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How Name Descriptiveness Impacts Proper Name Learning in Young and Older Adults

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Abstract

To elucidate the impact of name descriptiveness and aging on learning new names, 26 young and 26 healthy older participants learned visibly-descriptive (e.g., *Lengthy* for a giraffe), psychologically-descriptive (e.g., *Classy*), and non-descriptive (e.g., *Sam*) proper names for previously-unknown cartoon characters. More visibly-descriptive names were learned than psychologically- or non-descriptive names, which did not differ from each other. There was also a differential benefit for older adults when the name was visibly-descriptive of the referent, such that older adults learned visibly-descriptive names as well as young adults but there were substantial age-related deficits in learning psychologically- and non-descriptive names.

Proper names are harder to learn and remember than other types of biographical and semantic information (e.g., Cohen & Burke, 1993; McWeeny, Young, Hay, & Ellis, 1987; Valentine, Brennen, & Brédart, 1996), and aging is associated with substantial, disproportionate declines both in learning new names and in retrieving known names (e.g., Burke, MacKay, Worthley, & Wade, 1991; Evrard, 2002; James, 2004; 2006; James, Fogler, & Tauber, 2008; Rastle & Burke, 1996; Rendell, Castel, & Craik, 2005). The mechanisms underlying the specific difficulty of proper names are not yet well understood, although there is a growing body of research documenting the impact of various factors on proper name processing. The present research tested how name descriptiveness influences young and older adults' performance on a name learning task with the goal of advancing the development of theories of aging and proper name memory.

As described by Cohen (1990, p. 289), "names are meaningless, arbitrary, and difficult to image" and these properties contribute to the difficulty of learning and retrieving names (see also McWeeny et al., 1987). Herein, the term "non-descriptive" is used to designate the category into which most names fall, because most names do not provide information about the referent's mental or physical qualities (see also Fogler & James, 2007). In Western cultures, nicknames are occasionally derived from someone's appearance or personality (Hall, Waxman, Brédart, & Nicolay, 2003; e.g., a child with prominent cheeks may be nicknamed *Chubby Cheeks*; a talkative person may be called *Chatterbox*), but most people are not primarily known by such descriptive nicknames.

However, fictional characters in literature, cartoons, and comic strips often have descriptive names. Brédart and Valentine (1998) discovered that among well-known cartoon characters, those with names describing their salient physical or psychological properties were correctly named more often than those with non-descriptive names. Fogler and James (2007) extended Brédart and Valentine's experiment, testing a group of older adult participants in addition to

a college-aged (young adult) group to determine whether name descriptiveness would improve older adults' performance in spite of their more profound name-retrieval deficits. The advantage for descriptively-named cartoon characters (measured by response accuracy and correct response onset time) was evident for both age groups, with older adults showing a larger benefit from descriptiveness than young adults.

Fogler and James (2007) explained the advantage of descriptive names, and the particular benefit conferred to older adults, within Node Structure theory (NST; MacKay, 1987; MacKay & Burke, 1990). Within the model, the key difficulty of proper names is that, unlike other types of words (e.g., common nouns; adjectives), they are not multiply connected to other propositions or lexical items. This unique representational architecture makes names differentially difficult to learn and retrieve. NST's fundamental processes related to learning, aging, and proper name processing are detailed in the Appendix.

Fogler and James (2007) suggested that when viewing the picture of a familiar descriptively-named character, semantic information representing the character's visible and known features is activated, some of which shares identical phonology with the name (e.g., in the case of naming the *Pink Panther*, participants activate several large-cat names, including panther). Activation of nodes representing this semantic information transmits priming down to the lexical node that represents the desired concept, which in turn transmits priming down to phonological nodes that represent the sounds of the word. Within the model, priming is bidirectional, so that the lexical node for the character's name is subsequently primed bottom-up from the shared phonological nodes. In other words, the single connections that make it difficult to activate the proper-noun node are strengthened by virtue of bottom-up priming from the phonological nodes (see Abrams, White, & Eitel, 2003; James & Burke, 2000; Taylor & Burke, 2002, for evidence and discussion of phonological priming effects during word retrieval). Production of the name is then relatively fast and easy because the phonology has been made readily available. Compare this to trying to name a picture of *Charlie Brown*, for whom participants activate information about him being an often-glum, semi-bald kid who wears a striped shirt. *Charlie Brown's* semantic attributes do not prime the phonological nodes that comprise his name, so name retrieval is comparatively difficult and slow. The lack of age differences for producing descriptive names is consistent with older adults' intact bottom-up priming from activated phonological nodes (Taylor & Burke, 2002).

Crandall (2007) provided the first empirical demonstration that descriptiveness impacts proper name learning. She compared performance of young and older adults to determine whether the differential benefit that descriptive names conferred to older adults in Fogler and James (2007) would also emerge in a name-learning task. Participants learned names for novel cartoon characters with descriptive (e.g., *Cat Napper* for a sleeping cat) or non-descriptive names (e.g., *Bat Rapper* for the cat) over repeated testing rounds. Participants learned and recalled more descriptive than non-descriptive names, as expected. However, contrary to prediction, age group did not interact with name descriptiveness. The failure to find a particular benefit of descriptive names for older adults in Crandall's experiment was surprising in light of the name-retrieval results of Fogler and James (2007).

To clarify Crandall's (2007) results, analyses were conducted on the ratings that her participants made of the descriptiveness of each name following the learning task. Ratings of descriptive names did not differ for young and older adults, but older adults rated nondescriptive names as more descriptive than did young adults. Older adults were particularly likely to ascribe meaning to non-descriptive names, possibly inflating their percent correct for non-descriptive names and eliminating the expected interaction. In addition, Crandall did not strictly control the nature of the descriptive name (whether referring to a visible, physical part of the character or to a non-visible, mental or psychological aspect of the character).

The Current Experiment

The present experiment aimed to clarify the effects of name descriptiveness on learning names for never-previously-encountered individuals demonstrated by Crandall (2007). Under NST, descriptiveness should facilitate learning new proper names in a manner similar to retrieval because even though learning requires additional processes (detailed in the Appendix), bottom-up phonological priming is predicted to have beneficial effects for learning as well as retrieval. Specifically, the bottom-up priming from activated phonological nodes to the lexical name node is expected to enhance the formation of new connections required to create the representation of an individual's name. Age-related difficulty in forming new connections (see Appendix) should be overcome in the case of learning descriptive names because older adults benefit from bottom-up phonological priming to at least the same extent as young adults (James & Burke, 2000; Taylor & Burke, 2002).

To expand on Crandall's (2007) test of NST predictions regarding descriptiveness and name learning, visibly-descriptive names (e.g., *Lengthy* for a giraffe), psychologically-descriptive names (which could describe some not-immediately-apparent mental, emotional, or psychological attribute of the character; e.g., *Classy*), and non-descriptive items (which are only names; i.e., they do not have meaningful-word homophones; e.g., *Sam*) were compared. This categorization permits isolation of the particular aspects of descriptive names that impact learning new names. Using the NST framework, visibly-descriptive names are predicted to be the best learned and recalled for both age groups, with some advantage over psychologically-descriptive names, and a large advantage over non-descriptive names. Inasmuch as a visibly-descriptive name's phonology is primed from viewing its referent (e.g., the name *Sleepy* for a tired-looking donkey is cued by the character's visibly "sleepy" quality), these names should yield bottom-up priming of the name node and thus the best performance. A psychologically-descriptive name's phonology will not be activated automatically, but may develop over testing rounds as the psychological property becomes associated with the character. Therefore, psychologically-descriptive names were expected to show a smaller benefit of being descriptive. Name learning difficulty was predicted to be greatest for non-descriptive names, and older adults' name learning deficits were predicted to be most evident in this condition due to age-related deficits in priming transmission and therefore node commitment (see Appendix). This disproportionate name-learning deficit for older adults for characters with non-descriptive names was predicted to yield an age by name type interaction.

Method

Participants

Participants were 26 young adults (ages 19–29; $M = 22.73$) recruited from the University of Colorado at Colorado Springs and 26 older adults (ages 58–86; $M = 73.31$) recruited from the Colorado Springs community. The groups had similar years of education (young $M = 14.96$; $SD = 1.40$, older $M = 15.19$; $SD = 2.32$), $p > .05$. Scores on the Shipley (1940) 40-item vocabulary test were higher for older ($M = 35.92$; $SD = 3.38$), than young adults ($M = 32.08$, $SD = 3.86$), $t(49) = 3.79$, $p < .001$. All older adults who were recruited to participate in the experiment passed the Mini-Mental-State-Exam (Folstein, Folstein, & McHugh, 1975) with a minimum of 27 correct out of 30. Young participants received extra credit for a psychology course and older participants were paid \$10.

Materials

The 14 characters from Crandall (2007) were used along with two similarly-drawn characters. Pictures were in black and white ($N = 2$) or in color ($N = 14$), and all pictures were of similar visual quality. A visibly-descriptive name based on a salient physical property of the character

was generated for each of the 16 characters. Descriptive names that would be easily guessed by looking at the picture were avoided. After choosing a visibly-descriptive name (e.g., *Lengthy* for the giraffe), psychologically-descriptive (*Legend*) and non-descriptive (*Louis*) names were selected to approximate the visibly-descriptive name in length and initial phoneme. Non-descriptive names were of medium frequency (range = .06%–.29% according to the U.S. Census website; www.census.gov/genealogy/names/names_files.html). All names were one word in length.

Four sets of materials were created, each containing 16 characters: four with visibly-descriptive names, four with psychologically-descriptive names, and eight with nondescriptive names. Name types were rotated across characters in different sets. The eight nondescriptive names were used for different characters in all four sets (each character had the same non-descriptive name in two sets, a visibly-descriptive name in one set, and a psychologically-descriptive name in one set). Visibly- and psychologically-descriptive names were matched on their frequency as words in Frances and Kucera (1982), but non-descriptive names were presumed to have lower frequency of use than the words comprising the other name types.

Initially, name length and first phoneme were matched per character across all sets (e.g., *Lengthy*, *Legend*, and *Louis* for the giraffe). During a materials check, it was observed that participants used alliteration to aid recall, linking the assigned name to a physical property even when the name was not descriptive of that physical property (e.g., when given the name *Louis* for the giraffe, participants would say “Long Louis” during recall, indicating that alliteration was being used as a cue). Thus, name characteristics were matched across the set, but not per character (e.g., the giraffe was assigned the names *Lengthy*, *Classy*, and *Sam*).

Procedure

Participants were randomly assigned to one stimulus set and tested individually. During an “introduction round,” participants were instructed to learn all characters’ names. They saw each character on a separate Power Point slide for 3 s, with its name printed atop the picture. Pictures were then shown again in pre-selected random orders over multiple “testing rounds,” and participants attempted to recall each character’s name (with no time limit to produce a response). Responses were strictly scored (i.e., only completely accurate responses were correct). Incorrect responses (including “I don’t know”) during the testing rounds were corrected (i.e., the correct name was supplied aloud), and rounds continued until participants correctly recalled all names on two successive rounds or until they completed 12 rounds.

Results

Young adults required fewer testing rounds ($M = 4.58$, $SD = 1.58$) to learn the names of the cartoon characters than did older adults ($M = 7.42$, $SD = 3.43$), $t(50) = 3.84$, $p < .001$. All young adults reached criterion within 9 rounds, but 27% of older adults did not reach criterion within 12 rounds. This age difference in learning names to criterion replicates previous findings (e.g., James, 2004; James & Fogler, 2007; James et al., 2008).

Percentage of correctly named characters was analyzed in a 2 (young vs. older adults) $\times$ 3 (visibly-descriptive, psychologically-descriptive, non-descriptive names) mixed factorial ANOVA. As shown in Figure 1, young adults learned and recalled more names than older adults, $F(1, 50) = 12.30$, partial $\eta^2 = .20$, $p < .01$. A significant effect of name type was also found, $F(2, 100) = 46.80$, partial $\eta^2 = .48$, $p < .001$: More visibly-descriptive names were learned and recalled than psychologically-descriptive ($p < .001$) and non-descriptive names ($p < .001$), which did not differ from each other ($p > .05$). The difficulty for non-descriptive names could be due to their lower frequency of use than the other two name types (James & Fogler, 2007), but the finding that psychologically-descriptive names (which were matched on

frequency with the visibly-descriptive names) were not more readily learned than nondescriptive names suggests that results do not reflect a straightforward frequency effect.

There was a significant interaction between age and name type, $F(2, 100) = 4.99$, partial $\eta^2 = .09$, $p < .01$, which was driven by the disproportionate learning deficit in older adults for both psychologically-descriptive and non-descriptive names (see Figure 1). Percent of correctly recalled names was highest for visibly-descriptive names for both young and older adults, $ps < .01$. Young adults recalled more psychologically-descriptive than nondescriptive names, but the difference was not significant, $p = .09$. Older adults' recall did not differ for non-descriptive and psychologically-descriptive names, $p > .73$. Recall of visibly-descriptive names did not differ by age, $p > .05$, but young adults outperformed older adults on psychologically-descriptive names, $p < .01$, and on non-descriptive names, $p < .01$.

Because both age groups performed near ceiling for visibly-descriptive names, another analysis was conducted on percent correct naming from only the first testing round to ensure that a ceiling effect was not responsible for the obtained interaction. These data were analyzed in a 2 (young vs. older adults) $\times$ 3 (visibly-descriptive, psychologically-descriptive, nondescriptive names) mixed factorial ANOVA. The pattern found for the overall data was maintained (see Figure 1). Young adults outperformed older adults, $F(1, 50) = 10.37$, partial $\eta^2 = .17$, $p < .01$, there was a main effect of name type, $F(2, 100) = 48.69$, partial $\eta^2 = .49$, $p < .001$, and age interacted with name type, $F(2, 100) = 5.75$, partial $\eta^2 = .10$, $p < .01$. Follow-up t-tests indicated that both young and older adults recalled more visibly-descriptive than psychologically-descriptive or non-descriptive names, $ps < .01$. However, young adults recalled marginally more psychologically-descriptive than non-descriptive names, $p = .05$ while older adults' recall of psychologically-descriptive and non-descriptive names did not differ, $p > .40$. Recall of visibly-descriptive names did not differ by age, $p > .27$, but young adults outperformed older adults on psychologically-descriptive names, $p < .001$, and on nondescriptive names, $p < .05$. This indicates that the interaction found in analysis of the overall data was not an artifact of a ceiling effect, but rather due to a genuine disproportionate deficit in recall for psychologically-descriptive and non-descriptive names for older adults.

A by-items analysis (on percentage of trials with correct responses per character picture) using a 2 (young vs. older adults) $\times$ 3 (visibly- vs. psychologically- vs. nondescriptive names) repeated measures ANOVA confirmed the pattern of the by-participants analysis: There were main effects of age, $F(1, 15) = 23.07$, partial $\eta^2 = .61$, $p < .001$, and of name type, $F(2, 30) = 53.63$, partial $\eta^2 = .78$, $p < .001$, and an interaction between the two factors, $F(2, 30) = 5.52$, partial $\eta^2 = .27$, $p < .01$. Young adults outperformed older adults for psychologically- and non-descriptive names, $ps < .01$, but there was no age difference for visibly-descriptive names, $p > .28$.

Examination of participant errors indicates that guessing was not responsible for the ease with which visibly-descriptive names were learned. For a particular character, three-quarters of the participants met the character when it was assigned a name that was not visibly-descriptive. These participants never supplied the name that was the character's visibly-descriptive name in another set. That is, when participants were introduced to the giraffe as *Sam* or *Classy*, they never erroneously called the giraffe *Lengthy*, although participant errors did sometimes include other possible descriptive names, such as *Stretch*. This evidence indicates that the high degree of accuracy for visibly-descriptive names did not result from participants guessing the names.

Discussion

The obtained main effects comport with results of previous research, which has identified an age decrement in learning names in association with faces (e.g., James, 2004; James & Fogler,

2007; James et al., 2008) and a memory benefit for descriptive names (e.g., Brédart & Valentine, 1998; Crandall, 2007; Fogler & James, 2007). The present experiment demonstrates that visibly-descriptive names are better learned and recalled than psychologically- or non-descriptive names. In reality, most individuals' names are arbitrary labels that do not describe their referent. These findings implicate names' non-descriptive nature as one reason for the difficulty people generally report in learning names. The comparison of visibly-descriptive and psychologically-descriptive names refines understanding of the descriptiveness effect: Psychologically-descriptive names were no more easily learned than non-descriptive names, and the benefit of descriptiveness was limited to names which reference a salient visible or physical aspect of the character.

Brédart and Valentine (1998) and Fogler and James (2007) found an advantage for descriptive names using characters with a mixture of visibly- and psychologically-descriptive names (e.g., *Pink Panther*; *Oscar the Grouch*; *Pig Pen*). However, participants in those studies were expected to be familiar with some of the defining (physical and psychological) qualities of those well-known characters. In the case of novel acquaintances, only visible, physical characteristics can be immediately known, and therefore participants process psychologically-descriptive names just as if they were arbitrary. In other words, even though psychologically-descriptive names are definable and have the potential to describe their referent, without corroborating evidence that the individual possesses the quality implied by the descriptive name, the name is treated as arbitrary. In the same way that *baker* loses its meaning when preceded by the name designator "Mr." (McWeeny et al., 1987), a psychologically-descriptive term is rendered meaningless when given the "name" designation. Results suggest that if an unknown individual's name does not have an obvious visible link to his or her appearance, the name will be treated as arbitrary and non-descriptive.

It was found that visibly-descriptive names facilitated learning new names even more for older than young adults, and the predicted age by name type interaction was obtained, driven by older adults' differential deficits for psychologically-descriptive and nondescriptive names coupled with their preserved ability to learn visibly-descriptive names. Crandall (2007) did not obtain this interaction but the separation of visibly- and psychologically-descriptive names in the current experiment allowed the interaction to emerge. These findings indicate that age-related problems for learning new names vary with different types of descriptive names: When the names are strictly controlled, a benefit limited to visibly-descriptive names is revealed.

Perhaps the most striking finding in this research is the identification of a condition in which older adults do not show an age-related decline on an episodic memory task. Age-related declines are pervasive on new-learning tasks involving recall, even when the task involves meaningful information (e.g., Bäckman, Small, & Wahlin, 2001; Light, 1991; Woo & Schmitter-Edgecombe, 2009). Identification of a name-learning condition in which older adults perform as well as young adults, even after only a single presentation of the stimuli, is surprising and cannot be accounted for by theories which suggest generalized age-related cognitive declines.

NST (Cohen & Burke, 1993; James, 2004; MacKay, 1987) claims that a name has a single connection linking it to its referent. Names are not multiply-connected to semantic nodes, even when the name is a homophone of another word. This is purportedly true of visibly-descriptive as well as psychologically-descriptive and non-descriptive names. The advantage found for visibly-descriptive names is likely due to activation of the phonological nodes for words that describe physical aspects of the character upon seeing the character's picture. This activation transmits bottom-up priming to the appropriate lexical name node, facilitating node commitment. For example, a giraffe has a long neck, and the adjective *long* is connected to a semantic network that includes the definition of *long* and its synonyms. One of these synonyms,

lengthy, shares the entire phonology of the character's name (*Lengthy*). When the synonym *lengthy* is activated, it transmits priming down to the phonological nodes, which transmit priming back up to the name node, *Lengthy*. Even though the word *classy* is linked to a semantic network, it is not linked to the obvious properties of the given character; thus, the node for *classy* is not activated and does not send bottom-up priming to the name node, *Classy*. In this fashion, a definable name that is not obviously descriptive of the referent (e.g., *Classy*) is no different from a non-meaningful name (e.g., *Sam*), which has no semantic network (apart from possible ethnicity or gender cues).

An alternate possibility suggested by Fogler and James (2007) is that descriptive names, unlike all other names, have multiple connections to their referents. This different representational architecture for descriptive names could result from lifelong development of additional connections within the semantic network, with older adults' longer lives allowing for more connections to be formed. This explanation requires modification of the theory, but the data from Fogler and James' experiment could not rule it out. However, multiple connections to name nodes cannot explain the obtained pattern of results. There is no reason that a visibly-descriptive name, but not a psychologically-descriptive name, would develop these multiple connections. For example, if the visibly-descriptive name *Lengthy* was easy to learn because synonyms for *lengthy* (e.g., long, tall) were directly connected to the name node for the character, then the psychologically-descriptive name *Classy* would also be easy to learn because synonyms for *classy* (e.g., sophisticated, elegant) should also be directly connected to the character's name node. Psychologically-descriptive names were learned no more easily than non-descriptive names, indicating that bottom-up priming is a more likely mechanism than multiple connections to explain present results.

One possible caveat in interpreting these results is that the psychologically-descriptive names may have conflicted with participants' perception of the characters. Lea, Thomas, Lamkin, and Bell (2007) found support for the anecdotal feeling that a person does or does not "look like a *Bob*," and that this influences name learning. It is possible that the psychologically-descriptive names that were used evoked prototypes that were inconsistent with or irrelevant to the presented characters. For example, the name *Classy* may bring to mind a referent that has nothing in common with the picture of the giraffe to whom the name *Classy* was assigned, decreasing name-learning performance for psychologically-descriptive names. Future research should address whether older adults have name prototypes like young adults and how that might impact their name learning abilities.

These results contribute to understanding the aspects of proper names that make them difficult to learn and retrieve. Unfortunately, the findings do not suggest a straightforward mnemonic trick to assist with learning new names. Research that has tried to train participants to establish meaning for a name to improve learning has not always succeeded (e.g., Milders, Deelman, & Berg, 1998; Morris, Fritz, Jackson, Nichol, & Roberts, 2005). In fact, both young and older adults benefit more from simply being told that they need to learn the names for the faces than from being explicitly instructed to process the names semantically (Troyer, Haflinger, Cadieux, & Craik, 2006). These results clearly show that the name must be visibly, descriptively linked to its referent in order to assist in learning.

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Appendix: Learning and Memory for Proper Names within Node Structure Theory

NST (MacKay, 1987) is a broad cognitive theory that posits storage of information in a vast network of representational units called nodes. NST is an interactive-activation model that includes lexical nodes (representing words and names), semantic nodes (representing meaning), and phonological nodes (representing sounds). Inter-node connections transmit priming, and when sufficient priming accumulates, the node can be activated and its contents become available to consciousness. According to MacKay and Burke (1990), weakened internode connections lead to insufficient priming transmission, and three factors are stipulated to cause weakening: non-recent use, non-frequent use, and aging (i.e., all of older adults' internode connections are weaker than young adults'). Node commitment is the term for the process of new learning in NST, and node commitment requires very strong levels of priming, much greater than are necessary for activation of already-committed nodes. Because weakened connections reduce transmission of priming, node commitment (i.e., new learning) is harder for older than young adults.

Deficits in the transmission of priming interact with the architecture of NST to explain why proper names are particularly difficult to learn. Within NST, a common noun node is connected to semantic nodes that are related to or definitional of the noun. For example, the node for *teacher* is connected to many nodes containing information that has been linked to the word throughout one's lifetime (e.g., works in a school, has students). A multiply-connected node such as *teacher* receives convergent priming from all of its connections and is therefore more likely to receive adequate priming to enable activation than a node with only a single connection. If one of the connections fails to transmit sufficient priming for activation, the many other nodes connected to the target node can compensate. A similar benefit of convergent priming is found for learning new common nouns: Known aspects of their meaning or related terms provide priming via associative connections so that ample priming converges on the node, allowing node commitment to occur.

However, proper names do not have this multiple-connection advantage. Proper names have only single connections between the node representing the person's identity and the node representing the person's name. Convergent priming is not possible; adequate priming must be transmitted across that single connection or activation will fail, and the name will not be accessed. Learning a name for a new acquaintance also relies on ample transmission of priming to enable commitment of a new node, and the single connection in the representation of a name makes learning difficult because that single connection is responsible for adequate priming

transmission to enable node commitment (see James, 2004; James et al., 2008 for additional details of learning new names in NST). Imagine learning the occupation and name of a newly-encountered person. When learning that she is a teacher, priming summates from the many interconnected nodes that comprise the meaning of the occupation, so that if any one connection fails to transmit sufficient priming, learning can still occur. However, when learning that her name is *Tara*, if the single connection between the node representing her as an individual and the node for her name fails to transmit adequate priming, learning does not occur.

Figure 1.

Percentage of correctly named cartoon characters per name type for young and older adults in the entire experiment (left panel) and in the first testing round (right panel; error bars represent 1 SD).