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A Processing Advantage for Inalienable Possession: Evidence from English Phrase Plausibility Judgments¹

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(with František Lichtenberk)

Abstract

Possessive constructions encode a relation between two entities, the possessor and the possessum. For inalienable possession the relation encoded reflects a close, intrinsic connection between the possessor and the possessum (e.g., kinship, part-whole relations) whereas for alienable possession the relation is contingent and extrinsic. The distinction between alienable and inalienable possession, and even between different types of alienable possession, is sometimes overtly marked in the grammar (as in many Oceanic languages) and sometimes only covertly signalled (as in many European languages). In a previous offline study, we found that English attributive possessive phrases containing inherently relational possessums elicited a narrower range of interpretations than those given for phrases containing non-relational possessums (Lichtenberk, Vaid, & Chen, 2011). To the extent that the meaning of inalienable possessive phrases is directly retrievable from the lexical semantics of the relational possessum, we hypothesized that it should be accessed more quickly than the meaning of alienable possessive phrases, which may require additional computation. In the present study we tested this hypothesis using a plausibility judgment task. English adnominal possessive phrases containing relational vs. non-relational possessums each paired with animate or inanimate possessors were presented in the *s*-genitive form (*the N1's N2*). Independently of possessor characteristics, participants were significantly faster at judging plausibility for phrases with relational than those with non-relational possessums. The processing advantage observed for inalienable possession is taken as support for the claim that inalienable possessive relations have a privileged status in the mental lexicon.

Keywords

possessive, inalienable, relational nouns, plausibility judgments, pragmatic inference, phrase interpretation, coercion

1 Introduction

Possessive (or genitive) constructions have been extensively discussed in terms of their morphology, syntax, and semantics (e.g., Aikhenvald & Dixon, 2013; Barker, 1995, 2011; Heine, 1997; Langacker, 1995; McGregor, 2010; Partee & Borschev, 2002; Rosenbach, 2002, 2014; Seiler, 1983; Taylor, 1996) but there has been surprisingly little psycholinguistic

investigation of possessive constructions (Kennison, 2003). From a psycholinguistic perspective what is interesting – and challenging – about possessive constructions is that they encode a relationship between two entities, the possessor and the possessed, that is indeterminate, underspecified and thus has to be evoked (Kay & Zimmer, 1976). The process of selecting a plausible meaning involves an interplay of syntactic, semantic, and pragmatic factors. In this respect, possessive constructions are like compounds, whose interpretation has been studied more extensively (Downing, 1977; Gagné & Shoben, 1997; Gagné, 2002; Levi, 1978; Wisniewski & Gentner, 1991). In the case of compound phrase interpretation it has been shown that the greater the availability of a relation that links the modifier and modified entities, the easier it is to interpret the compound (for a review, see Gagné & Spalding, 2013). Comparable work is needed on the interpretation of possessive constructions and on their real time processing. Building on an earlier study we conducted that looked at offline possessive phrase interpretation (Lichtenberk, Vaid, & Chen, 2011), the present study examined the online processing of attributive possessive phrases in users of English (based on a pilot study reported in Vaid, Lichtenberk, & Chen, 2006). In both cases our interest was to test the claim that *possessive phrases conveying inalienable possession are more accessible in terms of their processing ease than possessive phrases conveying alienable possession*.

When considering the semantics of possessive constructions, two factors are immediately relevant: the range of forms the construction can take in usage and the range of meanings it can elicit (Ariel, 2004). In terms of meaning, possession in the commonly understood sense of ownership is only one kind of relationship that possessive constructions may express (Langacker, 1995, pp. 56-57; Taylor, 1996). Besides ownership, a variety of other relations between the possessor and the possessed entity may be signalled, including kinship, part-whole relations, control, or use (Barker, 1995, pp. 73-74). For example, *my car* may refer to the car I own, the car I drive, whether or not I own it, or even the car I aspire to drive or own.

In some cases the meaning that is intended by a speaker becomes clearer in context, and may be cued by the possessor; e.g., *the soccer mom's car* suggests a different relation between the two entities than that in the phrase, *the car dealer's car*. However, in other cases, the meaning of a possessive phrase is not influenced as much by contextual information, nor is it likely to change across contexts (e.g., in the phrases *the soccer mom's son* or *the car dealer's son* the relationship between the possessor and the possessum is given largely by the inherently relational meaning of the possessum). Although the existence of variability in the interpretation of possessive phrases has long been noted, few empirical studies have investigated this issue to date.

By contrast, variability in the *expression* of possession has been widely studied, using corpus data (Kreyer, 2003), experimental approaches involving elicited sentence completions (Rosenbach, 2014), and large scale statistical modelling studies (Grafmiller, 2004; Szmrecsanyi, Biber, Egbert & Franco, 2016). We know, for example, that in contemporary English, the predominant form in which the possessive construction is expressed is the prenominal or *s-* genitive form (e.g., *the nightingale's song*). Less common forms are the postnominal *of-* genitive (*the song of the nightingale*) or the noun-noun compound (*the nightingale song*) (see Jones, 2016). Importantly, these different forms are not interchangeable and there are different syntactic and semantic consequences of the choice of a given form. For example, animate possessors tend to be preferentially positioned earlier in an utterance, and thus are more prevalent in the *s-* genitive than the *of-* genitive (Rosenbach, 2014). These findings informed the design of the present research, which looked at the ease of comprehending two types of possessive phrases presented in the *s-* genitive form.

The variability in the range of possible relationships that may be expressed by possessive constructions has presented a challenge for attempts to arrive at a unified theoretical

account of the semantics of the possessive (Barker, 1995; Haspelmath, 2008; Storto, 2003; Taylor, 1996; Vikner & Jensen, 2002). A variety of accounts have been proposed, drawing on generative grammar, cognitive grammar, and a usage based perspective. Regardless of the approach taken, it is generally acknowledged that both language-internal phenomena (e.g., the syntactic and semantic characteristics of possessed entities) and language-external factors (cultural or pragmatic factors influencing what is a likely construal of a possessive relation in a given situation) affect, to different degrees, the interpretation and processing of possessive phrases.

1.1 Previous Work: (In)alienability and the Interpretation of Possessive Phrases

Of particular interest in the present study is the degree to which the possessor and possessed entities have a close, intrinsic relationship or a more variable, extrinsic relationship that is circumstantial and temporary. This distinction has been characterized by scholars in terms of *inalienable* and *alienable possession*, respectively (Barker, 1995, 2011; Lichtenberk, 1983, 1985; Nichols, 1988). Barker (1995) uses the term *lexical possession* to refer to intrinsic or inalienable possession, as the relation between the possessor and the possessum in such cases is directly recoverable from the lexical meaning of the relational noun (possessum). When the possessed entity is itself inherently relational the interpretation of possessive phrases is more constrained. Thus, possessive phrases involving kinship terms typically convey an inalienable or intrinsic possessive relation between the possessor and the possessum. Similarly, terms depicting part-whole relations, such as body parts (*neck, legs*), are inherently relational, as are terms for psychological states or expressions (*anger, smile*).

By contrast, in extrinsic possession, the possessive relation does not depend on any inherent characteristics of the possessum. Instead of an inherent relation between the possessum and the possessor there is a contingent relationship. The relationship between the two entities may be one of ownership (*her house*), control (*his boss*), use (*her dress*), or something produced by the possessor (*her cake*), among other possibilities. Possessums that are not inherently relational have been termed *sortal* nouns, as they describe a sort, or category, or kind of object; such nouns comprise the majority of “common nouns” (Löbner, 2011). When used in a *s*-genitive construction, such nouns are open to a variety of possible interpretations, the particular interpretation ultimately depending on the characteristics of the possessor and/or other extralinguistic contextual features. As Barker (1995: 53) notes, *extrinsic possession* “depends for its value on pragmatic factors determined by the context in which the possessive is uttered”.

A related distinction was proposed by Vikner and Jensen (2002), who distinguished between *lexical interpretations* and *pragmatic interpretations* of possessive phrases. Pragmatic interpretations, according to Vikner and Jensen (2002), require contextual support to constrain their meaning, whereas lexical interpretations are ‘privileged’ in that “the information needed to compute them is incorporated in the lexicon” (p. 195). While a noun that is inherently relational invites a default lexical interpretation, e.g., *the man’s body* is typically taken to mean ‘the body of the man’ it could, depending on the discourse context, be given a different reading, e.g., ‘the body of someone else that was found by the man’. Nevertheless, the default interpretation of inherently relational possessums is likely to be the inalienable meaning.

Importantly, inalienable and alienable relations also show different distributional characteristics in production. That is, there is a probabilistic tendency for inalienable possessive relations to favor the *s*-genitive over the *of*-genitive form (Rosenbach, 2002: 123-125). Moreover, the preference for use of the *s*-genitive to refer to prototypical possessive relations (kinship terms, part-whole relations) has been noted in children as young as 4 years of age

(Skarabela & Serratrice, 2009). Whether these distributional differences in frequency of use of alienable and inalienable possessive relations are the cause or the result of other underlying factors is a matter of debate (McDonald, 2013; Rosenbach, 2014).

1.2 A Relation-Based Account of Attributive Possessive Constructions

What is noteworthy is that the distinction between alienable and inalienable possession is formally marked in a number of languages. Indeed, most of the 450 or so languages of the Oceanic subgroup of Austronesian languages (spoken in Papua New Guinea, Melanesia, Polynesia and Micronesia), and some languages of the Americas (including languages spoken in Brazil), mark this distinction in some way, e.g., using different affixes or relational classifiers (see Lichtenberk, 1983, 1985, 2009a, 2009b). Moreover, initially in Austronesian there was only one basic type of possessive construction; subsequently an inalienable-alienable contrast emerged. Following this development, a three-way contrast emerged in the alienable category in the Oceanic subgroup of Austronesian, with a separate possessive classifier for the category of food, of drink, and of anything else. However, no further differentiation emerged in the inalienable category in Oceanic languages (Lichtenberk, 2013). Thus, Lichtenberk (2005, 2013) proposed that, diachronically, it appears that once a language marks a distinction between alienable and inalienable possession it may develop further subdivisions of alienable possession but not, apparently, of inalienable possession.

Following Pawley and Sayaba (1990), Lichtenberk (2005) characterized two views regarding the choice of possessive construction in Oceanic: a noun-class based view and a relation-based view. In the former view, a given noun belongs to a given class depending on the type of possessive constructions it selects (see also Franjeh, 2016). However, as a given noun can occur in the possessum position of more than one type of possessive construction (languages exhibit fluidity), Lichtenberk argued that a relation-based view provides a better account. In this view, the choice of a possessive construction depends on the kind of relation that holds between the possessum and the possessor (Lichtenberk, 2009a, p. 263; see also Lichtenberk, 1983).

The correspondence observed in many Oceanic (and other) languages between the choice of possessive construction and the type of semantic relation signified (alienable vs. inalienable) led Lichtenberk (2005, 2013) to speculate that there may be a cognitive motivation behind the emergence of differentiated markers for alienable but not for inalienable possession. He reasoned that, given that there is a fixed relation for part-whole relations or kinship relations, but no fixed relation in alienable possession, it became useful to mark the type of relation more closely by means of a dedicated construction for different types of alienable constructions.

A similar argument was made by Haiman (1983) in terms of an iconicity motivation. According to this account, the closer the conceptual relation between the possessor and the possessum, the less the need for overt marking of the possessive for inalienable possessums. A different argument, based on an economic motivation, proposed by Haspelmath (2008), posits that frequency of use could underlie the reduced marking of inalienable possession. That is, nouns referring to body parts or kinship terms are more likely to refer to possessed entities than other types of nouns and thus will be less likely to have overt marking.

If the additional marking of different types of alienable (but not inalienable) possession is motivated (whether for reasons of cognitive motivation, iconicity or frequency), one would expect to find differences in the interpretation and/or processing of alienable and inalienable possessive phrases even when a language does not overtly mark this distinction. As argued by Lichtenberk, Vaid, and Chen (2011), a language that does not overtly mark a distinction

between alienable and inalienable possession provides a strong test case for the notion that the distinction is motivated in some way. To test this possibility, Lichtenberk, Vaid and Chen (2011) conducted an offline possessive phrase interpretation study with native speakers of English in the U.S. Prenominal possessive phrases of the form *the N1's N2* were presented to participants, who were to write down the first interpretation of the phrase that came to mind, and any additional interpretations. Possessums were either relational (e.g., *name*) or non-relational (e.g., *books*) and were presented with possessors that could bias the meaning of the phrase, e.g., *the poet's books vs. the student's books*. It was predicted that, compared to phrases with relational possessums, those with non-relational possessums would elicit "(i) a higher incidence of extrinsic-possession than intrinsic-possession interpretations, (ii) a broader range of interpretations, and (iii) a lower consistency of a given interpretation across modifiers" (Lichtenberk et al., 2011, p. 672). All three predictions were supported.

The interpretation data were corroborated by a corpus study of English attributive possessive phrases in which possessors expressed by a pronominal possessive determiner (*her, his, its*, etc.) paired with a relational or non-relational noun were identified. This analysis showed that phrases containing relational possessums encoded a smaller and more salient set of possessum-possessor relations than phrases containing non-relational possessums (Lichtenberk et al., 2011).

More recently, an interpretation study of possessive phrases presented in the absence of linguistic context (using a proper name as the possessor) was carried out with English speakers in the U.K. (Kolkman, 2016a). The study examined default interpretations given by participants for 8 phrases representing five different types of possessive relations: inherent relations, part-whole relations, control, producer, and pragmatic relations. "Default interpretations" were operationalized as the most frequently occurring responses across participants for a given phrase. Kolkman (2016a) found that default interpretations were elicited for possessive phrases with inherently relational possessums (e.g., *John's teacher*) and for part-whole relations (*John's nose*). However, default interpretations were also noted for control relations (*John's car*) whereas the producer relation (*John's cake* interpreted as 'the cake that John baked') and other, pragmatic relations (e.g. *John's tree*) elicited a larger range of distinct interpretations. Kolkman concluded that, consistent with Lichtenberk et al. (2011), phrases with non-relational possessums show greater interpretational flexibility than those with relational possessums.

1.3 (In)alienability and the Processing of Possessive Phrases

These differences in the range and salience of interpretations of possessive constructions raise the question as to whether *lexical possession*, echoing Barker's (1995) terminology, is privileged in terms of its ease of processing. This was the focus of the present study. A processing advantage may be expected for inalienable possession to the extent that the meaning of such phrases is derivable from the lexical semantics of the relational possessum and thus stored in the lexicon. By contrast, since the meaning of phrases with alienable possession is not inherent in the meaning of the possessum but may require pragmatic inferencing, it may take longer to be retrieved.

Only one study to date has compared the processing of alienable vs. inalienable possessive phrases (Lin, 2007). Examining speakers of Chinese, a language which does not overtly mark this distinction, Lin conducted two experiments. The first involved a possessive decision task, in which participants were shown pairs of nouns and had to decide if possessive relations could hold between them. The nouns included inalienable nouns as the possessum (e.g., kinship terms and body parts) and alienable animate or inanimate nouns ('friend',

'notebook'). Shorter decision times were found for inalienable nouns and their possessors, particularly body parts, as compared to alienable nouns and their possessors.

Lin's (2007) second experiment involved a self-paced moving window paradigm. Participants were to read passive possessive relative clause constructions in which the possessum was a relational noun (kinship term or body part) or a non-relational noun. Sample stimuli (from Chinese) were *The actor whose palm/mask was cut through by a fruit knife fainted*. Lin (2007) found that sentences containing inalienable possessums (body parts and kinship terms) were read faster in the region of the head noun (possessor) than sentences with alienable nouns. Importantly, there was no difference in the reading of the alienable and inalienable nouns *per se*; the difference was observed only in the head-noun region, where the possessive relationship was being constructed. Lin interpreted these findings as support for an effect of linguistic integration, whereby inalienable nouns subcategorize for a possessor argument, leading to faster integration on the possessor arguments in the sentence.

1.4 A methodological aside

Of relevance to the question of the processing of alienable vs. inalienable possessive constructions is a psycholinguistic literature on constructions that require type-shifting or complement coercion in order to arrive at a plausible meaning for a phrase. In these studies it has been shown that when a phrase does not produce a coherent interpretation, an *enriched* composition is required, which may involve some form of *coercion*, that is, shifting the usual sense of an expression to take on an extended sense. When enriched composition occurs in the interpretation of referring expressions, there is a slowing of processing (e.g., Pyllkanen & McElree, 2006; Raffray, Pickering, Cai, & Branigan, 2014). When context is provided, the cost of coerced interpretation goes away (Traxler, McElree, Williams & Pickering, 2005). Some researchers have suggested that the additional processing required in studies of enriched composition is extralinguistic, involving pragmatic inferencing rather than semantic decoding (e.g., de Almeida, 2004; de Almeida & Dwivedi, 2008; see also Katsika, Braze, Deo & Pinango, 2012).

To the extent that the interpretation of alienable possession may also involve additional computation of meaning, or a kind of coerced processing, would this also slow processing? There are differing predictions as to whether coercion is computationally costly or not. In the specific case of possessive constructions, for example, Partee and Borschev (1998) theorized that type-shifting may lead to a coerced interpretation for alienable possessives, but that this effect need not be computationally costly. They suggested that psycholinguistic research was needed on this issue.

Like the study by Lin (2007) described above, most studies of coercion effects have relied on self-paced reading tasks or eye tracking measures (e.g., Traxler, Pickering, & McElree, 2002). With reading time measures, however, it is not entirely clear whether longer reading times for expressions presumed to involve coercion relative to controls reflect a processing cost of computing an enriched meaning or simply a failed attempt to derive a sensible interpretation of the expression (McElree, Pyllkänen, Pickering & Traxler, 2006). This interpretive issue was circumvented in the present study by using speed of plausibility judgments, instead of reading time.

The plausibility judgment task, we contend, provides a clearer measure of comprehension than reading time. It has also been frequently used to study the processing of noun-noun compounds (e.g., Gagné & Shoben, 1997) which, as mentioned at the outset, can be considered analogous to the processing of possessive constructions.

If slower (but still accurate) plausibility judgments are obtained for phrases containing non-relational possessums (alienable possession) than for phrases with relational possessums (inalienable possession) this would be evidence that computing an interpretation of alienable phrases takes time. Slower performance would not mean that an adequate interpretation of the phrase was not found, since the phrase plausibility task expressly measures the time it takes to arrive at an adequate (plausible) interpretation.

2 The Present Study

Extending prior work that found that English possessive phrases containing inherently relational possessums elicit a default interpretation compared to phrases containing non-relational possessums (Kolkman, 2016a; Lichtenberk et al., 2011) the present study sought to examine if there is a processing advantage for inalienable possession.

A plausibility judgment task was administered whereby participants were to decide as quickly as possible whether or not a prenominal possessive phrase (i.e., phrases taking the form, *the N1's N2*) made sense. Plausible phrases were constructed by pairing relational and non-relational possessums with animate or inanimate possessors (e.g., *the chef's s fame/the chef's recipes* vs. *the bistro's fame/the bistro's recipes*). Implausible phrases were constructed by pairing relational and non-relational possessums with inanimate possessors (*the play's murmur/the chisel's toys*).

If inalienable possession has a privileged status in the mental lexicon because the meaning of a relational possessum is directly retrievable from its stored lexical entry whereas that of a non-relational possessum requires additional computation, we would expect that *phrases with relational possessums are judged to be plausible significantly faster than phrases containing non-relational possessums (the possessum effect)*. In addition, our study allowed us to examine an animacy effect related to the possessor. We based our prediction here on the fact that animate entities tend to be positioned earlier in language production than inanimate entities (McDonald, 2013). In the case of possessive constructions, animate possessors are more frequently positioned in *s-* genitive phrases whereas inanimate possessors are more frequently positioned in *of-* genitive phrases (Rosenbach, 2008). Given that our study directly compared the processing of animate and inanimate possessors in *s-* genitive phrases, we expected an effect of possessor animacy whereby *plausibility judgments would be faster for phrases containing animate possessors than for those containing inanimate possessors (possessor effect)*. Finally, since possessum type and possessor type were factorially combined, our research design also allows for a test of whether the possessum effect will interact with the possessor effect or will be an independent effect.

To anticipate our findings, our study showed an effect of possessor animacy but this effect did not interact with a robust effect of possessum type: participants were faster to judge the plausibility of phrases containing relational possessums (inalienable possession) than non-relational possessums (alienable possession). This lends support to the view that the meaning of inalienable possessive phrases is privileged in the mental lexicon.

2.1 Participants

A set of 68 college students (with approximately equal numbers of males and females) ranging in age from 18 to 22 years were recruited from a large southwestern university in the United States. They received course credit for their participation. All were fluent, monolingual users of English with normal or corrected-to-normal vision.

2.2 Materials

A list of 120 English prenominal possessive phrases using the *s*-genitive construction was constructed. They included 80 semantically plausible phrases and 80 implausible phrases. Plausibility was determined based on the consensus judgment of the authors. The stimuli were divided into two counterbalanced lists each containing 40 plausible and 40 implausible phrases. Each phrase was presented in the form *the N1's N2*. Half of the plausible and implausible phrases had possessums that were inherently relational and the other half had possessums that were not relational. See Appendix A for a list of the phrases. Relational possessums included parts of a whole, natural bodily or mental products, or physical, mental, or other attributes.

Plausible phrases were constructed by pairing a relational and a non-relational possessum with a given animate and a given inanimate possessor. The animate possessor was always human. Thus, for example, a relational possessum, *fragrance*, was paired with an animate possessor, *the woman's*, and an inanimate possessor, *flower*. A non-relational possessum, *vase*, was also paired with the same two possessors; this resulted in the following four phrases: *the woman's fragrance* and *the flower's fragrance* (signalling inalienable possession) and *the woman's vase* and *the flower's vase* (signalling alienable possession). Another example was *the bartender's reputation* and *the hotel bar's reputation* (signaling inalienable possession) and *the bartender's drinks* and *the hotel bar's drinks* (signaling alienable possession). Implausible phrases were created by randomly pairing a separate set of 20 relational and 20 non-relational nouns as possessums with inanimate nouns as possessors, as in *the mall's mouth* or *the play's murmur* (inalienable) and *the banana's concert* or *the jar's necktie* (alienable). Implausible phrases all had inanimate possessors only, since pilot testing of stimuli showed that the use of animate possessors made it difficult to classify a phrase as implausible.

Relational and non-relational possessums were chosen from a pool of words that were judged by a panel of native English speakers to be roughly comparable in terms of their perceived familiarity. Possible frequency differences across items were neutralized by the requirement of the design whereby each relational and non-relational possessum pair was combined with a pair of possessors, an animate and an inanimate possessor. Although we did not explicitly control for phrase frequency, care was taken to avoid using idiomatic expressions or other stock phrases. Further, since we analyzed our data considering performance across items as well as across participants, this provided another way of checking that the items were comparable.

2.3 Procedure and Design

Participants were tested individually in a laboratory setting using a Dell GX series computer. Two counterbalanced stimulus lists of 40 plausible and 40 implausible phrases were prepared. The counterbalancing of the plausible stimuli was conducted with the stipulation that neither the possessors nor the possessums overlapped in a given list. The implausible phrases were randomly intermixed with the plausible phrases.

Phrases were electronically presented one at a time on a 17" VGA-adapted, 72 Hz CRT computer screen with a 640 x 480 resolution. Stimuli were presented and controlled using the E-Prime 2.0 software (Schneider, Eschman, & Zuccolotto, 2002) at a viewing distance of 85 cm. Participants were instructed that they would be seeing a series of phrases and that their task was simply to decide, as quickly as possible, if the phrase was plausible (made sense) or not. They were to signal their response by pressing a designated key, with their dominant hand, if they considered the phrase plausible, and another key if the phrase did not make sense. If some other key was accidentally pressed the program would not allow the participant to

proceed to the next trial; thus, only responses to the designated keys for plausible/implausible responses were registered. On each trial a neutral, orienting fixation stimulus was first presented for 800 ms followed by a phrase shown in the center of the screen. The phrase remained in view until a response was made. A millisecond timer was triggered by the onset of the stimulus and stopped with the participant's key press response.

Ten practice trials were given first, followed by the 80 test trials, which consisted of 40 plausible and 40 implausible phrases presented in a random order. There was an inter-stimulus interval (ISI) of 1 second. A short rest was given after 40 trials; the duration of the rest was up to the participants.

2.4 Design and Data Analysis

The design was a 2(Possessum Type) x 2(Possessor Type) within-subjects factorial. A repeated measures analysis of variance was conducted by-participants and by-item responses on mean response latencies to correct responses for plausible stimuli. The data were analyzed using the SPSS statistical analysis package. An additional analysis using linear mixed effects model was also conducted (Kuznetsova, Brockhoff & Christensen, 2016).

3 Results

An initial analysis of response latencies and accuracy as a function of phrase type (plausible vs. implausible) revealed higher accuracy for implausible than plausible judgments, [$F(1,67) = 21.01, p = .000, \omega^2 = .069$] but no differential response latencies to correct responses to plausible and implausible phrases [$F(1,67) < 1$]. This suggests that participants spent an equal amount of time to evaluate the plausibility/implausibility of each phrase. Subsequent analyses reported below focus only on the plausible items.

In analyzing the mean response times to plausible phrases, trials with response times that were less than 200 ms or greater than 2.5 standard deviations from the mean of the condition were considered outliers and were discarded. These cutoffs led to the rejection of less than 1% of the observations. In addition, responses to one set of items (i.e., *the graphic designer's/mailbox's lettering/letters*) were removed from the analysis because it had been presented incorrectly. Table 1 shows the re-computed mean RTs for each experimental condition for the plausible phrases, and Table 2 shows the mean RTs and percent accuracy for the implausible phrases.

The reaction time analysis of variance² for correct responses for plausible phrases showed a significant effect for possessum type in the analysis by participants and by items, $F_1(1,67) = 23.31, p = .000, \omega^2 = .076, F_2(1,36) = 4.04, p = .049, \omega^2 = .039$: Phrases with relational possessums were judged faster than those with non-relational possessums; *Mean RT(SE)* = 1336(34) ms vs. 1431 (41) ms, for relational vs. non-relational items, respectively.

In addition, there was a significant effect for possessor type, $F_1(1,67) = 9.99, p = .003, \omega^2 = .032, F_2(1,36) = 9.13, p = .005, \omega^2 = .097$, indicating that possessive phrases were more easily judged to be plausible when they contained animate than inanimate possessors (*Mean RT (SE)* = 1345 (35) ms vs. 1421(41) ms). There was no significant interaction. The findings of the possessum effect and possessor effect in plausibility judgments are illustrated in Figure 1.

Note. RT = Reaction Time. Standard errors are reported in parentheses.

Table 1. Mean response latencies (in ms) and accuracy (%) to plausible phrases by possessor type and possessum type

Possessor Type	Possessum Type	Response	
		RT	Accuracy
Animate	Inalienable	1298.3 (37)	94.45 (1.1)
	Alienable	1392.5 (39)	90.49 (1.2)
Inanimate	Inalienable	1373.8 (38)	84.40 (2.0)
	Alienable	1468.7 (50)	75.48 (1.9)

Table 2. Mean response latencies (in ms) and accuracy (%) to implausible possessive phrases with inanimate possessors by possessum type

Possessor Type	Possessum Type	Response	
		RT	Accuracy
Inanimate	Inalienable	1360.5 (33)	91.2 (1.0)
	Alienable	1446.1 (36)	87.7 (0.9)

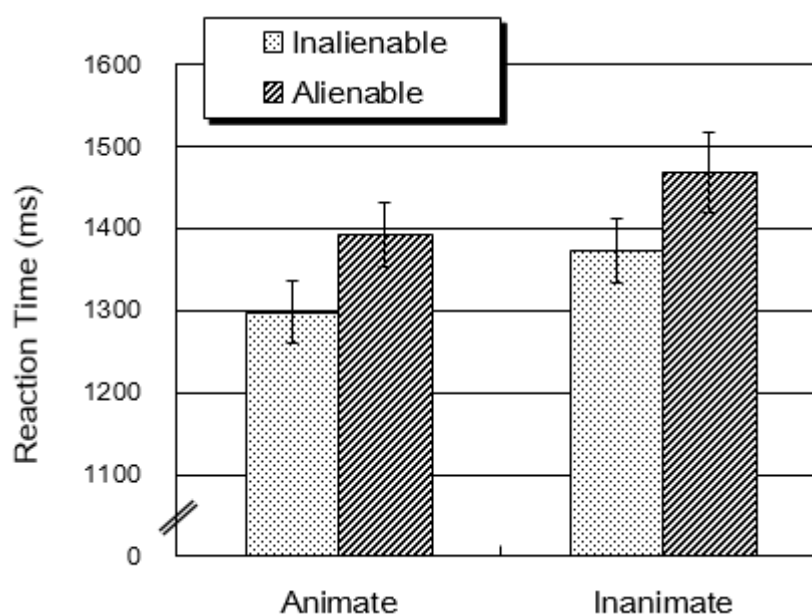


Figure 1. Plausibility judgments are faster for inalienable than alienable possessive phrases regardless of possessor animacy status

3 Discussion

Given that the relation expressed in a possessive construction between the possessor and the possessed entity is not explicitly provided but must be evoked (Kay & Zimmer, 1976), the ease of interpreting a possessive phrase will vary depending on how easily the encoded relation can be identified. Our study posited that phrases involving inalienable possession should be easier to process than those involving alienable possession because the inherently relational nature of the possessum in the former case provides a sufficient basis for identifying the intended meaning of the phrase, and is perhaps more likely to be directly retrieved from a stored lexical representation. Put differently, relational possessums elicit a default, salient meaning, that facilitates its processing (see Jaszczolt, 2017, for further discussion of default interpretations). By contrast, the process of selecting an appropriate interpretation for an alienable possessive relation should be more challenging, and may entail the generation of a coerced interpretation and one that factors in pragmatic (and not just syntactic/semantic) information. As a result, plausibility judgments should be slowed for phrases encoding alienable relationships between the possessor and possessed entities.

Our findings offer strong and consistent support for a processing advantage for inalienable possession. When making plausibility judgments for possessive phrases that differed only in terms of the nature of the relationship between the possessum and the possessor, English users were significantly faster when the relation was signalled by the possessum than when the possessum did not offer a basis for interpreting the phrase's meaning. Thus, participants were significantly faster in judging the plausibility of *the chef's fame* or *the bistro's fame* than they were at judging the plausibility of *the chef's recipes* or *the bistro's recipes*. In other words, the relational nature of a possessum facilitates phrase comprehension whereas the lack of relational cues in a possessum requires additional computational effort in order to arrive at a plausible relation between the possessor and the possessed entity.

Lexical possessives, following the terminology used by Barker (2011) appear to have a privileged presence in the mental lexicon. Our findings are compatible with the view that the meaning of phrases with relational possessums may be more easily retrieved because it is a default, salient meaning as compared to the more contextually-varying meaning of phrases with non-relational possessums. The latter may require a pragmatic interpretation that integrates information from linguistic and extralinguistic sources. The resulting integration of real world knowledge with lexical knowledge may slow processing of phrases encoding alienable possessive relations.

Our findings of a possessum effect extend previous findings with English users that showed that phrases with relational possessums tend to elicit a salient, default meaning (Lichtenberk et al., 2011; Kolkman, 2016a,b) and corroborate a previous self-paced reading time study with Chinese readers that showed that possessive phrases containing inalienable nouns are read faster than those containing alienable nouns (Lin, 2007).

An issue of relevance is the potential contribution of frequency as an explanatory factor for our findings, given that possessed entities are more often relational nouns in a language (Haspelmath, 2008). As such, the processing advantage enjoyed for inalienable possession may reduce to an advantage for the more frequently occurring variant. We suggest that the fact that there is a processing advantage for inalienable possession and the fact that most possessed entities express inalienable possessive relations may be part and parcel of the same phenomenon.

A second finding of the present research is of a possessor effect: phrase plausibility was judged significantly faster when the possessor was animate than when it was inanimate. This finding was expected and follows directly from linguistic analyses of an animacy hierarchy in

accessibility, whereby animate entities are thought to have greater prominence than inanimate ones (Ariel, 2004). The hierarchy is also reflected in patterns of usage, as revealed in large-scale corpus studies (e.g., see Krivan, 2014, for evidence of an animacy hierarchy in Czech possessive constructions). In the case of English, for example, one is more likely to find animate possessors occurring in the *s*-genitive (*Pavel's father*) than in the *of*-genitive (*the father of Pavel*). Moreover, inanimate possessors are more common in the *of*-genitive construction; thus, *the roof of the house* would be favoured over *the house's roof* (Rosenbach, 2008). Since all the phrases in our study involved the *s*-genitive form, phrases presented with inanimate possessors in our study may have been less accessible, which could account for their longer processing time as compared to those with the more frequently occurring animate first form. As such, our study provides empirical support for an accessibility hierarchy (Ariel, 2004), and is consistent with the “easy first” principle of the ordering of phrases in language production (McDonald, 2013).

Importantly, the effect of possessor animacy did not interact with the effect of possessum alienability, indicating that the two factors exert independent influences on possessive phrase processing. The absence of an interaction also tells us that the processing advantage observed for relational over non-relational possessums was not affected by the frequency difference in possessor type. If the processing advantage we observed for inalienable possession primarily arose from the fact that inalienable possessive relations occur more often in the *s*-genitive, then we would have expected that animate possessors (which are also preferentially realized in the *s*-genitive) should be processed even faster when paired with relational possessums (a more frequent occurrence in the language) than when paired with non-relational possessums. Instead, we found evidence for separate effects of possessor animacy and possessum relationality, suggesting that frequency of occurrence *per se* is not the sole driver of the observed effects. We had sufficient power to detect an interaction effect, so the lack of an interaction is meaningful.

Taken together, the findings provide strong evidence that, even when a language does not formally contrast alienable and inalienable possession, there is a processing advantage for interpreting possessive phrases that contain inherently relational possessums. This lends support to the claim that the distinction has an underlying cognitive motivation, and that relational nouns in possessive constructions are higher in accessibility than non-relational nouns.

A limitation of our study is that we only examined a particular possessive construction, the *s*-genitive. As such, our results cannot be generalized to the *of*-genitive or the compound genitive forms for the English possessive construction. It may be difficult to conduct analogous studies with these other forms, given that these forms do not allow for the range of readings to the same extent as the *s*-genitive does (e.g., Rosenbach, 2014; Gries, 2002). It has been noted, for example, that inalienable possessums are preferred over alienable possessums in the compound form and in the *of*-genitive form (e.g., *the birth of Mary*, vs. **the car of Mary*), though phrase length may also play a role in the choice of form (*the car of the woman with the black hair* would likely be preferred over *the woman with the black hair's car*). Nevertheless, it would be instructive in future work to extend the present investigation to consider a broader range of possessive constructions.

Another limitation is that our manipulation of animacy only contrasted human animacy vs. inanimate things. As such, our results do not speak to whether differences in processing may have arisen had we grouped our possessors in terms of their degree of animacy, as described in the animacy hierarchy for genitive variation in usage (Rosenbach, 2008: 153). According to that, phrases with a human possessor noun (*the girl's soccer ball*) occur in the *s*-genitive form much more often than those with an animal N (*the elephant's trunk*), which in

turn occur more often than those with a collective N (*the company's president*), or a temporal N (*Sunday's newspaper*), or a locative N (*Auckland's hiking trails*), which in turn occur more often than phrases with a common noun that is inanimate (*the hotel's elevator*).

Another limitation is that subtypes of inalienable relations were not distinguished. As such, our study does not speak to the issue of a possible hierarchy among relational possessums (see Haiman, 1985:135). In further work it would be interesting to sample a broader array of possessive phrases to be able to compare across different subtypes of possession, and to consider cultural differences in what can be possessed. It might also be worthwhile to reconceptualize relationality of possessums as a graded variable. Rosenbach (2008:154) has argued for complicating the notion of animacy, noting that it may be oversimplifying to treat animacy as static, for “an inanimate entity may occasionally be treated as animate by a speaker if the context supports such an interpretation.” It may similarly be important to recognize that even so-called non-relational nouns may have certain preferred interpretations, reflecting certain experience-based contingencies (see Kolkman, 2016a).

For the present, our findings provide strong evidence that, even when a language does not formally contrast alienable and inalienable possession, there is a processing advantage for possessive phrases that contain inherently relational possessums. The greater ease of accessing the meaning of relational possessums in turn suggests that the meaning of relational possessums is directly accessed from stored entries in the lexicon whereas the meaning of non-relational possessums may require the generation of additional semantic structures to arrive at a plausible interpretation of the phrase. Future research on the processing of possessive phrases may be directed at substantiating this claim using other kinds of online measures and comparing across languages that differ in the degree and type of marking of possessive constructions.

Notes

1. This research was designed and conducted in close collaboration with our dear colleague and friend, Frank Lichtenberk. An earlier version of this research was presented at the 2006 Mental Lexicon conference held in Montreal.

2. To cross-validate our ANOVA by subjects and by items, we analyzed our data with a mixed-effects model (Bates, Maechler, Bolker & Walker, 2015). With a model that included a by-subject random intercept, a by-item random intercept, and by-subject random slopes for both factors of possessor and possessum type, we obtained a significant effect of possessum type, $t(188.20) = 4.03$, $p < .001$. This effect indicated faster judgments for possessive phrases signalling inalienable possession than those to phrases signalling alienable possession. In this analysis the effect for possessor type was not significant, $t(61.10) = 1.01$, $p = .319$. No significant interaction was obtained, $t(1892.20) = 1.26$, $p = .207$.

Appendix A
List of Possessive Phrase Stimuli Used

Plausible Possessor x Possessum Pairings			
Animate-Inalienable	Animate-Alienable	Inanimate-Inalienable	Inanimate-Alienable
The chef's fame	The chef's recipes	The bistro's fame	The bistro's recipes
The bartender's reputation	The bartender's drinks	The hotel bar's reputation	The hotel bar's drinks
The jeweler's hands	The jeweler's auction	The clock's hands	The clock's auction
The player's value	The player's storage	The piano's value	The piano's storage
The performer's smile	The performer's origins	The mask's smile	The mask's origins
The woman's fragrance	The woman's vase	The flower's fragrance	The flower's vase
The rival's eye	The rival's job	The needle's eye	The needle's job
The writer's silence	The writer's ordeal	The night's silence	The night's ordeal
The musician's performance	The musician's breakdown	The engine's performance	The engine's breakdown
The actor's fury	The actor's arrival	The storm's fury	The storm's arrival
The athlete's age	The athlete's visits	The house's age	The house's visitors
The stylist's look	The stylist's chairs	The café's look	The café's chairs
The stewardess's legs	The stewardess's skirt	The table's legs	The table's skirt
The lover's memory	The lover's loss	The computer's memory	The computer's loss
The subject's response	The subject's data	The program's response	The program's data
The researcher's discovery	The researcher's publications	The research's discovery	The research's publications
The cop's speed	The cop's theft	The car's speed	The car's theft
The tenant's shadow	The tenant's rooms	The building's shadow	The building's rooms
The graphics designer's lettering	The graphics designer's letters	The mailbox's lettering	The mailbox's letters
The sailor's calm	The sailor's ships	The harbor's calm	The harbor's ships

Implausible Possessor x Possesum Pairings	
Inanimate - Inalienable	Inanimate - Alienable
the dirt's legs	the metal's recipes
the spoon's howl	the glass's success
the seaweed's face	the hammer's drinks
the houses' veins	the ovens' offices
the accident's reputation	the nail's profit
the evening's skin	the banana's concert
the coin's neck	the can opener's money
the marshmallow's teeth	the scissors' food
the notebook's heart	the tree's service
the play's murmur	the chisel's toys
the sky's back	the rope's readings
the key's fame	the teacup's threat
the water's spine	the shelter's gowns
the stone's hands	the shanty town's limousine
the tweezer's anniversary	the igloo's fireplace
the mall's mouth	the valley's shoes
the raisin's signature	the prison's paintings
the mold's performance	the needle's instruments
the mirror's fragrance	the jar's necktie
the fork's kin	the socket's reviews

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