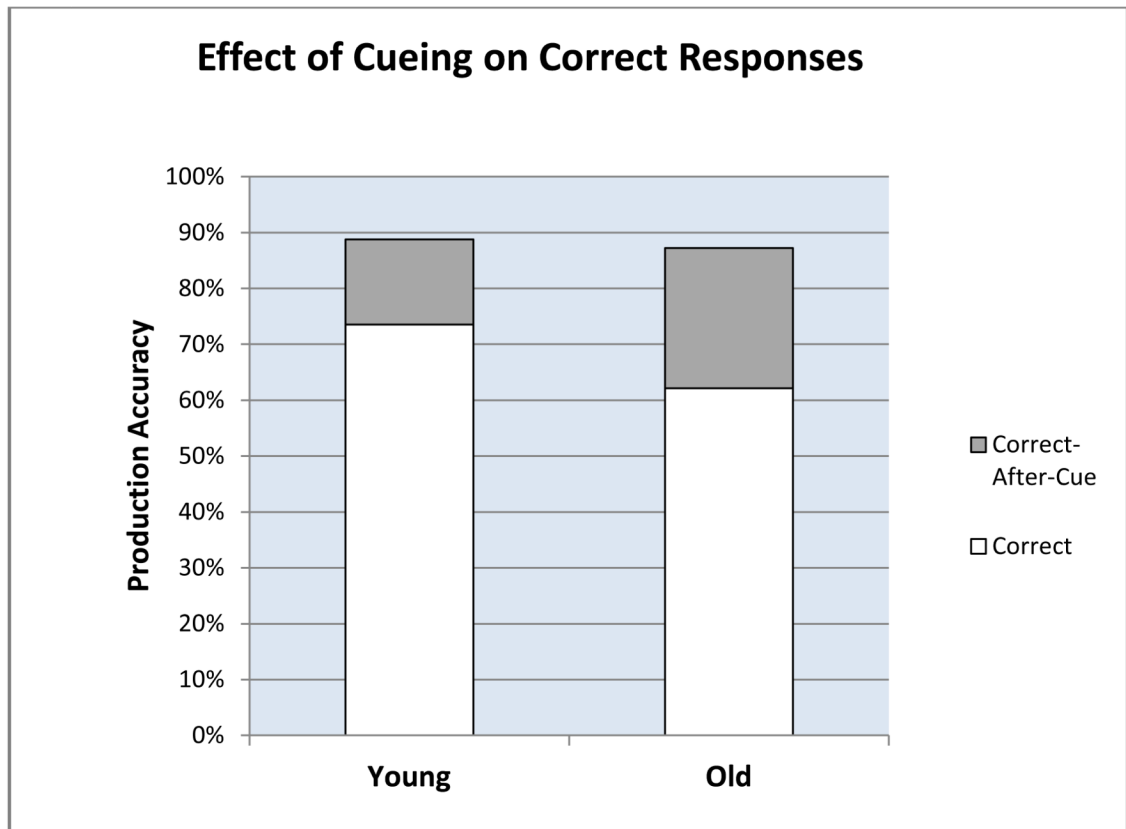
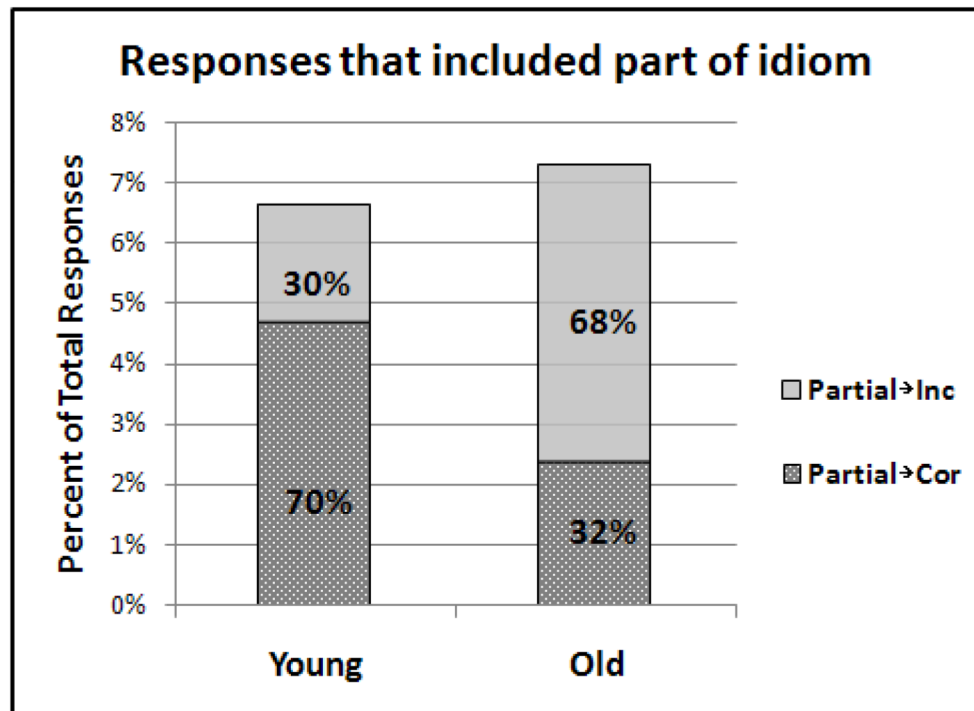


Figure 1. Age and Accuracy Correlations: Correct responses to the idiom production task by age group



**Figure 2. Correct and Correct-After-Cue Responses:** The percent correct of the total responses by the participants both before (white) and after (gray) the examiner’s initial word cue



**Figure 3. Responses containing part of the idiom: Results here distinguish Partial→Cor (where participants spontaneously produced the correct response after producing a partial attempt) from Partial→Inc (in which participants first produced a part of the target idiom but never subsequently gave the correct idiom)**



**Table 1**  
**Example of partial responses leading to a correct response (partial → cor)**

Example of partial → cor
Younger participant:
<i>Your eyes were big; people say you have big eyes, because ...</i>
<i>your mouth is bigger than your eyes,</i>
<i>I mean your eyes are bigger than your mouth.,</i>
<i>Your eyes are bigger than your appetite ...</i>
<i>You couldn't finish all your food, because your... your...</i>
<i>Is it an elaboration of that, that idiom?</i>
<i>Then your mouth, then your appetite,</i>
<i>Your eyes are bigger than your stomach.</i>
Older participant:
<i>Part of the woods.....</i>
<i>part of the neighbourhood.....</i>
<i>part of town....</i>
<i>Being in my part of... part of ...</i>
<i>woods I would say first.</i>
<i>Let's see ...</i>
<i>Neck of the neighbourhood</i>
<i>I am close, right?</i>
<i>Neck of the woods.</i>