A Fieldworker's Reflection on the Psycholinguistics of Language and Aging*

Katie Sardinha
Independent Scholar

Abstract: How does language change across the lifespan? Seven findings from the psycholinguistics literature on language and aging are discussed, each of which are of particular relevance to anyone who carries out linguistic research with older adults. Drawing upon experiences doing linguistic research on Kwak'wala, a Wakashan language spoken on the central coast of British Columbia, I reflect on ways that these findings can manifest in a fieldwork context.

Keywords: language and aging, psycholinguistics, fieldwork, Kwak'wala

1 Introduction

In British Columbia, more than half of indigenous first-language speakers are over the age of 65 (First Peoples' Cultural Council 2018). Given that most research on indigenous languages is carried out with older adults, anyone who does fieldwork on these languages should have some knowledge of how language changes (and doesn't change) across the lifespan. In a fieldwork context, understanding how language production and comprehension are affected by the course of normal aging can help fieldworkers adapt their research methodologies to better accommodate elderly language consultants.

Seven key findings have been selected from the psycholinguistics literature for discussion below, each of which have particular relevance for anyone engaged in fieldwork with older adult speakers. These seven findings are summarized in (1).

(1) Seven key findings from psycholinguistics

i. Most core language processes are robust to normal aging.
ii. In general, language production undergoes more noticeable decline than does language comprehension in advanced age.
iii. Tip-of-the-tongue (TOT) states become more common over the lifespan.
iv. Hearing loss and bottom-up changes in auditory processing, both of which are associated with advanced age, make comprehending speech more effortful.
v. Linguistic experience renders older adults more adept at using contextual cues to aid in comprehension. Increased top-down processing compensates somewhat for age-related sensory deficits.
vi. Syntactic complexity in natural discourse, both spoken and written, decreases with age.
vii. The structural complexity and overall quality of narratives increases with age.

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Contact info: katie.sardinha@berkeley.edu

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One limitation of the existing research on language and aging is that most of it has been carried out with native speakers of English. In what follows, I will highlight a few language-specific ways that age-related language change can manifest, drawing on my experiences working from 2009–2021 with older adult speakers of Kwak'wala, a Wakashan language spoken on the central coast of British Columbia. I will also reflect on strategies for overcoming some of the more common age-related difficulties that may arise in the course of linguistic elicitation.

An annotated bibliography of the relevant psycholinguistics literature is provided, summarizing the research which has served as the empirical basis for the generalizations in (1).

2 Seven findings from the psycholinguistics literature on language and aging

2.1 Most core language processes are robust to normal aging

Perhaps the most significant discovery about how language changes across the lifespan is that to a significant degree, it doesn't: most core language processes are robust to normal aging in healthy adults (Shafto & Tyler 2014). More specifically, knowledge of language remains remarkably stable in old age, while the ability to make effective use of this knowledge — to produce and comprehend speech in real life situations — can show varying degrees of change over the course of the human lifespan. To put this into Chomskian terms: linguistic competence remains stable across the lifespan, while some aspects of linguistic performance undergo age-related changes.

Some aspects of cognition involved in language performance tend to undergo decline in advanced age. Most notably, these include declines in working memory, general slowing in processing speed, and a reduction in inhibition (i.e. the ability to tune-out irrelevant stimuli) (Thornton & Light 2006). Age-related hearing loss (discussed in Section 2.4) can also negatively affect language performance.

Other aspects of linguistic performance improve over the lifespan as a result of accrued experience and learning. Vocabulary size, for instance, generally increases over the lifespan (Verhaeghen 2003), while the ability to use context as an aid to language comprehension (discussed in Section 2.5), and the ability to tell complex and interesting stories (discussed in Section 2.7) also tend to show marked improvement with advancing age.

From a brain science perspective, the relative stability of language might be due in part to changes in neural dynamics across the lifespan, including compensatory neural recruitment and functional reorganization in the brain (Shafto & Tyler 2014). From a behavioural perspective, even when certain deficits exist — such as hearing loss or memory issues — most healthy older adults are able to effectively compensate for these deficits in a wide range of real-life circumstances (Thornton & Light 2006).

In practical terms, the finding that most core language processes are robust to normal aging implies that linguistic fieldwork is possible and worthwhile with speakers of even very advanced age. Even though the natural effects of aging can make linguistic knowledge more challenging to access, the possibility of accessing it remains.

2.2 In general, language production undergoes more noticeable decline than does language comprehension in advanced age

In advanced age, an asymmetry tends to develop between the ability to produce language and the ability to comprehend language, such that in general, language production undergoes more noticeable decline than does language comprehension (MacKay & James 2004; Shafto & Tyler

2014; Wingfield & Lash 2015). Not only is this asymmetry manifest in empirical research on older adults, but it also accords with what older adults report about their own speech (Ryan et al. 1992).

Declines in language production are more socially visible than declines in language comprehension, and can lead to negative self-appraisal and negative appraisal by others (Hummert et al. 2004). Under the influence of negative stereotypes, people who perceive older speakers' production difficulties sometimes feel compelled to adopt a patronizing, simplified speech style to communicate with older speakers, a form of overaccommodation termed *elderspeak*. Elderspeak is characterized by fewer clauses per utterance, shorter sentences, fewer self-embedded clauses, more lexical fillers, more sentence fragments, more pauses, and a slower speech rate (Thornton & Light 2006:276–278). Though good intentions may underly the use of elderspeak, it tends to be perceived by older adults as patronizing and inappropriate. In addition to reinforcing negative stereotypes, elderspeak can lead older adults to experience lowered self-esteem, social withdrawal, and ultimately, can contribute to functional language decline (Hummert et al. ibid.).

In a fieldwork situation, elderspeak should be carefully avoided. In cases where accommodation to older speakers is necessary, such as when working with a speaker with severe hearing loss, several specific accommodations are recommended. These include providing more semantic elaboration (not less!), slowing your speech rate, and reducing your use of subordinate and embedded clauses (Thornton & Light 2006). In general, treating older adults as competent conversation partners gives rise to better overall communication and builds positive relationships between conversation partners (Hummert et al. 2004).

For researchers, it is important to avoid underestimating speakers' knowledge of language based on perceived production difficulties. Moreover, even when production difficulties are severe, it may still be possible to access a language consultants' knowledge of her language by designing research tasks that are comprehension based, rather than production based.

2.3 Tip-of-the-tongue (TOT) states become more common over the lifespan

A tip-of-the-tongue (TOT) state occurs when a person temporarily cannot recall a word while at the same time, having a sensation of knowing it. TOT states occur at every age, but they increase in frequency over the lifespan (Burke et al. 1991) and are reported by older adults to be one of the cognitive problems most seriously affected by aging (James & Burke 2004). In my experiences doing fieldwork with older adult language consultants, frequent TOT states are probably the most common age-related difficulties encountered during elicitation.

TOTs states are experienced somewhat differently by older and younger adults (Burke et al. 1991, Thornton & Light 2006). Younger adults are more likely to recall at least part of the phonology of the target word, while older adults are more likely to not recall any of the target word's sounds. It is also more common for younger adults to experience 'persistent alternates' — words that pop into your head and block the target word you are trying to remember. For instance, a speaker trying to recall the word *ottoman* might get the similar-sounding word *Audobon* stuck in their head instead, preventing them from bringing to mind the target word. *Audobon* in this instance is the persistent alternate. In general, TOT states for older adults are experienced more often as the mind just going blank, leaving the target word's phonology inaccessible to recall. Eventually, many TOT states get resolved by the target word coming to mind. Older adults, however, tend to experience a longer average TOT resolution time than do younger adults.

Research with English speakers has found that in general, some words are more vulnerable to producing TOT states than others (Burke et al. 1991, Thornton & Light 2006). Words that are more vulnerable include proper nouns (e.g. *Baker* vs. *baker*), low frequency words (especially in dense

phonological neighbourhoods),[1] and words that have not recently been used by the speaker. If the language being studied is one that is not used on a daily basis, this last category may be particularly relevant.

In my experience doing fieldwork with Kwak'wala speakers in their 70s and 80s, frequent TOT states have been the most salient age-related difficulty encountered during elicitation. A set of Kwak'wala words that were observed to produce TOTs from a random sampling of sessions is provided in (2), accompanied by notes related to whether each word falls into one of the categories deemed likely to produce TOT states.[2]

(2) Some words observed to produce TOT states in Kwak'wala

i.	ǰikʷa	('sweep')	*dense neighbourhood*
ii.	qəsa	('wind, coil')	*not recently used* [3]
iii.	qʷiɬa	('undo')	*dense neighbourhood*
iv.	gəbu	('jacket')	
v.	nəqela	('lunch')	*dense neighbourhood*
vi.	ʔigis	('sand')	
vii.	ḳum̓is	('crab')	
viii.	subayu	('axe')	
ix.	nəxʷʔid	('wrap')	*dense neighbourhood*

We might expect the way TOT states manifest in any given language to vary slightly, depending on the structure of the lexicon in that language. An English speaker in a TOT state tends to cycle through similar-sounding words in their mental lexicon in an attempt to come up with a target word (Burke et al 1991). Similarly, a Kwak'wala speaker in a TOT state will tend to cycle through stems that phonologically resemble the target root. Sometimes, however, this cycling appears to target phonologically possible root shapes without regard to whether they are in the lexicon of the language. An example of this is shown in (3), where the target root is *ǰikʷ*- 'to sweep'. In the process of trying to remember the root *ǰikʷ*-, the speaker cycles through five phonologically similar root shapes: *kʷiǰ*-, *kʷikʷ*, *kʷixʷ*-, *xʷikʷ*-, and *qiǰʷ*-. Only two of these roots are listed in the Boas (1948) dictionary.[4] Note that Kwak'wala roots are typically shaped CVC(C), and that verbal roots in Kwak'wala are bound morphemes and require either an aspectual suffix or the stem completive final vowel, *-a*.

[1] The phonological neighbourhood of a word consists of the set of words that differs from the word in terms of one phoneme. For instance, the phonological neighbourhood of the word *grape* includes *gape*, *great*, *grain*, *group*, etc. When a word has a 'dense' phonological neighbourhood, it means that there are many other similar-sounding words in the language.

[2] I have not commented on word frequency, as I do not have word frequency data for Kwak'wala. My impressions about neighbourhood density are based on looking through a Kwak'wala dictionary and counting the number of similar-sounding roots (Boas 1948).

[3] Two language consultants had difficulty recalling this word, and both commented that they had not used the word in a very long time.

[4] Boas (1948): *kʷiǰ*- 'to club, to swing, to strike with stick' (p. 302), *kʷikʷ*- 'eagle' (p. 301), *kʷixʷ*- [not listed], *xʷikʷ*- [not listed], *qiǰʷ*- [not listed].

(3) TOT state with *x̌ikʷ-* ‘sweep’ in Kwak’wala[5]

Target root: x̌ikʷ- ‘to sweep’
Attempted roots: kʷix̌-, kʷikʷ-, kʷixʷ-, xʷikʷ-, qix̌ʷ-

i.	SP:[6]	q̓əyu[d]ƛ̓ənƛ̓ x̌ən gənaməmwuʔɬeʔ, wuʔɬeʔ.
ii.		ƛ̓u:mən ʔəbəmp ki̓ʔs n̓əmp̓ən niɬ, uh, ʔex̌sda qənuʔx̌ʷ kʷix̌, uh.. kʷikʷ... kʷixʷʔix... kʷixʷʔix? Oh...
iii.	KS:	Is that...
iv.	SP:	x̌ikʷʔi! x̌ikʷʔi x̱a... floor.
v.	KS:	ʔəwin̓agʷiɬ, maybe?
vi.	SP:	...ʔəwin̓agʷiɬ.
vii.		leʔe ʔəx̌aya... p̓ət̓i, p̓ədix̌, uh, leʔe n̓axʔida.
viii.		heʔəmgis ki̓ʔs ʔex̌sda qən heʔ g̓ʷigili ƛ̓uẃən n̓in̓ula.
ix.		n̓ikida q̓ʷəlsq̓ʷəly̓akʷ, x̌ʷ, x̌ikʷasex̌us dalax̌ lax̌ada... hix̌ʔideʔ.
x.		k̓i:ʔsənuʔx̌ʷ hiɬq̓aləm qaʔənuʔx̌ʷ x̌ikʷa leʔe n̓axʔida.
xi.	KS:	[…] And so the word for ‘sweeping’, what was it? [...]
xii.	SP:	Oh, xʷikʷ... qix̌ʷa. Oh, x̌ikʷa!
xiii.	KS:	Kay.
xiv.	SP:	x̌ikʷa x̌a... (20150719_KW_SP_1.wav)

The five unsuccessful attempts at *x̌ikʷ-* in (3) all phonologically resemble the target root in possessing some combination of velar and uvular consonants in onset and coda position. Kwak’wala is known for having relatively many velar and uvular consonants, as shown in Table 1. This means that roots with velar and uvular consonants in onset and/or coda position will tend to have dense phonological neighbourhoods. Based on Burke et al.’s (1991) findings, we would predict low frequency roots of this sort to be particularly vulnerable to TOTs.

Table 1: Kwak’wala consonants

[5] A hypothesized translation of the Kwak’wala in this passage is as follows: (i) ‘I’m going to talk about my childhood long ago.’; (ii) ‘My mother really never once told, [uh,] wanted us to [sweep]...’ [...]; (iv) ‘sweep, sweep the...’; (v) ‘floor in house’; (vi) ‘floor in house’; (vii) ‘when uh, it got dark, after sunset’; (viii) ‘And she didn’t want me or my older siblings to do that.’; (ix) ‘The elders said you swept away your money into the fire.’; (x) ‘We were not allowed to sweep when it was after sunset.’

[6] ‘SP’ is an abbreviation for ‘speaker’.

	Bilabial	Alveolar	Lateral	Palatalized Velar	Labialized Velar	Uvular	Labialized Uvular	Glottal
Stops	p b	t d		k g	k^w g^w	q ǧ	q^w $ǧ^w$	ʔ
Ejectives	ṗ	ṫ		ḳ	$ḳ^w$	q̓	$q̓^w$	
Affricates		c dz	ƛ λ					
Ejective Affricates		c̓	ƛ̓					
Fricatives		s	ɬ	x	x^w	x̌	$x̌^w$	h
Sonorants	m	n	l	y	w			
Glottalized Sonorants	ṁ	ṅ	l̓	ẏ	ẇ			

TOT states can be frustrating for language consultants, especially when they are experienced one after the other in a session. For all fieldworkers, but especially those who work with older adults, it is important to reflect on strategies for supporting consultants while they experience TOT states in elicitation. In many cases, it is appropriate to be patient and just let the language consultant work through a TOT state on their own. At other times, however, TOT states can become overwhelming and it can be helpful to try and help bring about their resolution. I commonly use two strategies for trying to help resolve TOTs in a session: the direct method and the indirect method. I will also describe a third, as of yet untested method: the imagination method.

The direct method of resolving TOTs involves simply providing the language consultant with the target word they are after, using a dictionary to look up the target word when needed. An example of the direct method is shown in (4).

(4) The direct method of resolving TOTs

i. KS: So how would we say, um, ‘Monica took a crab and brought it home’...?
ii. SP: dax̌ʔidi Monikeǎa [‘Monica took a...’] ... Gee, it’s on the tip of my tongue, to say ‘crab’. Do you remember what ‘crab’ is?
iii. KS: Is it q̓um̓is?
iv. SP: Oh q̓um̓is! (20170925_KW_SP_1.wav)

The indirect method of resolving TOTs involves priming the consultant with words that are phonologically similar to the target word. This practice has been found experimentally to increase the likelihood of successfully recalling the target word and thereby resolving the TOT (James & Burke 2000). The indirect method can be used intentionally instead of the direct method in order to help the consultant obtain the satisfaction that comes from resolving her own TOT state. Alternatively, the indirect method can end up being used unintentionally. This was the case in (5), where my attempted form (*kʷigʷis*) was similar-sounding enough to the target (*ʔigis*) that it appears to have helped the speaker resolve her TOT.

(5) The indirect method of resolving TOTs[7]

i.	SP:	la ʔəx̌c̓osa q̓əsəneʔ laxǐiʔs laxlagas.
ii.		ẇa:las daʔɬəli Mervin λuʔ Caitlin.
iii.		ləm̓isida busibidu kind of, ʔəx̌aya, ʔəx̌aya, ẇənxʔids laxǎda... sand. Sand — oh, I know it, 'sand'.
iv.	KS:	kʷi-something? kʷigʷis?
v.	SP:	ʔigis! (20160712_KW_SP_1.wav)

One potential drawback of the indirect method is that it can prime persistent alternates which compete with the target word. The likelihood of this occurring will be lessened if the word used in priming is from a different syntactic class than the target word (Burke et al. 1991).

The third method of resolving TOTs involves imagining contexts and situations in which the target word could be used. Theoretically, this method should work by triggering semantic nodes connected to the target word. For instance, in an attempt to bring the word *ʔigis* 'sand' to mind, I might try asking the consultant to imagine walking along the beach and stopping to investigate the creatures she sees in the surf. While doing this, I would ask her to describe what she is seeing and doing in Kwak'wala, in hopes that the TOT will resolve spontaneously. To date I have not made use of this method, though it is predicted to work on the basis of the theory of TOTs put forward in Burke et al. (1991).[8]

Of course, if none of the previous methods for resolving a TOT is working, or if the TOT is causing the language consultant significant frustration, it is usually best to find a way to tactfully move on. Sometimes, the consultant will just use an English word in place of the target word, or an English word that has been phonologized into Kwak'wala; other times, she may provide an alternative phrasing of her sentence which avoids the target word. Often, the target word will spring spontaneously into consciousness later in the same session, though this is not guaranteed.

It is extremely important that fieldworkers learn to recognize TOT states and practice ways of supporting consultants while they are experiencing them, especially as experiencing TOT states on a frequent basis can negatively impact speakers' evaluation of their language competence (Burke & Shafto 2004:21). In my experience, language consultants have a tendency to interpret frequent TOT states as evidence of language attrition (an actual loss of linguistic knowledge) rather than what they really are: a barrier to overcome in accessing existing linguistic knowledge, and a natural consequence of aging. Especially within the context of language endangerment, this interpretation of TOT states as a manifestation of language loss can be very discouraging to consultants. It may be helpful to explain to language consultants that frequent TOT states are a normal part of aging and are not specific to any particular language.

2.4 Hearing loss and bottom-up changes in auditory processing, both of which are associated with advanced age, make comprehending speech more effortful

Hearing loss is one of the most common chronic conditions reported by elderly people (Gordon-Salant 2005). This means that in fieldwork with older adult language consultants, difficulties related

[7] A hypothesized translation of the Kwak'wala in this passage is as follows: (i) 'Then he put the shirt into his litter box.'; (ii) 'Mervin and Caitlin really laughed.'; (iii) 'Then the little cat, uh, uh, hid it in the...'

[8] Burke et al.'s (1991) theory of TOTs is used to motivate the Transmission Deficit Hypothesis and is embedded within a broader theory of language production called Node Structure Theory (NST).

to hearing loss are likely to be among the most common age-related difficulties encountered in the course of linguistic elicitation.

Word recognition and sentence comprehension are degraded in many everyday situations, and this is especially true for older adults possessing any degree of hearing loss (Wingfield & Lash 2015). Noisy environments and situations involving multiple talkers are especially difficult, with reverberation being particularly problematic. Words with dense phonological neighbourhoods (especially when they have high neighbourhood frequency)[9] are particularly hard to identify in degraded environments (Sommers & Danielson 1999). Older adults also have a harder time than younger adults processing faster speech more generally (Wingfield et al. 1985).

While sensory deficits are a barrier to word recognition in their own right, they also increase the effort required for speech perception and this can have significant "downstream" effects (Wingfield & Lash 2015.). In other words, the more an older adult has to strain to recognize words and sentences, the fewer cognitive resources she will have available for processing and remembering speech. For language consultants, this means that hearing loss can increase the effort required to carry out routine elicitation tasks, such as translations, judgments, and phonological or semantic comparisons.

While it is always advisable to do fieldwork in a quiet environment, it is especially important when working with older adults who have hearing loss. Fieldwork should be carried out in environments where noise — especially reverberation — is minimized, and in smaller rather than larger groups of people. The more a language consultant has to strain to hear the researcher, the more the quality of elicitation will be diminished. It is therefore very important for the researcher to adjust the volume and speed of their own speech to reduce the effort the consultant needs to expend to overcome sensory deficits. Having patience and having empathy for the consultant are crucial, as oftentimes, the consultant will be working harder than will be obvious to the researcher.

2.5 Linguistic experience renders older adults more adept at using contextual cues to aid in comprehension. Increased top-down processing compensates somewhat for age-related sensory deficits

Older adults adapt to hearing loss by becoming increasingly skilled at using contextual cues to overcome sensory deficits and comprehend spoken language (Pichora-Fuller et al. 1995; Sommers & Danielson 1999; Wingfield et al. 1985; Yonan & Sommers 2000). This enhanced ability to make use of context, compared to younger adults, is a type of expertise acquired through experience using language.

All adults, young and old, identify words in noise better when the words are presented in highly predictive sentence contexts, as compared with non-predictive sentence contexts. For instance, the word *oath* is easier to identify in the sentence *The witness took a solemn oath,* where it is more predictable, than it is in the sentence *John hadn't discussed the oath*, where it is less predictable. When younger and older adults are compared in experiments that involve identifying words in noise, older adults are found to benefit more than younger adults from the presence of semantic context (Pichora-Fuller et al 1995). In other words, older adults have been found to be more adept than younger adults at using semantic information in the immediate context of a word to help in identifying it. Context also improves performance when identifying words in time-compressed speech, and once again, this is especially true for older adults (Wingfield et al. 1985).

[9] A word is said to have a high neighbourhood frequency when it possesses a relatively high number of high frequency phonological neighbours.

Another dimension of linguistic context that older adults make efficient use of is voice familiarity. In general, words are easier to identify when they are spoken by voices the perceiver is familiar with. However, Yonan and Sommers (2000) showed that older adults are better than younger adults at using voice familiarity as a cue to help in identifying novel words. Voice familiarity is thus another dimension that older adults make use of to compensate for age-related sensory decline.

The finding that older adults are especially skilled at using contextual cues to aid in language comprehension is highly relevant in the context of fieldwork. While the importance of embedding elicitation tasks within a rich semantic context is already well recognized within semantic fieldwork methodology (Matthewson 2004; Bochnak & Matthewson 2015), this finding points to the broader significance of providing an enriched context for facilitating speech recognition and comprehension. Especially with older adults, elicitation sessions should be designed to be as semantically and pragmatically immersive as is practically possible. Fortunately, we can also expect language consultants with hearing loss to benefit from the increased familiarity with the researcher's voice that develops naturally over time.

2.6 Syntactic complexity in natural discourse, both spoken and written, decreases with age

Syntactic complexity in discourse can be evaluated using a measure called D-level, where point-values are assigned to sentences based on the relative time at which their constituent syntactic constructions have been observed to emerge in child language (Kemper et al. 2001). The underlying assumption behind the D-level measure is that syntactic constructions which arise earlier in child language are structurally simpler than constructions which arise later. Hence, a higher D-level indicates greater syntactic complexity than a lower D-level.

Several studies have used D-level to evaluate the syntactic complexity of spoken and written discourse, and have found that older adult English speakers produce proportionally fewer mean clauses per utterance, as well as fewer left-branching subordinate and embedded clauses, than do younger adults. These studies include Kemper's (1990) analysis of diaries written over a 70-year period by adults 20–80 years old from the "sod-busting" era on the Illinois prairie; Kemper et al.'s (1990) analysis of elicited narratives comparing adults in their 60s, 70s, and 80s; and Kemper at al.'s (2001) longitudinal study of elicited oral samples from older adults over a period of 7–15 years, some healthy and some with dementia.

The reasons for an observed decrease in syntactic complexity over the adult lifespan are not clear from the research. However, there are two candidate explanations for the decrease. The first is that it arises due to constraints on working memory brought on by normal aging. The second is that older adults tend to adopt age-specific pragmatic strategies which result in the production of less syntactic complexity. For instance, older speakers might become less inclined to produce complex syntactic structures as they assume teaching and mentorship roles within their communities. Alternatively, older speakers could be reducing syntactic complexity in natural discourse as part of a response to age stereotypes projected onto them (Hummert et al. 2004).

The finding that syntactic complexity tends to decrease for older speakers in natural discourse is relevant for any research that aims to extract linguistic generalizations from corpora and naturalistic field data. The finding does not, however, say anything about the level of syntactic complexity older adult speakers are capable of producing in general. This finding therefore sheds light on why elicitation with older adult language consultants is so important: if older adults are less likely to produce complex syntactic structures in natural spoken and written discourse (for whatever reason), the only way to learn about these structures is to elicit them directly.

One interesting aspect of the finding that the syntactic complexity observed in discourse decreases in the course of normal aging is that its manifestation is bound to be language-specific, at least to some degree. What counts as 'syntactic complexity' in Kwak'wala, a language where all relative clauses are formally subject relatives and where wh-words are predicates so there is no wh-movement (Anderson 1984; Levine 1984)? Perhaps syntactic complexity in a language like Kwak'wala could more properly be characterized as morphosyntactic complexity. In that case we might expect to find, on the basis of the research cited above, a decrease over the lifespan in the use of structures with the kind of complexity illustrated in (6). In (6), the verb has three suffixes influencing the valency of the predicate: the causative *-mas*, the accusative object passive *-suʔ,* and the indefinite object suffix *-nuk*^{w}.

(6) Morphosyntactic complexity in Kwak'wala[10]

təp̓idamacuʔnuk^{w}oǩ							Stacey.
təp	-xʔid	-a	-mas	-suʔ	-nuk^{w}	=i	Stacey
broken	-BEC	-A	-CAUS	-ACC.PASS	-INDEF.OBJ	=D3	Stacey

'Stacey made something break.' (20110628_KW_SP VF)

As there has been no research on the acquisition of syntactic structures in Kwak'wala-speaking children, it is not currently possible to apply the D-level measure within this language.

2.7 The structural complexity and overall quality of narratives increases with age

The 'structural complexity' of a narrative is a measure that consists of three components: (i) the part structure of the narrative, i.e. the configuration of events and episodes within it; (ii) the way the parts of the narrative relate to each other, for instance temporally or causally; and (iii) whether the narrative has meta-structure or an evaluative component, such as an overarching moral or lesson which serves to contextualize it within in some broader framework (Kemper et al. 1990). In research looking at structural complexity, narratives are ranked from Level 1 to Level 8 depending on the relative time during child development that narratives of the observed level of complexity are produced. For instance, the least complex narratives (Level 1) consist of simple strings of successive events that are neither temporally or causally linked, while the most complex narratives (Level 8) consist of multiple embedded episodes and nested chains of connected events, together with an evaluative coda that contextualizes the narrative.

Studies on narrative production involving older adults have found that narratives become structurally more complex as the age of speaker increases (Kemper 1990; Kemper et al. 1990). In fact, in Kemper (1990), only people aged 80+ produced Level 8 narratives. In these studies, structurally complex narratives, hence those produced by the oldest adults in the sample, were also consistently rated as more "interesting" than those produced by younger adults.

Structurally complex narratives (and hence, by correlation, narratives produced by older adults) nevertheless are found to have certain trade-offs. To begin with, structurally complex narratives are found to be less syntactically complex overall (as already discussed in Section 2.6). Additionally, structurally more complex narratives tended to manifest less discourse cohesion, as measured through the presence of devices such as linking words and ellipsis, while also containing

[10] The abbreviations used in (6) include: BEC = become operator (marks transition predicates), A = final vowel, CAUS = causative, ACC.PASS = accusative passive, INDEF.OBJ = indefinite object suffix, D3 = third person distal deictic determiner, 'that over there'.

more ambiguous pronouns. Thus, while narratives told by older adults tend to contain more complex narrative structure, they also exhibit less complexity in the domains of syntax and discourse cohesion. While the reasons for this asymmetry are unclear from the research, the authors of these studies suggest that age-related deficits in language production and working memory are at least partly responsible. In the words of Kemper et al. (1990:226): "It seems that adults learn to produce complex narrative structures but the production demands of these narrative structures compete with those of complex sentences."

In the context of fieldwork, this finding is important because it provides a special incentive to study narratives produced by older speakers. It also reveals that there is much we still do not know about how discourse changes across the lifespan.

3 Discussion

One of the most remarkable empirical findings about language is its relative stability across the lifespan. Nevertheless, understanding what aspects of language do change in advanced age is crucial for anyone who carries out research with older adults.

To the extent that age-related difficulties arise during fieldwork with older adults, they can be understood and, in most cases, acted upon. Most notably, every fieldworker should reflect on strategies for managing TOT states as they arise in elicitation and should find ways to accommodate age-related hearing loss. Avoiding elderspeak, treating consultants as competent communication partners, being patient when production difficulties arise, and providing an immersive semantic context for elicitation are also important practices that every fieldworker should strive to adopt.

Age-related difficulties aside, older adult speakers tend to be especially good storytellers, are skilled at using contextual cues to aid in language comprehension and have large vocabularies with which to describe their life experiences. Wise is the fieldworker who finds ways to make use of these strengths to enhance the quality of elicitation with older adults.

In the context of fieldwork on languages with aging speaker populations, the finding that linguistic knowledge remains robust across the lifespan should inspire optimism. The enduring nature of linguistic knowledge means that advanced speaker age is not itself a barrier to carrying out successful linguistic research on any language.

Annotated Bibliography of Psycholinguistics Research

Burke, Deborah M., Donald G. Mackay, Joanna S. Worthley, & Elizabeth Wade. 1991. On the tip of the tongue: What causes word finding failures in young and old adults? *Journal of Memory and Language* 30(5):542–579.

A theory of TOTs is put forward on the basis of evidence from two studies: the first, comparing naturally occurring TOTs in young, middle, and older adults via a retroactive questionnaire and a four-week structured diary exercise; and the second, looking at experimentally-induced TOTs in young and older adults. The characteristic properties of words that commonly generate TOT states are discussed, as are differences in the ways TOT states manifest in different age groups. This is the first study to establish empirically that TOTs increase over the lifespan in normal aging. The results are used to motivate the Transmission Deficit Hypothesis, a component of Node Structure Theory.

Burke, Deborah M. & Meredith A. Shafto. 2004. Aging and language production. *Current Directions in Psychological Science* 13:21–24.

An overview of research on word-finding failures is provided. Relevant studies have involved tasks such as picture naming and inducing slips of the tongue. A model of aging and word retrieval failures is presented (the Transmission Deficit Model), and its theoretical underpinnings are explained in terms of Node Structure Theory. This theory explains why it is that advanced age, word frequency, and word recency all contribute to the likelihood of TOT states.

Gordon-Salant, Sandra. 2005. Hearing loss and aging: New research findings and clinical implications. *The Journal of Rehabilitation Research and Development* 42(4):9–24.

This review article provides an overview of recent research on age-related hearing loss and auditory processing problems (also known as presbycusis). Studies show that elderly adults have difficulties perceiving speech in noisy environments, quick speech, and strong accents. Bottom-up processing is compromised with age, and issues with working memory, general cognitive slowing, and inhibition deficits also work to limit comprehension. However, even with a degree of compromised hearing, elderly adults generally have minimal problems comprehending speech in low-noise environments with familiar talkers.

Hummert, Mary L., Teri A. Garstka, Ellen B. Ryan, & Jaye L. Bonnesen. 2004. The role of age stereotypes in interpersonal communication. In Jon F. Nussbaum & Justine Coupland (eds.), *Handbook of communication and aging research* [2nd ed.]. Hillsdale, NJ: Lawrence Erlbaum, 91–114.

The role of positive and negative stereotypes of aging within interpersonal communication is discussed. An overview of experimental work completed on the subject is provided, along with a summary of several communication models which have been proposed to account for the effects of age stereotyping on older adults' linguistic and social lives. Negative stereotyping, in particular, affects older adults through negative feedback loops, leading ultimately to a decline in older adults' linguistic abilities and to varying degrees of social withdrawal. Age stereotypes increase in complexity both as one ages and as one accumulates quality experience with older adults. Communication with older adults is most successful when "elderspeak" is avoided.

James, Lori E. & Burke, Deborah M. 2000. Phonological priming effects on word retrieval and tip-of-the-tongue experiences in young and older adults. *Journal of Experimental Psychology: Learning, Memory, and Cognition* 26:1378–1391.

Prior to producing a target word that answered a general knowledge question, young and older participants read aloud prime words that sometimes shared phonological components with the target word. In a first experiment, subjects' processing of prime words was found to decrease tip-of-the-tongue (TOT) states in producing the target words. In a second experiment, priming was found to increase recall of the target word, but only when the speaker was in a TOT state. These results are interpreted as providing support for the Transmission Deficit Model of word-finding failures.

Kemper, Susan. 1990. Adults' diaries: Changes to written narratives across the life-span. *Discourse Processes* 13:207–223.

This study looks at diaries kept by eight adults born between 1856–1876, all of whom were farmers and rural professionals from the sod-busting era of prairie Illinois, who wrote over a 70-year period from their early 20s to their late 80s. The diaries are analyzed in terms of their structural complexity (i.e. complexity of the plot) and properties of text cohesion (e.g. anaphora, ellipsis, lexical repetition, conjunctions, etc.), and then judged for their overall quality by teachers of English composition. Entries by adults in their 70s and 80s were generally more structurally complex and interesting, while exhibiting less overall syntactic complexity and cohesion. Ambiguous anaphors, in particular, increased with the complexity of narratives and the diarist's age. Certain changes in the content of narratives are also noted. The results are interpreted in light of the interplay between increasing linguistic experience and working memory constraints.

Kemper, Susan, Shannon Rash, Donna Kynette, & Suzanne Norman. 1990. Telling stories: The structure of adults' narratives. *European Journal of Cognitive Psychology* 2:205–228.

Elderly adults in their 60s, 70s, and 80s were each asked to tell a narrative, either personal or fantasy. These elicited narratives were then subjected to four types of analysis: analysis of their structural complexity (the complexity of their plot), syntactic complexity, propositional content (meaning density), and cohesion. The narratives were also rated by experienced judges for their overall quality. The authors found that older adults (those in their 70s and 80s) produced structurally more complex narratives with lower syntactic complexity and lower levels of cohesion; propositional content, on the other hand, did not vary across age. Overall quality of a narrative was highly correlated with structural complexity, meaning that the stories told by more elderly participants were typically "better" stories, and this is particularly true of the oldest group of participants, those in their 80s. This overall pattern is said to arise as a trade-off between two processes: increasing linguistic experience over the lifespan leads to expertise in telling complex stories, while the onset of age-related working memory problems leads to simpler syntax and weaker text cohesion. Kemper, Susan, Marilyn Thompson, & Janet Marquis. 2001. Longitudinal change in language production: Effects of aging and dementia on grammatical complexity and propositional content. *Psychology and Aging* 16:600–614.

This study investigated language samples collected from healthy older adults (over a period of 7–15 years) and older adults with dementia (over a period of 6–30 months), looking at changes in "D-Level" (grammatical complexity) and "P-density" (idea density), as well as measures of working memory. In healthy older adults, declines in D-Level were apparent beginning around 74 years of age and occurring for 2–4 years, while P-Density declines were present as well in this group, but were more modest. Declines were much steeper and occurred much quicker for older adults with dementia. Age-related changes in working memory are associated with decline on measures of discourse production.

MacKay, Donald G. & L. E. James. 2004. Sequencing, speech production, and selective effects of aging on phonological and morphological speech errors. *Psychology and Aging* 19:93–107.

The experimenters induce slips of the tongue to investigate age-linked production effects in phonology and morphology, comparing younger and older adults. An error-induction paradigm is used to induce omissions, additions, and substitutions of phonological segments and suffixes. Older adults produce more errors overall and have longer response times. Older

adults also produce more omission errors, while younger adults produce more additions and non-sequential errors. These and a range of other specific findings are argued to be predicted by Node Structure Theory.

Pichora-Fuller, M. Kathleen, Bruce A. Schneider, & Meredyth Daneman. 1995. How young and old adults listen to and remember speech in noise. *Journal of the Acoustical Society of America* 97: 593–608.

Two experiments were conducted to investigate age-related differences in the identification and recall of sentence-final words heard in a babble background. Three groups were compared: old adults with presbycusis, old adults with near-normal hearing, and younger adults. In experiment 1, the level of babble was varied, and sentence-final words appeared in either predictable contexts or unpredictable contexts. Both groups of old listeners derived more benefit in identifying these sentence-final words from supporting context than did young listeners. In experiment 2, a working memory task was added, and older subjects recalled fewer of the items they perceived in all signal/noise conditions. These results support a processing model whereby in older adults, more resources are reallocated to support processing and are therefore not available for upstream processes like memory.

Ryan, Ellen Bouchard, Sheree T. Kwong See, W. Bryan Meneer, & Diane Trovato. 1992. Age-based perceptions of language performance among young and older adults. *Communication Research* 19:423–443.

Sixty younger adults (mean age 26.4 years) and sixty older adults (mean age 72.9 years) completed the Language in Adulthood Questionnaire for themselves and then as a reflection on typical adults aged either 25 or 75 years. Older adults reported having more problems with receptive and expressive aspects of language than did younger adults, while both groups expressed a belief that older adults in general experience more linguistic problems than younger adults, with a few exceptions for specific skills.

Shafto, Meredith A. & Lorraine K. Tyler. 2014. Language in the aging brain: The network dynamics of cognitive decline and preservation. *Science Translational Medicine* 346(6209):583–587.

Most core language processes are robust to brain aging, with the exception of some aspects of production. Evidence from brain imaging shows that while peoples' brain matter changes with age, some degree of age-related compensatory neural recruitment and functional reorganization results in the preservation of adults' linguistic abilities into old age. Some differences between younger and older adults in neural dynamics include the following: older adults tend to process more of language bilaterally than do younger adults; frontal regions are recruited more often in older adults; and brain-wide networks are more diffuse and less locally integrated in older adults than in younger adults, whose networks are more modular.

Sommers, Mitchell S. & Stephanie M. Danielson. 1999. Inhibitory processes and spoken word recognition in young and older adults: The interaction of lexical competition and semantic context. *Psychology and Aging* 14:458–472.

The importance of inhibitory abilities and semantic context to spoken word recognition were investigated in older and young adults. In experiment 1, older adults were found to have a greater difficulty than younger adults in recognizing words with many phonological neighbours, though older adults also were found to benefit more from contextual information than younger adults. In experiment 2, individual differences in auditory inhibition were measured, using a speeded classification task and an auditory stroop task. Older adults were found to have a harder time inhibiting irrelevant stimulus information overall. Combining results from both experiments, older adults' reduced ability to inhibit lexical competitors is argued to contribute to their greater difficulty in recognizing words with many lexical neighbours.

Thornton, Robert & Leah L. Light. 2006. Language comprehension and production in normal aging. In James E. Birren & K. Warner Schaie (eds.), *Handbook of the Psychology of Aging* [6th Edition]. Amsterdam: Elsevier, 261–287.

This broad review of the psycholinguistics literature on language and aging summarizes findings concerning older adults' comprehension and production at the word, sentence, and discourse levels. Theories of language and aging interact with theories of cognitive decline over the lifespan, which posit cognitive slowing, problems in working memory, weakening of inhibitory processes, weakened connections between memories, and downstream effects of sensory deficits as sources of language decline. When it comes to processing language, older adults seem to rely more on top-down processing to make up for bottom-up processing deficits. Broad models of cognitive aging are argued to be too general to account for the existing body of research findings.

Verhaeghen, Paul. 2003. Aging and vocabulary scores: A meta-analysis. *Psychology and Aging* 18: 332–339.

A meta-analysis of 210 articles from the 1986–2001 issues of *Psychology and Aging*, containing 324 independent pairings of younger and older adults, finds that older adults in general possess higher vocabulary scores than younger adults. On average, across measures, older adults score 0.8 standard deviations higher on vocabulary tests than do younger adults, though this value varies depending on the test that is employed. A concern remains that this effect may be exaggerated due to sampling error, as samples of older adults have tended to contain high proportions of highly educated people.

Wingfield, Arthur & Amanda Lash. 2015. Audition and language comprehension in adult aging: Stability in the face of change. In K. Warner Schaie & Sherry L. Willis (eds.), *Handbook of the Psychology of Aging*, [8th Edition]. Amsterdam: Elsevier, 165–185.

The effects of age-related hearing loss on language comprehension are investigated in this review article. Broadly speaking, language perception competes for resources with 'upstream' cognitive processes. For older adults with hearing loss, this means that language comprehension can be a source of stress and fatigue, especially in noisy environments, and especially when there is not enough context to aid in comprehension. Declines in auditory processing associated with advanced age are compensated for somewhat through skills and knowledge acquired through a lifetime of experience.

Wingfield Arthur, Leonhard W. Poon, Linda Lombardi, & David Lowe. 1985. Speed of processing in normal aging: effects of speech rate, linguistic structure, and processing time. *Journal of Gerontology* 40:579–85.

Older and younger adults were exposed to speech with varying degrees of semantic and syntactic constraints (normal English sentences, meaningless word strings, and random strings) and with varying degrees of time compression (275, 325, 375, and 425 words per minute), and were asked to repeat the stimuli back. Background noise and loudness of the speech signal were controlled for across groups. Both groups performed at or near ceiling on normal sentences. With meaningless word strings and random strings, however, older adults' performance declined dramatically as the speech rate increased. This result is argued to follow from age-related cognitive slowing. Relative to younger adults, however, older adults made more efficient use of context to overcome the debilitating effect of time compression.

Yonan, C. A., & Sommers, M. S. 2000. The effects of talker familiarity on spoken word identification in younger and older listeners. *Psychology and Aging* 15:88–99.

Young and old adults were asked to identify novel words spoken by either familiar or unfamiliar voices. Whether voice information was acquired intentionally (experiment 1) or incidentally (experiment 2), older adults exhibited a greater benefit from voice familiarity than did younger adults. The familiarity of a talker's voice facilitates spoken word identification, especially for older adults. Voice familiarity is thus one dimension that older adults are able to use in overcoming age-related sensory decline.

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