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SINGULAR *THEY*: ONLINE AND OFFLINE INTERPRETATION EFFECTS AMONG L1 AND L2 SPEAKERS

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ABSTRACT

While research suggests that L2 speakers rely more heavily on non-grammatical cues than L1 speakers during real-time processing (Cunnings, 2017), how referential and grammatical cues interact in L1 and L2 comprehension remains of interest. The present study investigates how the plural grammatical cue of the English singular *they* (a grammatically plural pronoun used to refer to a grammatically singular antecedent) interacts with the referential cue of its antecedent to shape L1 and L2 speakers' online processing and final interpretations. In a self-paced reading task, L1 English monolinguals and L1 German-L2 English speakers read sentences containing either a referential (e.g., *that jogger at the intersection*) or a nonreferential (e.g., *a jogger*) antecedent. A second clause referred to this antecedent using a grammatically singular (*he/she*) or plural (*they*) pronoun. Following each sentence, participants indicated whether the subject was singular or plural. L1 and L2 participants showed no reading time differences for *they* vs. *he/she* in either referential context, suggesting that neither group had difficulty integrating the plural feature of *they* while reading. Interpretation responses revealed that singular *they* resulted in an increase in the proportion of plural responses compared to *he/she* among L1 participants only with nonreferential antecedents, suggesting that L1 participants were sensitive to an offline interaction between the grammatical cues of the pronoun and the referential cues of the antecedent. L2 participants, conversely, exhibited an increase in the proportion of plural interpretations of singular *they* with both referential and nonreferential antecedents, revealing no offline interaction between the cues. Implications for cue-based retrieval accounts of L1 and L2 language processing (Cunnings, 2017; Wagers, Lau, & Phillips, 2009) are discussed.

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Chapter 1

Introduction and Literature Review

Language comprehenders must process a large quantity of information quite rapidly in order to interpret the underlying message of an utterance. Speakers can convey meaning to comprehenders in numerous ways, such as through lexical semantics, syntactic structure, discourse cues, or intonation. Despite the large amount of information conveyed in written and spoken language, comprehenders are able to quickly focus on relevant linguistic information and usually arrive at a correct interpretation.

Comprehension in a second language (L2) is perhaps even more remarkable than comprehension in one's native language (L1). Anyone who has tried to learn an L2 will know that rules and grammatical preferences between one's L1 and L2 often differ. It is therefore especially challenging to master an L2, in which the relevant information a comprehender must utilize may be different than in the L1. How comprehenders use linguistic information in their L2 to form interpretations, and how L2 interpretations compare to L1 interpretations, is thus of interest to identify the underlying mechanism comprehenders use to understand the meaning of utterances.

Underlying processing mechanisms which explain observed differences between L1 and L2 comprehension remain under debate (see Cunnings, 2017). The present study considers a cue-based retrieval account of L1 and L2 comprehension (Cunnings, 2017; Wagers, Lau, & Phillips, 2009) to investigate how information encoded in language interacts in a unique linguistic construction: singular *they*. Singular *they* refers to a construction in English in which a grammatically plural pronoun refers to a grammatically singular antecedent, for example in *Someone forgot their books on the table.* Consequently, utterances using singular *they* contain mixed information regarding the number of the antecedent. The present study investigates how the

number cues of singular *they* and its antecedent influence online and offline language processing among L1 and L2 comprehenders, and furthers our understanding of how comprehenders integrate competing number information during real-time language processing.

L1 processing

During communication, comprehenders receive various linguistic cues through language. Each bit of information encoded in language can be thought of as a linguistic cue, and the compilation of all linguistic cues in an utterance shapes how comprehenders interpret its overall meaning. Linguistic cues are used in both language production and language comprehension; a speaker chooses appropriate cues to transmit a message, and a comprehender interprets these cues to arrive at their underlying meaning.

Linguistic cues appear in many forms. Cues that arise through the grammar and structure of a language are considered grammatical cues. Previous research has shown that grammatical cues, such as grammatical gender (e.g., Esaulova, Reali, & von Stockhausen, 2014; Lorimor, Jackson, & Foote, 2015), grammatical number (e.g., Foote & Bock, 2012, Patson & Husband, 2016; Wagers et al., 2009), thematic role assignment (e.g., Esaulova, Reali, & von Stockhausen, 2017; Smyth, 1994), and syntactic structure (e.g., Cuetos & Mitchell, 1988; Felser, Roberts, Marinis, & Gross, 2003), influence production and comprehension among L1 speakers. For example, mismatches in grammatical number between a subject and its agreeing verb, such as (1) from Wagers et al. (2009), create difficulties in comprehension. As a result, comprehenders read the word following the ungrammatical verb in (1b) (i.e., *rusty*) more slowly than the same word following the grammatical verb in (1a).

(1a) The old key unsurprisingly was rusty from many years of disuse.

(1b) *The old key unsurprisingly were rusty from many years of disuse.

In addition to grammatical cues, semantic cues also influence language production and comprehension. Semantic cues stem from the underlying meaning of words and phrases. One such semantic cue is a noun's conceptual number (e.g., Eberhard, 1999; Vigliocco, Butterworth, & Garrett, 1996). Conceptual number refers to the distributivity of a noun phrase, i.e., how many real-world entities it refers to. For example, the noun phrase in (2) is conceptually plural; each bottle has a different label, so the phrase refers to more than one label. The noun phrase in (3), conversely, is conceptually singular; only one road leads to the mountains, so the phrase refers to only one road. Importantly, this illustrates that a noun's conceptual number is not always identical to its grammatical number. Both noun phrases in (2) and (3) are grammatically singular; the conceptual number difference arises from semantic cues.

(2) The label on the bottles

(3) The road to the mountains

Comprehenders must process grammatical cues and semantic cues, along with other cues, to interpret the message of an utterance. The underlying mechanism that comprehenders use to arrive at the meaning of an utterance is of great interest to psycholinguists. A growing body of research supports a cue-based memory retrieval mechanism of language comprehension (e.g., Martin & McElree, 2011; Wagers et al., 2009). Under a cue-based retrieval model, a comprehender receives a succession of linguistic cues during comprehension, which she must incrementally integrate into working memory. As cues are integrated, they form something analogous to a mental picture of the utterance, which allows the comprehender to interpret the message while it is being communicated. Additionally, some language components, such as subject-verb agreement and

pronouns (both described in detail below), call for the retrieval of previously encountered cues for their successful integration into the comprehender's mental picture.

One example of cue-based retrieval during language processing occurs during subject-verb agreement. In many languages, verbs must agree in various features with their subjects. For instance, subjects and their conjugated verbs must agree in number and person in English. Since verbs are conjugated frequently, speakers of a language must produce and comprehend subject-verb agreements quite often. Subject-verb agreement consequently provides researchers with an ideal environment in which to test how linguistic cues are used in producing and comprehending two sentence elements that must match in certain features.

While subject-verb agreement is normally a straightforward process, sometimes an intervening sentence element may disrupt subject-verb agreement. This intervening phenomenon is known as agreement attraction. Complex noun phrases consisting of a head noun and a modifying prepositional phrase (e.g., *the key to the cabinets*) have been frequently employed to study agreement attraction and cue-based retrieval mechanisms. For example, Bock and Miller (1991) showed that when speakers had to complete a sentence beginning with a complex noun phrase (e.g., *the key to the cabinets*), they sometimes produced a verb that did not agree in grammatical number with the head noun, such as in (4). The intervening noun phrase (i.e., *the cabinets*), which contains a plural cue, interferes with the number retrieval of the head noun (i.e., *the key*) when producing the verb, resulting in such ungrammatical productions.

(4) *The key to the cabinets are ...

Semantic cues have been shown to further influence such agreement attraction productions. For example, speakers are more likely to produce an ungrammatical plural verb form when the subject

is conceptually plural (e.g,. *the label on the* bottles) than when the subject is conceptually singular (e.g., *the road to the mountains*; Eberhard, 1999; Vigliocco et al., 1996).

Interfering linguistic cues in agreement attraction also influence language comprehension. Patson and Husband (2016) presented participants with sentences beginning with one of the four phrases in (5), manipulating whether the distractor noun (i.e., *cabinet/cabinets*) or verb (i.e., *is/are*) contained a plural cue.

(5a) The key to the cabinet is ...

(5b) The key to the cabinets is ...

(5c) *The key to the cabinet are ...

(5d) *The key to the cabinets are ...

After reading each sentence, participants were asked whether the subject of the sentence was singular or plural (e.g., *Was there more than one key?*). As such, the comprehension question probed for information about the head noun, and participants thus had to retrieve the number cue of the head noun from memory to respond. A literal interpretation should always yield a singular response – however, participants' responses were shown to be influenced by other cues in the sentence. Specifically, Patson and Husband found that whenever a plural cue was present, in either the distractor (i.e., *cabinets*), the verb (i.e., *are*), or both, participants were more likely to incorrectly interpret the head noun (i.e., *key*) as plural. This suggests that cue-based retrieval is not perfect, and sometimes other cues in memory interfere during the retrieval process, leading to interpretations that are not completely consistent with the grammatical input.

Pronouns provide another common linguistic structure in which cue-based retrieval is utilized in language processing. When encountering a pronoun, a comprehender must activate previously integrated words to search for the pronoun's corresponding antecedent. Similar to

subject-verb agreement, pronouns and their antecedents must match in certain features, such as number, gender, and/or person, depending on the language. Under a cue-based retrieval framework of language comprehension, comprehenders utilize linguistic cues to correctly identify and retrieve the antecedent when processing a pronoun.

Research investigating how comprehenders arrive at an interpretation of a pronoun has shown that comprehenders may weight (i.e., rely on) some cues more heavily than others. Kaiser and Trueswell (2008) investigated how L1 Finnish comprehenders weight various cues when processing pronouns. In Finnish, two different third-person pronouns can be used to refer to humans: *hän*, a gender-neutral personal pronoun; or *tämä*, a demonstrative pronoun. Participants heard passages in which these pronouns could refer to one of two possible antecedents to investigate the effects of two grammatical cues in pronoun resolution: sentence role (i.e., do participants interpret the subject or the object as the antecedent?) and linear distance (i.e., do participants interpret the noun closer to or farther from the pronoun as the antecedent?). They found that participants weighted sentence role more heavily when interpreting *hän* (i.e., were more likely to interpret the antecedent as the subject, regardless of linear distance), but weighted sentence role and linear distance more equally when interpreting *tämä* (i.e., did not show a clear preference for subject/object or nearer/farther antecedents). This suggests that Finnish comprehenders do not always weight one cue over the other; rather, the weightings vary according to the type of pronoun (*hän* or *tämä*). This study, along with similar research in other languages (Dillon, Chow, & Xiang, 2016; Schumacher, Roberts, & Järvikivi, 2017), demonstrates that L1 comprehenders weight cues differently depending on context.

In summary, current research suggests that L1 speakers utilize a cue-retrieval mechanism when producing and comprehending language. Of particular importance for the current study,

interfering linguistic cues have been shown to influence cue-based retrieval, and L1 comprehenders have been shown to weight linguistic cues varyingly depending on their context.

L2 processing

L2 speakers have exhibited differences from L1 speakers in both production (e.g., Jackson, Mormer, & Brehm, accepted; Wei, Chen, Liang, & Dunlap, 2015) and comprehension (e.g., Felser, Sato, & Bertenshaw, 2009; Roberts, Gullberg, & Indefrey, 2008). For example, Felser et al. (2009) investigated how the gender of a non-local noun phrase influences how L1 and L2 English speakers process reflexive pronouns. In sentences such as (6), the reflexive pronoun *himself* can syntactically refer only to *Richard*. However, by manipulating the gender of an earlier noun phrase (i.e., *John/Jane*), which the reflexive pronoun cannot refer to, Felser and colleagues investigated how such earlier noun phrases can influence reading times of *himself*.

(6) John/Jane noticed that Richard had cut himself with a very sharp knife.

Felser et al. found that L2 speakers' first-pass reading times of *himself* were slower when the earlier noun phrase matched the gender of the antecedent (i.e., sentences with *John* resulted in slower reading times of *himself* than sentences with *Jane*). L1 speakers, however, showed no significant first-pass reading time differences. This suggests that the L2 speakers at least briefly considered *John* as a possible antecedent, even though it is not syntactically licensed as such, leading Felser et al. to conclude that there are fundamental differences in how L2 versus L1 speakers process L2 input, with L2 speakers being less able to use syntactic constraints to build the structure of a sentence in real time.

Various hypotheses have attempted to account for observed differences between L1 and L2 sentence processing. In one account, Clahsen and Felser (2006) posit a Shallow Structure Hypothesis. Under this hypothesis, L2 comprehenders are less sensitive to grammatical cues than L1 comprehenders, and, therefore, do not always construct a full, detailed syntactic structure of a sentence during processing. For example, the L2 results from Felser et al. (2009) can be explained with this hypothesis. The referential pronoun's antecedent is determined by syntactic structure, and since L2 speakers are posited to form only incomplete structures, two possible antecedents (*John* and *Richard*) in any position in the sentence creates more processing difficulties, even when only one possible antecedent is syntactically licensed.

In a recent review of current L2 processing research, Cunnings (2017) proposes an alternative account for diverging results between L1 and L2 processing. Rather than hypothesizing that L2 speakers do not construct full syntactic structures, Cunnings suggests that L2 speakers utilize a similar cue-based retrieval mechanism to L1 speakers. L1/L2 processing differences then arise based on the weightings of cues, and the possibility that L2 speakers may weight the relative importance of such cues differently from L1 speakers. He also posits that L2 comprehenders weight discourse-based cues and lexical-semantic cues more heavily than grammatical cues, as compared to L1 speakers. Additionally, Cunnings hypothesizes that L2 processing is more susceptible to interference when L2 comprehenders integrate and retrieve linguistic cues from working memory than L1 processing. Cunnings argues that a cue-based mechanism, alongside these quantitative differences in how such a mechanism is implemented in L1 and L2 processing, can better account for findings than other theories such as the Shallow Structure Hypothesis (Clahsen & Felser, 2006).

Jegerski (2016), for example, supports Cunnings' (2017) approach, contra the Shallow Structure Hypothesis. Jegerski investigated whether near-native L1 English-L2 Spanish speakers exhibited processing effects similar to L1 Spanish speakers in a self-paced reading task while reading sentences containing either agreement attraction, as in (7b), or sentences in which the head noun was singular or plural, leading to ungrammatical sentences, as in (8b) versus (8a).

(7a) El testigo del abogado tiene mala fama en el barrio.

(7b) El testigo de los abogados tiene mala fama en el barrio.

"The witness of the lawyer/lawyers has a bad reputation in the neighborhood."

(8a) Los testigos del abogado tienen mala fama en el barrio.

(8b) El testigo del abogado *tienen mala fama en el barrio.

"The witnesses/*witness of the lawyer have a bad reputation in the neighborhood."

Jegerski found that both near-native L2 Spanish speakers, as well as L1 Spanish speakers, read the ungrammatical verb in (8b) more slowly than the verb in (8a). Both groups also showed an effect of number attraction. L1 speakers read the region after the verb in (7b) more slowly than the same region in (7a). Near-native L2 speakers read the verb in (7b) more slowly than the verb in (7a), displaying the same effect earlier than L1 speakers. These results reveal that L1 speakers and near-native L2 speakers show similar sensitivity to number manipulations of both the head noun and the local noun, suggesting that L2 speakers have access to grammatical information and use this information to build the syntactic structure of the sentence during online processing. This provides evidence against the Shallow Structure Hypothesis. Cunnings's account, on the other hand, supports these results, as his cue-based retrieval account does not claim that L2 speakers are insensitive to morphosyntactic cues during online comprehension.

At the same time, Cunnings's (2017) model acknowledges that L2 speakers do not always exhibit the same parsing routines as L1 speakers, and accounts for evidence that previously supported the Shallow Structure Hypothesis, such as Felser et al. (2009), discussed above. Rather than proposing that Felser et al.'s results that a syntactically inaccessible but gender-matching antecedent slows down L2 reading times of a later reflexive pronoun arise from a lack of syntactic representation, Cunnings's model posits that these slower reading times are a result of interfering linguistic cues in L2 antecedent retrieval. More specifically, the presence of two matching grammatical cues in the sentence leads to interference as L2 speakers retrieve cues from earlier sentence elements to determine the pronoun's antecedent. Results such as these also support Cunnings's model in which L2 speakers weight cues differently than L1 speakers. Namely, L2 speakers seem to rely less heavily on grammatical cues (such as syntactic structure) than semantic cues (such as gender) when searching for an appropriate antecedent. But, again, they still have complete access to such syntactic information during real-time sentence processing, even if they are less likely to use such information.

In summary, L2 processing has been observed to differ from L1 processing. While various explanations for these comprehension differences have been proposed, Cunnings's (2017) proposal, which extends a cue-based retrieval hypothesis to bilinguals, seems to provide a realistic account for current research results. According to Cunnings, a key difference between L1 and L2 processing is that L2 speakers weight grammatical cues less heavily than discourse cues compared to L1 speakers.

Singular *they*

The present study investigates the interaction between linguistic cues in L1 and L2 processing of a common but non-standard pronoun in English: singular *they*. Singular *they* is a construction in which a third-person plural pronoun (e.g., *they, them, their*) refers to a grammatically singular antecedent. Singular *they* is traditionally used when the antecedent could refer to a person of any gender, as in (9), or when the speakers does not know the gender of the person being referred to, as in (10) (Bodine, 1975; MacKay, 1980; Meyers, 1990).

(9) A jogger should wait at a red light, even if *they* feel impatient.

(10) Someone left *their* books on the table.

Empirical studies have investigated how L1 speakers use this pronoun in writing. According to a survey conducted by LaScotte (2016), L1 English speakers reported singular *they* to be acceptable in informal contexts, and exhibited a strong preference to use singular *they* over other pronominal forms to refer to a singular, genderless antecedent (*an ideal student*) in an informal writing task.

Singular *they* is rather unique among pronoun agreement. In English, pronouns must agree in number with their antecedents. However, since English lacks a singular third-person genderless pronoun, L1 speakers frequently employ singular *they* for this purpose in informal contexts (LaScotte, 2016). Alternatives to singular *they* include a generic masculine pronoun, as in (11), or a combination of both masculine and feminine pronouns in the same utterance, as in (12). Unlike singular *they*, these alternatives utilize grammatically singular pronouns, and thus match in grammatical number with their antecedents. Even so, generic masculine and combined pronominal forms have become outdated in English.

(11) A jogger should wait at a red light, even if *he* feels impatient.

(12) A jogger should wait at a red light, even if *he/she* feels impatient.

Singular *they*, therefore, provides a novel linguistic environment in which to test how various linguistic cues interact in language comprehension. Utterances containing singular *they* present comprehenders with conflicting cues as to the number representation of the antecedent. The stated antecedent presents a singular grammatical cue (e.g., *a jogger*), while singular *they* presents a plural grammatical cue. Comprehenders must integrate these conflicting grammatical number cues when interpreting a sentence containing singular *they*.

Previous research has investigated how L1 speakers read singular *they* following various types of antecedents. Foertsch and Gernsbacher (1997) investigated how semantic reference of the antecedent influenced reading times of singular *they* in a self-paced reading task. Semantic reference is a linguistic cue which indicates how many real-world entities a noun phrase identifies: referential (or referring) noun phrases identify a specific entity in the real world (e.g., *that jogger at the intersection*); nonreferential (or non-referring) noun phrases do no identify a specific entity (e.g., *a jogger*; Saeed, 2016). Foertsch and Gernsbacher were also interested in how gender stereotypes of the antecedent (e.g., *truck driver* is stereotypically masculine, *nurse* is stereotypically feminine, *student* is stereotypically either male or female) influenced singular *they* reading times. See Table 1 for sample stimulus items from this study.

Table 1. Sample stimulus items from Foertsch and Gernsbacher (1997).

	Referential antecedent	Nonreferential antecedent
Stereotypically masculine antecedent	*That truck driver* shouldn't drive when sleepy, even if *he/she/they* may be trying to make a deliver on time, because many accidents are caused by drivers who fall asleep at the wheel.	*A truck driver* should never drive when sleepy, even if *he/she/they* may be struggling to make a delivery on time, because many accidents are caused by drivers who fall asleep at the wheel.
Stereotypically feminine antecedent	*My nurse* was able to explain how my medication would affect me, even though *he/she/they* had no say in prescribing it, because nurses must anticipate how patients will respond to medication.	*A nurse* should have an understanding of how a medication works, even if *he/she/they* will not have any say in prescribing it, because nurses must anticipate how a patient will respond to the medication.
Gender neutral antecedent	*A runner I know* always ate lots of pasta the night before a race, even when *he/she/they* would've rather had a steak, because carbohydrates provide fuel for endurance events, while proteins do not.	*A runner* should eat lots of pasta the night before a race, even if *he/she/they* would rather have a steak, because carbohydrates provide fuel for endurance events, while proteins do not.

Foertsch and Gernsbacher found no significant reading time differences when reading clauses containing singular *they* compared to clauses containing *he/she* when referring to gender neutral antecedents. This result was consistent across both referential and nonreferential gender neutral antecedents. Interestingly, gender stereotyped antecedents revealed a variation between how singular *they* was read after referential and nonreferential antecedents. No significant difference in reading times were found between *they* and the singular pronoun with matching gender when the antecedent was nonreferential; *they* was read slower than the matching pronoun when the antecedent was referential. Taken together, the results from this study suggest that singular *they* may be processed differently depending on the referential status of the antecedent, even if this difference was not found in reading times of gender neutral antecedents.

More precise eye-tracking studies among L1 speakers have revealed mixed results. Sanford and Filik (2007) manipulated not only the grammatical number of the pronoun (singular *he/she* and plural *they*) but also the grammatical number of gender neutral referential antecedents (singular *person* or plural *people*), as in (13).

(13) Mr Jones was looking for the station. He saw *someone/some people* on the other side of the road, so he crossed over and asked *them/her* politely where the station was. It was in a different part of town.

Among other eye gaze measures, they analyzed the total reading time (sum of all gazes) of the two-word region containing the pronoun (underlined above), a measure which is sensitive to how much difficulty a comprehender has in processing the region. They found that reading times were fastest when the number of the pronoun and the antecedent matched (singular pronoun with singular antecedent; plural pronoun with plural antecedent). A plural pronoun following a singular antecedent (i.e., singular *they*) was read more slowly (unlike in Foertsch & Gernsbacher, 1997,

who investigated reading times of entire clauses), but not as slowly as a singular pronoun following a plural antecedent. Sanford and Filik argue that, while the mismatch in number cues when reading singular *they* may disrupt processing slightly, the disruption is not as severe as a mismatch between a plural antecedent and a singular pronoun. This suggests that the competing number cues in singular *they* are more readily accommodated by L1 speakers than a traditional ungrammatical number mismatch. Doherty and Conklin (2017), on the other hand, found no total reading time differences in an eye-tracking experiment when reading singular *they* and *he/she* following gender neutral referential antecedents in sentences, replicating results similar to Foertsch and Gernsbacher.

No previous research to our knowledge has investigated the effect of singular *they* on comprehenders' final interpretation of utterances. By analyzing how comprehenders interpret the number of the antecedent referred to by singular *they*, we can shed light on how comprehenders integrate competing grammatical number cues in their final interpretation, after all linguistic cues have been processed. Furthermore, no previous research has investigated how L2 speakers process sentences containing singular *they*. Comparing how L1 speakers, who have been shown to use singular *they* frequently (LaScotte, 2016), and L2 speakers, who have no corresponding grammatical form in their L1, process singular *they* will give insight into how L1 and L2 speakers use these cues to incrementally build the structure and meaning of an utterance.

Present study

The present study considers a cue-based retrieval processing model with regard to a novel linguistic construction, the English singular *they*. We will investigate how the referential cue of

the antecedent (i.e., whether the antecedent is a referential or nonreferential noun phrase) influences online and offline language processing among L1 and L2 speakers of English. Specifically, we will analyze reading times and interpretation measures as participants read sentences containing singular *they* in a self-paced reading task. Online reading times will reveal if difficulties arise as comprehenders integrate the plural grammatical cue of singular *they* at the point they initially encounter the pronoun. Offline interpretation measures will give insight into how comprehenders incorporate and retrieve all of the cues in a sentence when arriving at a final interpretation.

We will compare these measures between two groups of participants: L1 English monolingual speakers, and L1 German-L2 English speakers. In German, there is no equivalent to singular *they*; a German pronoun must always match its antecedent in number, gender, and person. Thus, when encountering singular *they* when reading in their L2 English, L1 German speakers cannot rely on a corresponding L1 pronoun processing strategy. Comparing the processing effects of singular *they* among L1 English and L1 German speakers will allow us to examine how these groups differ in the cues used in the interpretation of singular *they*.

If the self-paced reading time results of Foertsch and Gernsbacher (1997) hold for a more fine-grained word-by-word self-paced reading measure, we predict that L1 English speakers will show no reading time differences between singular *they* and a singular pronoun *he/she*, regardless of whether the pronoun refers to a referential or nonreferential antecedent. A cue-based account of L1 comprehension predicts that comprehenders will be more likely to interpret the antecedent as plural following singular *they* (which contains a plural cue) compared to a singular pronoun (which does not contain a plural cue). We also predict more plural interpretations following a

nonreferential antecedent (which contains no clear singular referential cue) compared to a referential antecedent (which contains a clear singular referential cue).

L2 results from the sentence reading task could, following Cunnings's (2017) L2 comprehension model, pattern in two distinct ways. First, Cunnings's model predicts that cue interference is more likely to occur in L2 processing than in L1 processing. If this holds, L2 reading times are likely to be slower for *they* than *he/she*, as the singular antecedent cue interferes with the integration of the plural cue of *they*. This should be especially prevalent in the referential condition (i.e., *that jogger*), which contains a singular grammatical cue and more clearly refers back to a single specific subject noun. If the cues of singular *they* interfere during offline interpretation, L2 speakers will be more likely to interpret the sentence as referring to more than one person for sentences containing the plural pronoun *they* than *he/she*, and, again, this effect is likely to be greater when interpreting a referential antecedent. At the same time, Cunnings's model posits that L2 comprehenders weight grammatical cues less heavily than L1 comprehenders. This could mean that the grammatical number cues of the pronoun are less likely to interfere with cues from the antecedent. Thus, L2 comprehenders would have less difficulty integrating *they* while reading the sentence, resulting in fewer differences in reading times between *they* and *he/she* in both referential conditions. Additionally, plural grammatical cues from *they* would be less likely to interfere during cue retrieval during interpretation, resulting in a similar amount of plural interpretations between *they* and *he/she* in both referential conditions.

We will also examine how L1 and L2 speakers use singular *they* in informal writing. At the beginning of the experiment, participants will be prompted to describe a singular, genderless antecedent (i.e., *a student*) in a writing task based on LaScotte (2016). These results will reveal if and how L2 English speakers differ in pronoun choice when antecedent is gender neutral. We

predict that the L1 German-L2 English speakers will use singular *they* less frequently than the L1 English speakers, since an equivalent of this construction does not exist in German. Furthermore, written production results will be analyzed at an individual level to investigate if speakers who produce singular *they* in their own writing in turn process the pronoun differently than those who do not utilize it in their own writing.

Taken together, the written production task and the sentence reading task will provide insight into how L1 and L2 speakers use and process singular *they*.

Chapter 2

Methods

Participants

Fifty-three L1 English speakers, recruited and tested online via Amazon Mechanical Turk, and 31 German L2 English speakers from a German university participated in the experiment for payment. Twenty-one L1 speakers were excluded from analyses because they were older than 35 years old, reported foreign language exposure before the age of five, or answered fewer than 80% of the unambiguous non-critical trial questions correctly. Two L2 speakers were also excluded, one due to significant exposure to a foreign language before the age of five, and one due to a mild case of dyslexia. The final participant pool consisted of 32 L1 speakers (10 female; 22 male) and 29 L2 speakers (20 female; 9 male). The L2 speakers also completed a 43-point multiple choice proficiency test probing their English grammatical accuracy, with items taken from the Michigan English Language Institute College Entrance Test (MELICET), which is a retired version of the Michigan test for English as a Second Language (used with permission from Blattner, 2007).

Participant data is reported in Table 2. The L2 English participants were significantly younger than the L1 English participants ($t(59) = 6.04$, $p < .001$), although the average age in both participant groups was below 30 years and the overall age range was similar across groups.

Table 2. Biographical information.

	L1 participants (N = 32)		L2 participants (N = 29)	
	M (SD)	*range*	*M (SD)*	*range*
Age (in years)	28.6 (4.1)	19-36	22.6 (3.6)	18-33
L2 English proficiency (maximum score 43)	N/A	N/A	33.5 (5.8)	19-41

Materials

During the main task, participants read sentences in English in a self-paced reading task. Critical trials consisted of three clauses and were modeled after the stimuli used by Foertsch and Gernsbacher (1997). The first clause began with the subject of the sentence, varying according to whether the subject was a grammatically singular referential noun phrase (e.g., *that jogger at the intersection*), as in (14), or a grammatically singular nonreferential noun phrase (e.g., *a jogger*), as in (15). The second clause introduced a pronoun which referred back to the subject, varying according to whether the pronoun was grammatically singular (either *he* or *she*), as in (14a) and (15a), or grammatically plural (*they*), as in (14b) and (15b). All items included a third clause so that the region of interest did not coincide with the end of the sentence.

(14a) *That jogger at the intersection* should wait at a red light, even if *she* feels impatient, because it could be dangerous to do so.

(14b) *That jogger at the intersection* should wait at a red light, even if *they* feel impatient, because it could be dangerous to do so.

(15a) *A jogger* should wait at a red light, even if *she* feels impatient, because it could be dangerous to do so.

(15b) *A jogger* should wait at a red light, even if *they* feel impatient, because it could be dangerous to do so.

Each critical trial was followed by a yes-no comprehension question probing the number of the subject (e.g., *Does more than one jogger feel impatient?*). In total 40 critical trials of this type were created. See Appendix A for a complete list of critical items.

Additionally, 18 distractor trials and 61 filler trials, along with corresponding comprehension questions, were adapted from a previous experiment (Brehm, Jackson & Miller, accepted). Many of these items included colloquialisms, abbreviations, and intentional misspellings so as to create an informal context in which singular *they* might be used by native speakers. Distractor items were included so as to mask the number ambiguity in the critical trials. Twelve of the distractor trials contained syntactically ambiguous relative clauses. The ambiguity was probed in the corresponding comprehension questions (e.g., *Wow the mother of the bride who embarrassed herself at the reception was complaining to the priest.* Q: *Was the mother embarrassed?*). Six other distractor trials asked for number information (e.g., *It's too bad, the art critics wrote the interviews had been a complete disaster.* Q: *Did more than one interview go poorly?*). Filler trials consisted of informal sentences and comprehension questions probing unambiguous sentence information or required participants to make simple inferences (e.g., *I'm going over to my friend's apartment tonight, wanna come?* Q: *Does the author of this email have plans for the evening?*). See Appendix B for complete list of distractor and filler trials.

The 40 critical trials were divided into eight lists, such that each list contained 10 items in each condition, but only one version of any given item. The critical trials in each list were presented in a pseudorandomized order, along with the 18 distractor trials and 61 filler trials. In total, each participant read a total of 119 sentences during the main task.

Procedure

Both groups of participants completed the experiment via the online experiment platform Ibex Farm. L1 participants were directed to the experiment online through Amazon Mechanical Turk and completed the experiment remotely in approximately 30 minutes. L2 participants were tested on the experimenter's laptop in individual laboratory sessions lasting approximately 60 minutes. The experimental tasks were completed in the following order.

Participants first completed a written production task. The written production task gave insight into how L1 and L2 speakers use singular *they* in an informal writing context. Participants were instructed to respond to the following prompt (from LaScotte, 2016) in three to five sentences: *What does it mean to be an ideal student? What does an ideal student need to do? If the student doesn't do this, what are the consequences?*Production data was used to identify possible trends between how participants use singular *they* and how they interpret singular *they* in the sentence reading task.

Following the written production task, participants completed the main self-paced reading task. At the beginning of this task, written instructions for the self-paced reading task appeared on the screen. Three practice trials preceded the experimental trials. Participants received feedback following the comprehension questions during the practice trials ("Correct" or "Incorrect"), but

did not receive feedback during the experimental trials. In each trial, participants first saw the subject line of an email from which the upcoming sentence was supposed to originate (e.g., *RE: Attention!!*). Presenting sentences from hypothetical emails, along with the colloquialisms used in filler trials, added to the informal context of the task. Following the subject line, sentences were presented one word at a time using the moving-window procedure (Just, Carpenter, & Woolley, 1982). Participants were instructed to read each word and then press the spacebar to continue to the next word. After the final word of the sentence, the comprehension question appeared on the screen. Participants pressed a key ("F" for "Yes", "J" for "No") to record their response and to continue to the next trial.

Following the main task, participants completed a language background questionnaire. L2 speakers also completed the proficiency test prior to the end of the experiment.

Data analysis

All responses from the written production task data were scored for pronoun usage. Each pronoun which referred to a singular, genderless antecedent (e.g., *a student*) was counted and sorted into one of the following categories: generic masculine (*he, him, his, himself*), generic feminine (*she, her, hers, herself*), combined forms (*he or she, he/she*), indefinite (*someone, one*), second person (*you, your, yourself*), and singular *they* (*they, them, their, themselves* referring to a grammatically singular entity). Two participants explicitly used a plural antecedent (*students*) in their responses; pronouns referring to this antecedent were excluded from the data. Another participant mistyped the beginning of a sentence (*The are focused and...*), and this mistype was also excluded from the final count.

For the main task, comprehension question responses faster than 100ms or more than 3 *SD*s slower than the mean of all comprehension questions in each participant group were excluded (3.9% of L1 trials; 7.2% of L2 trials). These trials were also removed from reading time (RT) analyses.

After removing the above trials, by-word RTs faster than 100ms or slower than 10,000ms were excluded. Remaining RT data was considered at the participant level, and by-word RTs greater than 3*SD*s from a participant's mean were excluded. In total, 8.3% of L1 by-word RTs and 13.7% of L2 by-word RTs were excluded from all usable trials. By-word RTs were then length residualized by participant prior to analyses (as in Fine, Jaeger, Farmer, & Qian, 2013). We defined our critical region for by-word RT analyses to be the pronoun in the second clause and the following two words of critical trials.

Analyses were conducted using mixed-effect logistic regression models for the interpretation data and mixed-effect models for the RT data with the lme4 package (Bates, Mächler, Bolker, & Walker, 2015) of R version 3.3.3 (R Development Core Team, 2017). Reference (nonreferential vs. referential) and Pronoun (*he/she* vs. *they*) were entered as fixed effects into the model, contrast coded as -.5 and .5. The random effect structure included random intercepts for Items and Participants, and correlated by-participant random slopes for Reference and Pronoun. Following general convention, for the mixed-effect model of the RT data, we considered *t*-values to be significant if they had an absolute value greater than 2.

Chapter 3

Results

Written production task results

Table 3 shows the number of pronouns used in each category to refer to a singular, genderless antecedent (i.e., *an ideal student*) among L1 and L2 responses. Note that this count includes the total number of instances the pronoun was used across all responses. If more than one pronoun was used in a response, each instance was counted separately, and, as such, these data do not reflect the number of participants who used each pronoun. As shown, L1 speakers used singular *they* more frequently than L2 speakers to refer to a singular, genderless antecedent. Singular *they* accounted for a majority (68.91%) of the pronouns used by L1 participants, while generic masculine pronouns (33.33%) and combined forms (28.28%) were used most frequently by L2 participants.

We also were interested in the number of L1 and L2 participants who used singular *they* in their written responses. Table 4 shows the number of participants in each group who used singular *they* at least once in the written production task. As shown, a greater proportion of L1 participants (71.88%) used singular *they* than L2 participants (20.69%).

Table 3. Written production task results, number of pronouns used to refer to singular, genderless antecedent.

	L1 participants	L2 participants
Generic masculine (*he, him, his, himself)*	8 (6.72%)	33 (33.33%)
Generic feminine (*she, her, hers, herself*)	0 (0%)	0 (0%)
Combined form (*he or she, he/she*)	1 (0.84%)	28 (28.28%)
Indefinite (*someone, one*)	12 (10.08%)	2 (2.02%)
Second person (*you, your, yourself*)	16 (13.45%)	20 (20.20%)
Singular *they*	82 (68.91%)	16 (16.16%)
Total	119 (100%)	99 (100%)

Table 4. Written production task results, number of participants who used singular *they* at least once in response.

	L1 participants	L2 participants
Used singular *they*	23 (71.88%)	6 (20.69%)
Did not use singular *they*	9 (28.13%)	23 (79.31%)
Total	32 (100%)	29 (100%)

Self-paced sentence reading task results

L1 participant results

Figure 1 presents descriptive results for the L1 word-by-word RT data around the critical region (pronoun in the second clause and following two words) in the self-paced reading task. As seen in Table 5, we found no significant effect of Reference or Pronoun on by-word RTs in the critical region.

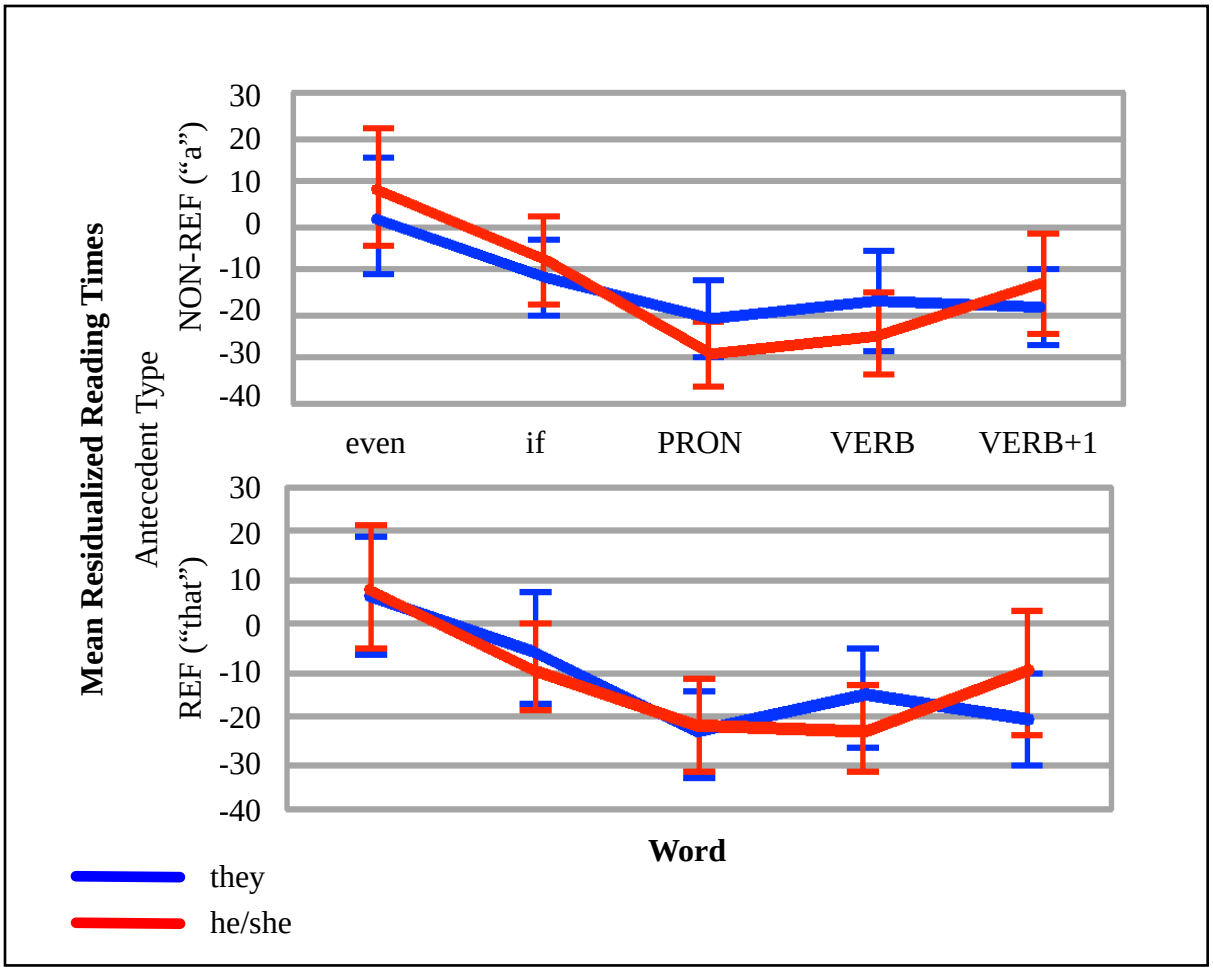

Figure 1. L1 by-word length residualized reading times around the critical region, split by condition. Error bars represent by-word *SE*s.

Table 5. Summary of the mixed-effect models for L1 critical region RT data.

	Pronoun			Verb			Word after verb		
Fixed effects	Estimate	Std. error	t-value	Estimate	Std. error	t-value	Estimate	Std. error	t-value
(Intercept)	-24.44	4.30	-5.689	-19.98	3.08	-6.478	-15.33	2.93	-5.242
Reference	2.84	3.30	0.860	1.92	3.99	0.483	0.26	4.13	0.062
Pronoun	2.49	3.09	0.80	7.58	4.59	1.65	-7.68	4.44	-1.729
Reference x Pronoun	-9.01	6.08	-1.482	-0.42	7.23	-0.058	-4.17	8.07	-0.517
Random effects	Var.	Std. dev.	Corr.	Var.	Std. dev.	Corr.	Var.	Std. dev.	Corr.
Item									
(Intercept)	27.92	5.28		8.12	2.85		57.89	7.61	
Participant									
(Intercept)	492.00	22.18		191.44	13.84		96.11	9.80	
Reference	50.77	7.13	0.40	88.42	9.40	-0.13	23.57	4.86	0.78
Pronoun	10.05	3.17	-0.21	253.29	15.92	0.23	108.88	10.44	-1.00

Figure 2 presents descriptive results for the L1 interpretation data. As seen in Table 6, a significant main effect of Reference was found, because L1 participants were more likely to interpret the sentence subject as plural with nonreferential antecedents than with referential antecedents. No significant main effect of Pronoun was found. Furthermore, a significant interaction effect was found between Reference and Pronoun. L1 participants were more likely to interpret the sentence subject as plural for *they* compared to *he/she* with nonreferential antecedents, while there was no difference in the proportion of plural responses for *they* versus *he/she* with referential antecedents.

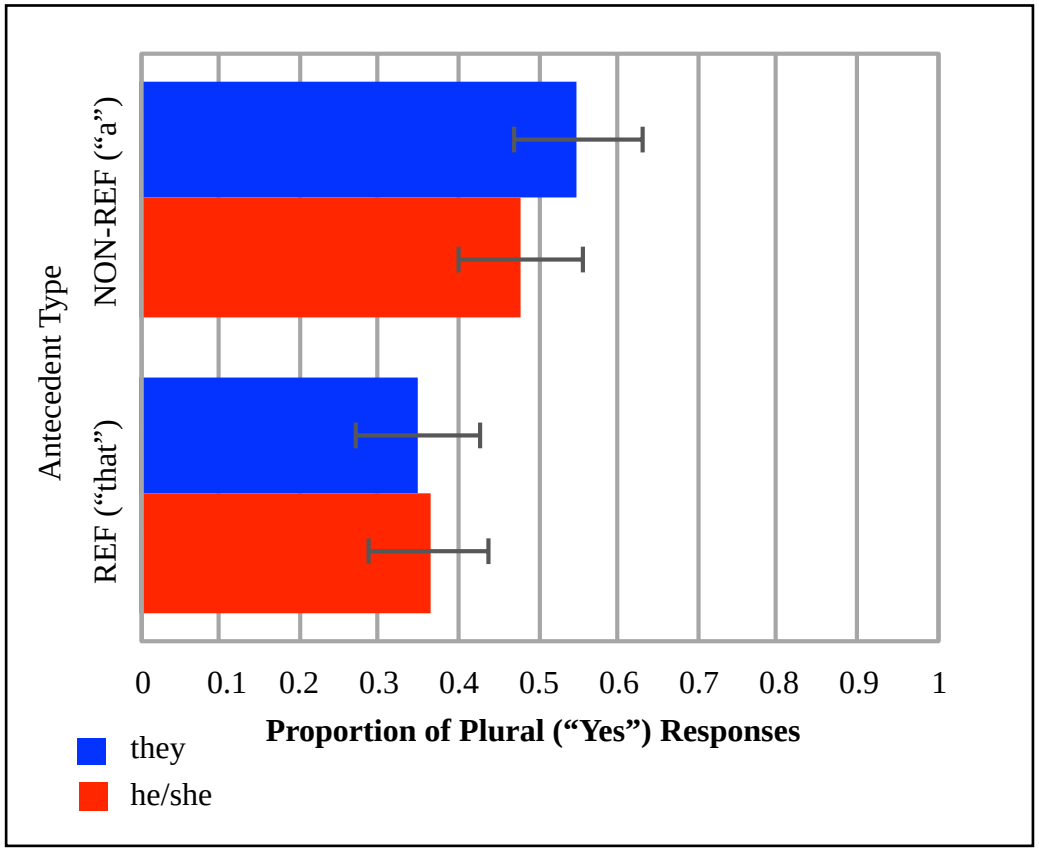

Figure 2. Proportion of plural interpretations among L1 participants, split by condition. Error bars represent *SE*s for each condition.

Table 6. Summary of the mixed-effect logistic regression model for L1 interpretation data.

Fixed effects	Estimate	Std. error	z-value	Pr (>|z|)
(Intercept)	-0.53	0.37	-1.44	.151
Reference	-1.10	0.26	-4.20	<.001
Pronoun	0.20	0.16	1.25	.210
Reference x Pronoun	-0.63	0.31	-2.03	.042
Random effects	Var.	Std. dev.	Corr.	
Item				
(Intercept)	0.33	0.58		
Participant				
(Intercept)	3.77	1.94		
Reference	1.24	1.11	0.22	
Pronoun	0.002	0.05	0.82	

L2 participant results

Figure 3 presents descriptive results for the L2 RT data for the critical region surrounding the pronoun. Similar to the L1 results, there was no significant effect of Reference or Pronoun on by-word L2 RTs in this region, as seen in Table 7.

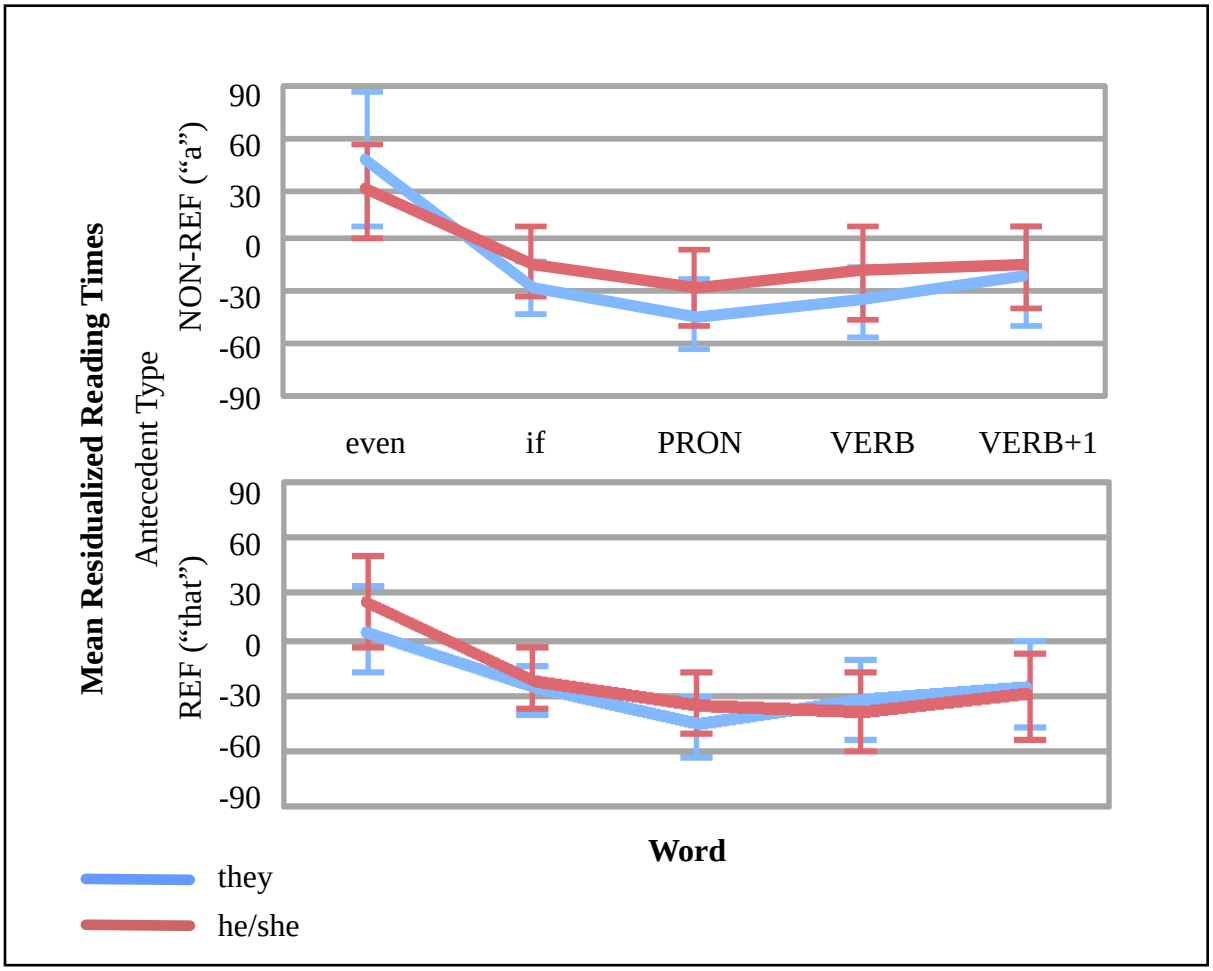

Figure 3. L2 by-word length residualized reading times around the critical region, split by condition. Error bars represent by-word *SE*s.

Table 7. Summary of the mixed-effect models for L2 critical region RT data.

	Pronoun			Verb			Word after verb		
Fixed effects	Estimate	Std. error	t-value	Estimate	Std. error	t-value	Estimate	Std. error	t-value
(Intercept)	-38.91	7.68	-5.068	-30.52	8.89	-3.433	-21.49	8.28	-2.595
Reference	-4.45	7.85	-0.566	-7.95	11.97	-0.664	-9.68	13.24	-0.731
Pronoun	-14.67	8.27	-1.773	-6.87	9.25	-0.743	-1.24	9.98	-0.124
Reference x Pronoun	2.93	14.69	0.199	26.17	17.98	1.456	14.74	19.57	0.752
Random effects	Var.	Std. dev.	Corr.	Var.	Std. dev.	Corr.	Var.	Std. dev.	Corr.
Item									
(Intercept)	241.4	15.54		553.4	23.52		489.4	22.12	
Participant									
(Intercept)	1100.5	33.17		1253.8	35.41		900.0	30.00	
Reference	214.9	14.66	0.46	1737.0	41.68	-0.37	2206.7	46.98	-0.18
Pronoun	404.9	20.12	0.12	136.9	11.70	-0.33	107.4	10.36	-0.17

Figure 4 presents descriptive results for the L2 interpretation data. As seen in Table 8, a significant main effect of Reference was found, because L2 participants were more likely to interpret the sentence subject as plural with nonreferential antecedents than with referential antecedents. A significant main effect of Pronoun was also found. L2 speakers were more likely to interpret the sentence subject as plural for *they* compared to *he/she* in both referential and nonreferential conditions. Critically, unlike the L1 interpretation data, no significant interaction effect between Reference and Pronoun was found among L2 participants.

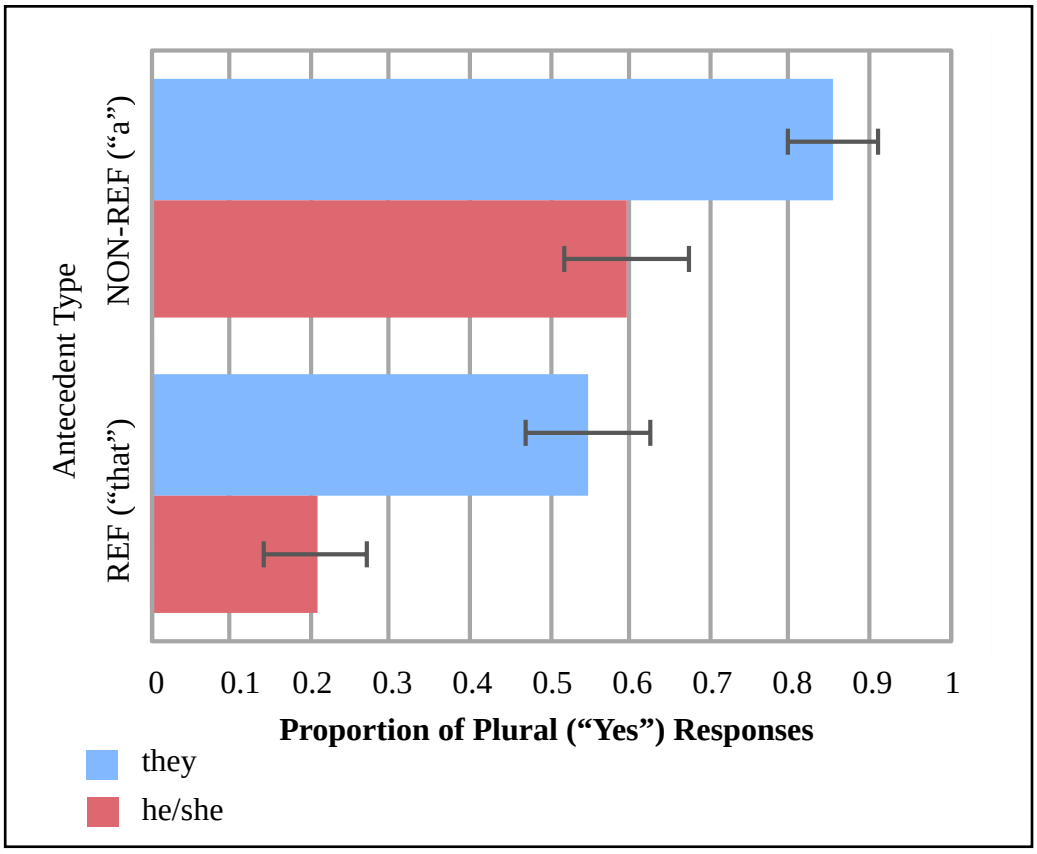

Figure 4. Proportion of plural interpretations among L2 participants, split by condition. Error bars represent *SE*s for each condition.

Table 8. Summary of the mixed-effect logistic regression model for L2 interpretation data.

Fixed effects	Estimate	Std. error	z-value	Pr (>|z|)
(Intercept)	0.31	0.22	1.44	.148
Reference	-2.08	0.24	-8.69	<.001
Pronoun	1.80	0.29	6.25	<.001
Reference x Pronoun	0.32	0.36	0.89	.373
Random effects	Var.	Std. dev.	Corr.	
Item				
(Intercept)	0.39	0.63		
Participant				
(Intercept)	0.82	0.90		
Reference	0.64	0.80	-0.25	
Pronoun	1.40	1.18	-0.18	

Combined analyses

Group effects

To confirm that the observed effects in the interpretation results were different between participant groups, we ran a final mixed-effect model in which we analyzed all L1 and L2 interpretation data with Group (L1 vs. L2) coded as an additional fixed effect variable, contrast coded as -.5 and .5. As seen in Table 9, there was a significant three-way interaction between Group, Reference, and Pronoun, demonstrating that L1 and L2 speakers did interpret the sentences differently. Model comparison to a model without the three-way interaction term showed that this term was significant in the model ($\chi^2(2) = 4.08$, $p = .043$).

Table 9. Summary of the mixed-effect logistic regression model for all L1 and L2 interpretation data.

Fixed effects	Estimate	Std. error	z-value	Pr (>|z|)
(Intercept)	-0.09	0.21	-0.43	.669
Reference	-1.54	0.17	-9.08	<.001
Pronoun	0.98	0.15	6.60	<.001
Group	0.78	0.39	1.99	.047
Reference x Pronoun	-0.12	0.23	-0.53	.595
Reference x Group	-1.03	0.34	-3.06	0.002
Pronoun x Group	1.59	0.30	5.33	<.001
Reference x Pronoun x Group	0.93	0.45	2.06	.039

Random effects	Var.	Std. dev.	Corr.
Item			
(Intercept)	0.27	0.53	
Participant			
(Intercept)	2.13	1.46	
Reference	0.87	0.93	0.04
Pronoun	0.52	0.72	-0.03

Individual L2 production effects

Since there was a significant interaction between Reference and Pronoun was present in the L1 interpretation data but not present in the L2 data, it is plausible that L2 speakers did not exhibit this effect because they were unfamiliar with singular *they*. To investigate this, we split the L2 participants into two sub-groups: participants who used singular *they* at least once in the written production task, and those who did not. We reasoned that L2 participants who did not produce singular *they* may not be familiar with the construction, which may have driven the L2 interpretation results.

Figures 5 and 6 show the L2 interpretation responses split into users and non-users of singular *they*. The figures show that L2 singular *they* users performed similarly to L2 non-users, suggesting that the effects observed in the L2 group as a whole were not driven by differences in interpretations between users and non-users. In particular, the interaction between Reference and Pronoun, which was present in the L1 interpretation data, does not seem to be exhibited by either sub-group, and, thus, did not seem to be modulated by an individual's use or non-use of singular *they*.

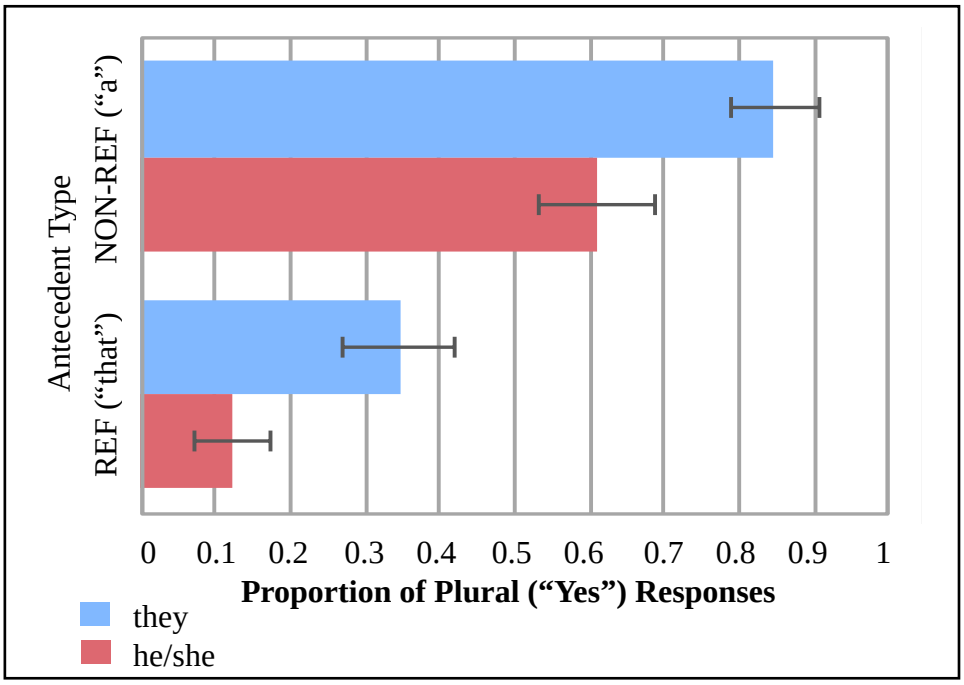

Figure 5. Proportion of plural interpretations among L2 participants who used singular *they* at least once in written production task, split by condition. Error bars represent *SE*s for each condition.

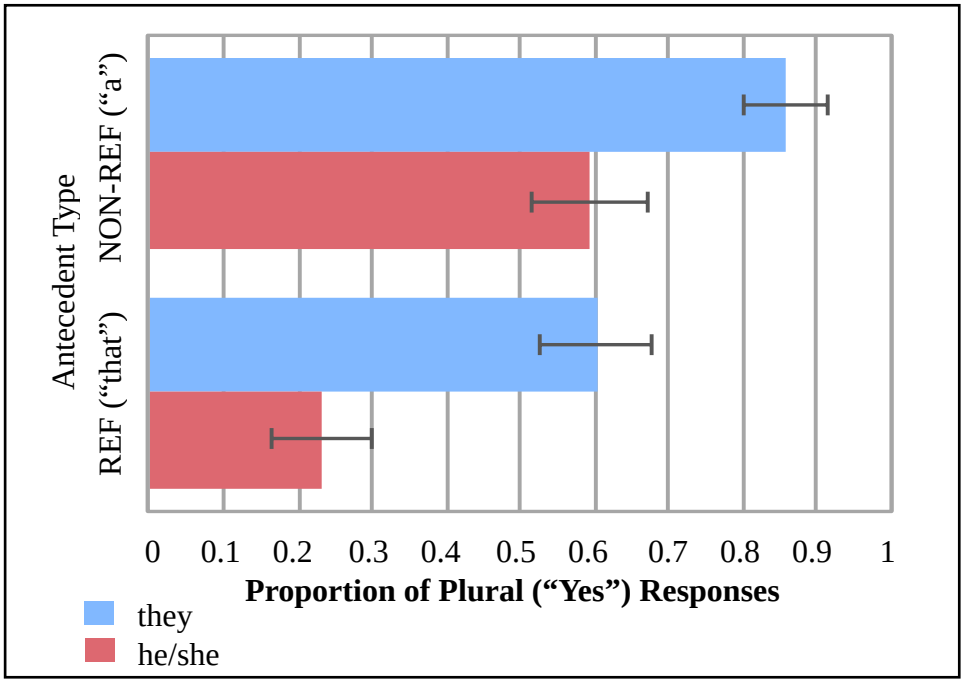

Figure 6. Proportion of plural interpretations among L2 participants who did not use singular *they* in written production task, split by condition. Error bars represent *SE*s for each condition.

Chapter 4

Discussion

Summary of results

The written production task revealed that L1 and L2 English speakers differed in their choice of pronouns when referring to a singular, genderless antecedent (*a student*). L1 participants used singular *they* frequently in their responses, while L1 German-L2 English participants did not use singular *they* as often as L1 speakers. Instead, the L2 speakers preferred to use generic masculine pronouns (*he*) or combined pronominal forms (*he or she*). Additionally, a greater proportion of L1 participants used singular *they* at least once in written responses.

Self-paced reading results revealed no significant reading time differences between singular *they* and a singular pronoun (*he/she*) in either the L1 or the L2 participant groups. The referential status of the antecedent also did not significantly impact reading times of the pronoun.

Interpretation results from the self-paced reading task revealed that the L1 and L2 speakers utilized both pertinent cues in the utterance (the referential cue of the antecedent and the grammatical cue of the pronoun) to form an offline number interpretation. Both groups were more likely to interpret a nonreferential antecedent (*a jogger*) as being plural than a referential antecedent (*that jogger at the intersection*). The manner in which the referential cue of the antecedent interacted with the grammatical cue of the pronoun, however, differed between groups. The effect of the pronoun on L1 interpretations was modulated by the referential context. Namely, the L1 speakers showed no difference in the proportion of plural interpretations between *they* and *he/she* with referential antecedents. With nonreferential antecedents, the proportion of plural responses following *they* was slightly higher than the proportion of plural

responses following *he*/*she*. Thus, the L1 speakers showed an interaction between the antecedent's referential cue and the pronoun's grammatical cue when forming an offline number interpretation. The L2 speakers showed no such cue interaction. In both referential and nonreferential conditions, the proportion of L2 plural responses following *they* was higher than the proportion of plural responses following *he/she*.

Written production task discussion

The written production task revealed that L1 English speakers favored the use of singular *they* when referring to singular, genderless antecedents in an informal writing task, replicating results reported by LaScotte (2016). The L1 speakers used singular *they* more often than other pronouns, and a majority of L1 participants used singular *they* at least once in their responses. The L1 speakers' frequent use of singular *they* highlights the role singular *they* plays in L1 informal English and adds to a body of research indicating that L1 speakers have effectively adopted this pronoun to refer to singular, genderless antecedents.

The L1 German-L2 English speakers did not use singular *they* as frequently in written responses. The L2 speakers instead favored a generic masculine pronoun (*he*) or a combined pronominal form (*he or she*) to refer to a singular, genderless antecedent. These preferences possibly stem from how gender inclusivity is handled in their L1 German. When a noun could refer to a person of any gender, German speakers frequently opt to use the masculine form (e.g., *der Student* 'the student$_{\text{MASC}}$'), or show the inclusion of both genders by indicating the ending of both masculine and feminine forms (e.g., *Student/-innen*). Applying such L1 strategies in their L2 English would account for the L1 German-L2 English speakers' frequent use of the generic

masculine and combined forms in their written responses. Their preference for these forms may indicate that many L2 speakers may not be familiar with singular *they*, or, at the very least, may not be familiar enough with singular *they* to use this construction in their own writing.

Taken together, written production responses revealed that L1 and L2 English speakers differ in pronoun use when referring to a singular, genderless antecedent. L1 speakers frequently employ singular *they*, while L1 German-L2 English speakers prefer a generic masculine pronoun or a combined pronominal form, suggesting that L2 speakers likely adapt strategies of gender inclusivity from their L1. Further research is necessary to more systematically investigate how the L1 pronoun system influences how speakers produce pronouns in an L2.

Self-paced sentence reading task discussion

Self-paced reading time results suggest that the L1 and L2 speakers had little difficulty integrating the plural cue of *they* into their mental representation of an utterance while reading. These results replicate results of Foertsch and Gernsbacher (1997), who measured reading times of entire clauses containing singular *they*. Our finer-grained (word-by-word) reading times provide further evidence that singular *they* does not cause any reading difficulties in a self-paced reading task. These results also suggest that L2 speakers are readily able to adapt to non-standard cues which do not occur in their L1. Furthermore, reading time results among both groups may suggest that number information of the pronoun remains underspecified at the point of initially reading the pronoun, since we did not observe pronoun effects until the point when comprehenders had to form an interpretation.

The converging self-paced reading results of the present study and those from Foertsch and Gernsbacher (1997) contrast with the mixed results of eye-tracking research. Sanford and Filik (2007) found that the total reading time of the region containing singular *they* was longer than when it contained *he/she*, while Doherty and Conklin (2017) found no such difference in eye-tracking measures. Divergent results may indicate a fundamental difference between eye-tracking measures and self-paced reading times; a difference that warrants future research.

Offline interpretation results revealed that both L1 and L2 speakers' interpretations were influenced by the referential cue of the antecedent. Both groups were more likely to interpret nonreferential subjects as referring to more than one entity than referential subjects. These results add to research indicating that semantic number cues, such as semantic reference and conceptual number, influence how language comprehenders process number information (e.g., Eberhard, 1999; Vigliocco et al., 1996).

Among the L1 speakers, responses revealed an interaction between the referential cue of the antecedent and the grammatical cue of the pronoun. Singular *they* resulted in more plural responses with nonreferential antecedents, but not with referential antecedents. This interaction suggests that the L1 speakers were able to integrate the grammatical cue of the pronoun with the referential cue of the antecedent, and that these cues worked in conjunction at the point of establishing co-reference (i.e., when retrieving cues to form an offline number interpretation of the antecedent).

Interpretation responses among the L2 speakers revealed no such interaction. Rather, the L2 interpretations were influenced by referential cues and grammatical cues separately. When retrieving cues from memory to establish co-reference, the L2 speakers did not show an influence of one cue on the other, as the effect of singular *they* resulted in a higher proportion of

plural responses regardless of referential context. A further analysis indicated that interpretation results among those L2 participants who used singular *they* in the written production task patterned similarly to the L2 results as a whole. This suggests the non-interaction between cues among L2 interpretations was not solely a result of being unfamiliar with singular *they*.

Rather, the L2 interpretation results suggest that L2 speakers may have trouble integrating two disparate cues together to form offline interpretations. Note, however, that this does not mean that L2 speakers cannot successfully use information from multiple cues when interpreting utterances, as both referential and grammatical cues were significant predictors of their interpretations. Rather, each cue separately modulates offline interpretations, but cues do not seem to influence how other cues within the utterance are utilized.

Taken together, reading time and interpretation results are informative to the study of cue-based retrieval in language comprehension. In particular, we found a difference in how cues interacted when retrieving cues to inform offline interpretations (i.e., cues interacted among L1 interpretations; cues did not interact among L2 interpretations), but this difference was not observed in online reading time measures. Even if a comprehender can readily integrate cues into a mental representation during online processing, the cues may still interact during offline cue retrieval. As such, these results underscore the importance of using both online and offline processing measures to inform cue-based comprehension models.

Broader implications and future work

The results of the present study are compatible with Cunnings' (2017) cue-based retrieval model of L2 processing. One important hypothesis in Cunnings' model is that L2 speakers

exhibit greater cue interference during L2 cue retrieval than L1 speakers. When retrieving the number cue of the antecedent, the L2 speakers' interpretations were always influenced by the number cue of the intervening pronoun. L1 speakers, on the other hand, only took into account the number cue of the pronoun in certain referential contexts. Thus, the plural cue of *they* seems to interfere with the retrieval of the number cue of the antecedent in both referential contexts among L2 speakers, while this interference was limited to nonreferential antecedents among L1 speakers.

Cunnings' model (2017) also proposes that L2 speakers weight grammatical cues less heavily than non-grammatical cues compared to L1 speakers. Both groups of speakers patterned similarly when integrating the grammatical number cue of the pronoun while reading, and both groups were able to take into account referential and grammatical cues when forming offline interpretations. This study does not conclusively provide evidence for or against L2 speakers' weightings of grammatical cues compared to other cues. If anything, our results indicate that L2 speakers may rely more heavily on grammatical number information in certain contexts (e.g., in a referential antecedent context) than L1 speakers.

One limitation to this study is that our results may be influenced by the order in which the cues were presented. In each critical item, the antecedent appeared prior to the pronoun, so that participants already had an idea of what the subject was by the time they encountered the pronoun and had to integrate number information on the pronoun into the overall structure and meaning of the sentence. It is plausible that our null reading time results arose because comprehenders already had assigned number information to the antecedent, and did not have to rely on the pronoun's number cue for its successful integration into the mental representation. If this is the case, the number information of the pronoun may remain unspecified at the point of

reading the pronoun. If comprehenders fully process *they* as plural, difficulties should arise when integrating this cue into the mental representation, and, thus, we would expect reading times to reflect this difficulty. Alternatively, null reading time results may indicate that comprehenders' number assignment to the antecedent was at first underspecified, and, thus, it was equally difficult for comprehenders to integrate the number cue from either a singular or a plural pronoun. This view also allows for an initial underspecification of the pronoun, as the integration of an underspecified pronoun with an underspecified antecedent would also not likely cause reading difficulties at the pronoun. In either case, the present study does not provide a clear view into how the number cue of the pronoun alone influences number expectation.

An informative next step is to investigate cataphoric (forwards-looking) pronouns, which occur before the antecedent they refer to, as in example (16). A cataphoric pronoun design would inform us about what information is contained on the pronoun itself. Our critical items lend themselves easily to a cataphoric design if we switch the first two clauses, such as in (16) below.

(16) Even if *he/she/they* feel(s) impatient, a jogger should wait at a red light, because it could be dangerous to cross the street.

When reading sentences containing a cataphoric pronoun, a comprehender must integrate the cues of the antecedent after having already encountered and processed number cues on the pronoun. In other words, the pronoun's cues could help the comprehender predict information about the upcoming antecedent (i.e., whether the antecedent is singular or plural). An antecedent which contradicts these predictions should result in difficulty integrating the antecedent into the ongoing parse of the sentence. The results of such a design, taken together with the results of the current study, would provide insight into how the pronoun cues itself influence language

processing. This study would also shed light on if and how a cataphoric use of singular *they* affects online and offline processing. A study with this design is currently in progress.

Conclusion

Overall, the results of the present study add to a growing body of research indicating that L2 processing differs from L1 processing. Specifically, we showed that L1 and L2 speakers utilize the number cues presented in utterances containing singular *they* differently. The plural cue of singular *they* influenced L2 speakers' number interpretation of both referential and nonreferential antecedents, while singular *they* influenced L1 speakers' interpretations of only nonreferential antecedents. Further, the effect of singular *they* on L2 interpretations seems to be independent of whether L2 participants are familiar with this non-standard pronominal form; this effect seems to hinge on the fact that comprehenders were reading in their L2. Considering these results in a cue-based retrieval account of language processing, these results suggest that there is greater cue interference (i.e., the cue of the pronoun interferes when retrieving the cue of the antecedent) in L2 cue retrieval than in L1 cue retrieval, compatible with Cunnings's (2017) model. However, contrary to Cunnings's model, we also found that under certain linguistic contexts, L2 speakers may utilize grammatical number cues more heavily than L1 speakers to inform an offline interpretation. Further, we reveal that online cue integration processes may not straightforwardly map onto offline cue retrieval processes, since neither group of speakers revealed online reading time effects, despite revealing differing offline effects. As such, this study highlights the importance of expanding the scope of inquiry to include a broader range of

linguistic structures and to measure both online and offline measures in order to more fully inform our understanding of L1 and L2 language processing.

Appendix A

Critical Items

Four versions of each critical item were created, corresponding to the experimental conditions, as seen in (1). For the remaining critical items, the nonreferential condition is presented in (a), referential in (b), and both pronoun conditions appear simultaneously. Each item's corresponding comprehension question appears in (Q).

1a. A runner might eat pasta before a race, even if he likes steak better, because carbs are a good source of energy. (nonreferential antecedent, singular pronoun)
1b. A runner might eat pasta before a race, even if they like steak better, because carbs are a good source of energy. (nonreferential antecedent, plural pronoun)
1c. That runner with the sunglasses might eat pasta before a race, even if he likes steak better, because carbs are a good source of energy. (referential antecedent, singular pronoun)
1d. That runner with the sunglasses might eat pasta before a race, even if they like steak better, because carbs are a good source of energy. (referential antecedent, plural pronoun)
1Q. Does more than one runner prefer steak?

2a. A student should study before a test, even if she/they prefer(s) having a party, since studying is important for students.
2b. That student in the class should study before a test, even if she/they prefer(s) having a party, since studying is important for students.
2Q. Does more than one student want to have party?

3a. A fitness instructor might drink a lot of water every day, even if she/they like(s) to drink Coca-Cola, because hydration is important.
3b. That fitness instructor at the gym might drink a lot of water every day, even if she/they like(s) to drink Coca-Cola, because hydration is important.
3Q. Does more than one fitness instructor like to drink Coca-Cola?

4a. A presenter should speak loudly, even if she/they feel(s) shy, because the audience can't hear otherwise.
4b. That presenter with the glasses should speak loudly, even if she/they feel(s) shy, because the audience can't hear otherwise.
4Q. Does more than one presenter feel shy?
5a. An employee should finish tasks on time, even if he/they get(s) stressed, since clients are waiting on the results.
5b. That employee at the desk should finish tasks on time, even if he/they get(s) stressed, since clients are waiting on the results.
5Q. Does more than one employee get overwhelmed?

6a. A patient must follow the instructions, even if he/they know(s) the medicine well, because it could have some side effects.
6b. That patient at the hospital must follow the instructions, even if he/they know(s) the medicine well, because it could have some side effects.
6Q. Does more than one patient know the medicine well?

7a. A kid must do some housework, even if he/they like(s) to watch TV after dinner, as housework is good preparation for later in life.
7b. That kid on the couch must do some housework, even if he/they like(s) to watch TV after dinner, as housework is good preparation for later in life.
7Q. Does more than one child like to watch TV after dinner?

8a. A scholar could talk to more colleagues, even if he/they hate(s) socializing, because it is important to share ideas.
8b. That scholar at the conference could talk to more colleagues, even if he/they hate(s) socializing, because it is important to share ideas.
8Q. Does more than one scholar hate socializing?

9a. A person should eat breakfast every day, even if she/they sleep(s) in late, since breakfast provides energy.
9b. That person down the block should eat breakfast every day, even if she/they sleep(s) in late, since breakfast provides energy.
9Q. Does more than one person sleep in late?

10a. A driver must always follow the traffic rules, even if he/they think(s) the road is clear, or else someone could get hurt.
10b. That driver in the car must always follow the traffic rules, even if he/they think(s) the road is clear, or else someone could get hurt.
10Q. Does more than one driver think the road is clear?

11a. A baby must sleep 10 hours a night, even if he/they want(s) to stay up late, because sleep is important for brain development.
11b. That baby in daycare must sleep 10 hours a night, even if he/they want(s) to stay up late, because sleep is important for brain development.
11Q. Does more than one baby want to stay up late?

12a. A toddler should eat enough vegetables, even if he/they like(s) dessert the best, as vegetables provide important vitamins.
12b. That toddler with the bib should eat enough vegetables, even if he/they like(s) dessert the best, as vegetables provide important vitamins.
12Q. Does more than one toddler like dessert the best?

13a. A jogger should wait at a red light, even if she/they feel(s) impatient, because it could be dangerous to cross the street.

13b. That jogger at the intersection should wait at a red light, even if she/they feel(s) impatient, because it could be dangerous to cross the street.
13Q. Does more than one jogger feel impatient?

14a. A client must pay for the business's service on time, even if she/they has/have other bills to pay, because it would be wrong not to.
14b. That client on the contract must pay for the business's service on time, even if she/they has/have other bills to pay, because it would be wrong not to.
14Q. Does more than one client have other bills to pay?

15a. A server could provide excellent service, even if he/they feel(s) grumpy, as long as tips depend on the quality of service.
15b. That server at the café could provide excellent service, even if he/they feel(s) grumpy, as long as tips depend on the quality of service.
15Q. Does more than one server feel grumpy?

16a. A teenager might obey the teacher, even if she/they hate(s) listening, because it is respectful to do so.
16b. That teenager in detention might obey the teacher, even if she/they hate(s) listening, because it is respectful to do so.
16Q. Does more than one teenager hate listening?

17a. A worker might read the safety instructions, even if he/they prefer(s) not to, because it would be dangerous not to.
17b. That worker in the factory might read the safety instructions, even if he/they prefer(s) not to, because it would be dangerous not to.
17Q. Does more than one worker prefer not to read instructions?

18a. A dentist should avoid candy, even if she/they love(s) eating sweets, because sugar is bad for the teeth.
18b. That dentist in the clinic should avoid candy, even if she/they love(s) eating sweets, because sugar is bad for the teeth.
18Q. Does more than one dentist love eating sweets?

19a. An author should use simple words, even if he/they want(s) to seem smart, because novels should be readable by everyone.
19b. That author of the novels should use simple words, even if he/they want(s) to seem smart, because novels should be readable by everyone.
19Q. Does more than one author want to seem smarter?

20a. A journalist must report the truth, even if she/they question(s) the facts, as readers depend on the news to form opinions.
20b. That journalist at the newspaper must report the truth, even if she/they question(s) the facts, as readers depend on the news to form opinions.
20Q. Does more than one journalist question the facts?

21a. A tourist might become sick on vacation, even if she/they pay(s) a lot of money to travel, since life isn't fair.
21b. That tourist from America might become sick on vacation, even if she/they pay(s) a lot of money to travel, since life isn't fair.
21Q. Does more than one tourist pay a lot of money to travel?

22a. A singer could work at a second job, even if she/they want(s) to focus on music, because money is important for success.
22b. That singer at the bar could work at a second job, even if she/they want(s) to focus on music, because money is important for success.
22Q. Does more than one singer want to focus on music?

23a. A movie star might use social media, even if he/they avoid(s) interacting with fans, because the Internet connects people.
23b. That movie star in Hollywood might use social media, even if he/they avoid(s) interacting with fans, because the Internet connects people.
23Q. Does more than one movie star avoid interacting with fans?

24a. A speaker might make a mistake, even if he/they prepare(s) for many days, because speaking in front of people is not easy.
24b. That speaker at the meeting might make a mistake, even if he/they prepare(s) for many days, because speaking in front of people is not easy.
24Q. Does more than one speaker prepare for many days?

25a. A painter could paint in the city, even if he/they dislike(s) busy places, since art should be enjoyed by many people.
25b. That painter of the portrait could paint in the city, even if he/they dislike(s) busy places, since art should be enjoyed by many people.
25Q. Does more than one painter dislike busy places?

26a. A scientist must be careful in the lab, even if she/they feel(s) rushed, because science can be dangerous.
26b. That scientist at the university must be careful in the lab, even if she/they feel(s) rushed, because science can be dangerous.
26Q. Does more than one scientist feel rushed?

27a. A traveler might not pick up a foreign language, even if he/they pay(s) attention to it, because learning a new language is hard.
27b. That traveler in Europe might not pick up a foreign language, even if he/they pay(s) attention to it, because learning a new language is hard.
27Q. Does more than one traveler pay attention to the language?

28a. A lawyer could pick up knitting, even if she/they feel(s) it is silly, because it is important to have hobbies.
28b. That lawyer for the business could pick up knitting, even if she/they feel(s) it is silly, because it is important to have hobbies.

28Q. Does more than one lawyer feel that knitting is silly?

29a. A piano player must wear gloves in the winter, even if he/they hate(s) gloves, because fingers are important for piano playing.
29b. That piano player at the club must wear gloves in the winter, even if he/they hate(s) gloves, because fingers are important for piano playing.
29Q. Does more than one piano player hate gloves?

30a. A walker should wear bright colors, even if she/they walk(s) during the day, since cars often drive too fast.
30b. That walker in the park should wear bright colors, even if she/they walk(s) during the day, since cars often drive too fast.
30Q. Does more than one walker walk during the day?

31a. A manager should be early for work, even if he/they live(s) far away, because being on time is important.
31b. That manager at the company should be early for work, even if he/they live(s) far away, because being on time is important.
31Q. Does more than one manager live far away?

32a. A neighbor should avoid loud music at night, even if she/they throw(s) a party, as other people are trying to sleep.
32b. That neighbor down the hall should avoid loud music at night, even if she/they throw(s) a party, as other people are trying to sleep.
32Q. Does more than one neighbor throw a party?

33a. A parent might worry on the first day of school, even if he/they know(s) the schools are safe, since it's hard not to be anxious.
33b. That parent at the office might worry on the first day of school, even if he/they know(s) the schools are safe, since it's hard not to be anxious.
33Q. Does more than one parent know that schools are safe?

34a. A professor must read every day, even if she/they work(s) long hours, because reading improves the brain.
34b. That professor of history must read every day, even if she/they work(s) long hours, because reading improves the brain.
34Q. Does more than one professor work long hours?

35a. A poet could write short stories too, even if he/they find(s) story writing difficult, because writers can always improve.
35b. That poet in the shop could write short stories too, even if he/they find(s) story writing difficult, because writers can always improve.
35Q. Does more than one poet find story writing difficult?

36a. A banker must take a shower every day, even if she/they sit(s) on a chair all day, because money is dirty.

36b. That banker at the counter must take a shower every day, even if she/they sit(s) on a chair all day, because money is dirty.
36Q. Does more than one banker sit on a chair all day?

37a. A bookseller could sell books for a low price, even if she/they want(s) to make money, because people will always buy more books.
37b. That bookseller in town could sell books for a low price, even if she/they want(s) to make money, because people will always buy more books.
37Q. Does more than one bookseller want to make money?

38a. An Uber driver must always carry a phone charger, even if he/they drive(s) only a short distance, since phones die unexpectedly.
38b. That Uber driver in New York must always carry a phone charger, even if he/they drive(s) only a short distance, since phones die unexpectedly.
38Q. Does more than one Uber driver drive only a short distance?

39a. A child must go to school every day, even if she/they want(s) to stay at home, because education leads to more success.
39b. That child next door must go to school every day, even if she/they want(s) to stay at home, because education leads to more success.
39Q. Does more than one child want to stay at home?

40a. A cook could make a delicious cheeseburger, even if she/they avoid(s) eating meat, as long as good ingredients are available.
40b. That cook at the grill could make a delicious cheeseburger, even if she/they avoid(s) eating meat, as long as good ingredients are available.
40Q. Does more than one cook avoid eating meat?

Appendix B

Distractor and Filler Items

All distractor and filler items were presented to each participant. Each item's corresponding comprehension question appears in (Q). Distractor items are categorized by type.

Distractor items

Syntactically ambiguous items

41. Wow the mother of the bride who embarrassed herself at the reception was complaining to the priest.
41Q. Was the mother embarrassed?

42. In this story the butler of the actor who did not like himself very much caught the armed robber.
42Q. Was it the butler who didn't like himself?

43. So actually the nephew of the fisherman who drowned himself in the ocean didn't know about the tricky current.
43Q. Did the nephew drown?

44. In the show the grandmother of the stewardess who treated herself to an ice cream cone was waiting at home.
44Q. Was it the grandmother who had an ice cream cone?

45. So the brother of the count who crippled himself by falling off a horse took a long time to get over it.
45Q. Was it the brother who was crippled?

46. Sometimes the sister of the baroness who admired herself an inordinate amount enjoyed all the attention.
46Q. Was it the sister who admired herself?

47. Did you hear the daughter of the saleswoman who talked to herself all the time walked in to the room.
47Q. Was it the saleswoman who talked to herself?
48. So maybe the son of the fireman who criticized himself far too often was painting the bedroom.
48Q. Was the fireman self-critical?

49. And the aunt of the nun who lost herself in thought was disturbed by the noise.
49Q. Was the nun lost in thought?

50. In the movie the uncle of the milkman who had to support himself with a low income liked to fish.
50Q. Was it the milkman who was self-supporting?

51. Usually the niece of the duchess who looked at herself in the mirror wore a blue shirt.
51Q. Was it the duchess who looked in the mirror?

52. But the landlord of the businessman who had locked himself in the office received a phone call.
52Q. Was it the businessman who was locked up?

Number comprehension items

53. So, actually, the golfers the caddy escorted were eager to return to the country club.
53Q. Did more than one golfer seem pressed for time?

54. Did you hear the assistant the pharmacists guided placed the order for the drug.
54Q. Was there more than one pharmacist?

55. But the visitor the hosts engaged described the route to the attractions.
55Q. Was there more than one attraction?

56. It's too bad, the art critics wrote the interviews had been a complete disaster.
56Q. Did more than one interview go poorly?

57. Well, actually, the lab technicians proposed the ideas might be worth another try.
57Q. Did more than one idea seem worth trying again?

58. I heard it on the radio, the concerned priests asserted the belief would be hard to justify.
58Q. Did more than one priest seem concerned?

Filler items

59. So the personal trainers the athletes exercised with were extremely expensive but worth the money.
59Q. Did someone charge less than he should have?

60. He said that an old woman rescued a cow from nearly crashing into a fence.
60Q. Did the cow crash in to the fence?

61. The other day the cook kept the soup from actually boiling over on the stove.
61Q. Did the soup boil over on the stove?

62. I totally saw that the defender stopped the ball from surely hitting the net right away.
62Q. Did the ball hit the net right away?

63. Yesterday I saw that the librarian stopped a book from almost falling off the shelf.
63Q. Did the book fall off of the shelf?

64. Last year the nurses restrained a man from surely leaving the hospital right away.
64Q. Did the man leave the hospital right away?

65. She told me that the cashier restrained a pickpocket from almost taking the cash and running away.
65Q. Did the pickpocket take the cash and run?

66. Last year my neighbor prevented a lady from actually dying of a bad stroke.
66Q. Did the lady die of a bad stroke?

67. I read that a babysitter kept a baby from nearly suffocating in the old crib.
67Q. Did the baby suffocate in the old crib?

68. Last week a nurse saved a patient from nearly falling out of her bed.
68Q. Did the patient fall out of her bed?

69. Did you know that a passerby rescued a kid from almost running into some bad traffic.
69Q. Did the kid run into some bad traffic?

70. I saw that a cop prevented a stroller from surely tipping into the bushes.
70Q. Did the stroller tip in to the bushes?

71. Yesterday I heard that a mailman saved a cat from actually climbing a very tall tree.
71Q. Did the cat climb the very tall tree?

72. It's the big local story, the newspaper editors advocated the truth needed to be made public.
72Q. Did the editors support something staying secret?

73. Can't BELIEVE she did that omg seriously.
73Q. Does the author of this email seem mad?

74. Rose told me to come over after dinner, because her roommate was away and she wanted to talk about life.
74Q. Did Rose want to hang out?

75. Lol do you have any plans for Friday night?
75Q. Does the author of this email have Friday night free?

76. So are we watchign Netflix tonight or…
76Q. Does the author of this email use Netflix?

77. Bring chips, I've got everything else covered.
77Q. Does the author of this email like chips?

78. What should I do, I kinda want to cook tonight but I also kinda want to go out DECISIONS ARE SO HARD!
78Q. Is the author of this email feeling ambivalent about something?

79. I'm so hungry and this party is totally LAME can we leave soon and can we please get pizza?
79Q. Is the author of this email planning to buy something?

80. I never know what to order here, what are you getting?
80Q. Does the author of this email have her mind made up?

81. Yo can we please have stirfry for dinner tonihgt?
81Q. Does the author of this email seem hungry?

82. My roommate makes the best pasta omg.
82Q. Does the author of this email like her roommate Jane's cooking?

83. Man I'm super homesick only 3 weeks till christmas vacation!
83Q. Does the author of this email miss home?

84. Why cant he keep his nose in his own business!
84Q. Is the author of this email angry at someone?

85. Shoot I need to remember to call my mom tonight before she thinks I died.
85Q. Does the author of this email sometimes forget to return phone calls?

86. Why does mom keep calling me, I'm fine!!
86Q. Did the author of this email forget to call her mother again?

87. So my sister is moving in with me next year and I'm super excited and I can't wait until I can see my sister everyday!
87Q. Does the author of this email get along well with her sister?

88. My parents lost the password for their skype account again because the older generation isn't used to this new technology.
88Q. Is the author of this email better at using the computer than some of her family members?

89. Have you seen that new show on Netflix? it's about a girl who has super powers.
89Q. Does the author of this email like shows about superheroes?

90. Want to go tot the movies with us tonight, it's that scary new movie!
90Q. Does the author of this email want to watch a film?

91. We waited in line to go see the Hunger Games movie for twelve hours, because literally everybody needed to see it tonight.
91Q. Does the author of this email seem like a patient person?

92. I have SOOOO many textbooks to read for class and they're all BORING:/ I wish I had time to read a book for fun again.
92Q. Does the author of this email miss reading novels?

93. I hateeee having to do my online course.
93Q. Does the author of this email have obligations she doesn't like much?

94. I'm going to flip if he doesn't come today, because it's never a good idea to skip class when you're trying to get an education.
94Q. Is the author of this email feeling frustrated about something?

95. There's nothing on tv tonihgt, what are you watching?
95Q. Is the author of this email looking for something to watch?

96. The big test is tomorrow and I TOTALLY FORGOT about it, I'll be in the library cramming for the big chemistry test untill late. :(
96Q. Is the author of this email prepping for her exam tonight?

97. 3am is my favorite time to start an essay…
97Q. Does the author of this email sometimes wait too long to start homework

98. I have 2 give a huge presentation tomorrow & I'm not ready.
98Q. Is the author of this email unprepared for something?

99. Guess who stayed out too late last night and slept through their 8am class this morning? I'm so mad at myself!
99Q. Was the author of this email asleep at eight this morning?

100. Waht classes are you taking next semester? I haven't even thought about it yet.
100Q. Is the author of this email still thinking about her course schedule?

101. God bless my midterm was moved a week later, because having enough time to study the material helps students succeed in classes.
101Q. Does the author of this email seem relieved?

102. I saw the cutest puppy today floppy ears and waggy tail and everythingg.
102Q. Was the author of this email excited about something?

103. Class is canceled today so I get to sleep in, because sleep is a really important part of a college student's life and success.
103Q. Was class cancelled today?

104. Literally tell everyone that chinese restaurant is giving out free food today!
104Q. Was something given away for free?

105. The bus is always soooo late and its so crowded.
105Q. Does the author of this email dislike taking the bus?

106. My bff is coming up to visit me this weekend because she didn't want to miss hanging out on my birthday!!
106Q. Did the author of this email make plans with a friend?

107. MA'AM DID YOU GET MY TEXT EARLIER???
107Q. Does the author of this email seem frustrated?

108. They're giving out free ice cream in the commons, SPREAD THE WORD, just thought you should know !!!
108Q. Does the author of this email like ice cream?

109. Hey I heard about the fight you had with Jimmy, are you ok?
109Q. Does the author of this email seem concerned?

110. Well I couldn't believe that he didn't invite me to the party, because I invited him to my place last weekend!
110Q. Is the author of this email mad at her friend?

111. Don't forget to invite Cindy to dinner tonight! I completely forgot to tell her when I saw her at school today but I think she should come!!
111Q. Is Cindy going to be invited to dinner?

112. My roommate is the literal best for bringing my sweatshirt to me because this building is freezing cold.
112Q. Is the email writer's roommate considerate?

113. I'm going over to my friend's apartment tonight, wanna come?
113Q. Does the author of this email have plans for the evening?

114. Is it cool if I bring a friend to teh thing tonight, I know you said no guessts but she's really cool and a lot of fun.
114Q. Does the author of this email intend to go to a party tonight?

115. BILL WHERE ARE THE ICE CUBES you literally had one thing to remember for the party and you FORGOT THEM OMG!
115Q. Did the email writer's friend forget to bring something to the party?

116. I saw Jimmy talking to a girl after class, we need to talk now.
116Q. Was Jimmy talking to a girl?

117. K but let's go to that pickup basketball game anyway starts at 4:00.
117Q. Does the author of this email want to play basketball tonight?

118. What time should we meet for the tailgate?
118Q. Is the author of this email going to tailgate for the game?

119. R u going to the party at Mark's tomorrow night, because the last time I went to a party there I didn't know anybody?
119Q. Is Mark having an event?

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ACADEMIC VITA

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EDUCATION

Pennsylvania State University 2013-2018
Schreyer Honors College
MAJORS: German, Applied German Option, Bachelor of Science
Mathematics, Bachelor of Arts
MINOR: Linguistics
GRADUATION DATE: May 2018
HONORS THESIS: Singular *they*: Online and offline interpretation effects among L1 and L2 speakers

RESEARCH EXPERIENCE

RECIPIENT, PIRE Undergraduate Research Grant 2017
Award presented by the Center for Language Science, Pennsylvania State University
PARTNERED WITH Technische Universität Braunschweig
ADVISORS Carrie N. Jackson and Holger Hopp

- Conducted original, independent research studying native and non-native language processing
- Created experimental scripts using Ibex Farm and became familiarized with eye-tracking methodology, Amazon Mechanical Turk, and supplementary psycholinguistic tasks
- Analyzed results using R software and Microsoft Excel for honors thesis

RESEARCH ASSISTANT, Second Language Acquisition Lab SPRING 2015-SPRING 2018
Pennsylvania State University
ADVISOR Carrie N. Jackson

- Assist graduate students and post-docs in all aspects of linguistic research (designing stimuli, running participants, coding data, analyzing results, presenting research)
- Discuss relevant literature in the field of linguistics to become acquainted with linguistic theory

ADDITIONAL EXPERIENCE

TUTORING INTERN (PENNSYLVANIA LITERACY CORPS), Skills of Central Pennsylvania FALL 2017

- Gained teaching and interpersonal skills by tutoring adults with disabilities in group social classes and individual reading and math lessons (40 hours)

BAND MEMBER, Pennsylvania State University Marching Blue Band FALL 2013-FALL 2016

BARITONE SECTION LEADER (GUIDE) FALL 2016

- Oversaw section of 16 members in all aspects of practice and performance
- Ensured members were prepared for every event (all home football games and selected away games)

SQUAD LEADER FALL 2015-FALL 2016

- Communicated instructions for weekly halftime show to squad of 4 members
- Instructed members of squad in learning field instructions and music during rehearsal

CASH CONTROL ASSISTANT, Hersheypark SUMMER 2014-SUMMER 2017

Hershey Entertainment and Resorts Company, Hershey, Pennsylvania

CASH CONTROL SUPERVISOR SUMMER 2015-SUMMER 2017

- Process daily revenue from Hersheypark and other entertainment properties
- Responsible for preparing daily deposit, training new employees, and problem solving in a fast-paced environment
- Work with cash control coordinators to optimize cash control procedures

PRESENTATIONS

Selected to present research and findings of PIRE fellowship and honors thesis at the following events. (* indicates a talk/oral presentation; others are poster presentations)

UNDERGRADUATE RESEARCH EXHIBITION, Pennsylvania State University SPRING 2018
YOUNG LANGUAGE SCIENCE SCHOLAR SPEAKER SERIES, Penn State University SPRING 2018
CUNY HUMAN SENTENCE PROCESSING CONFERENCE, University of California Davis SPRING 2018
*DISTINGUISHED LANGUAGE SCIENCE COLLOQUIUM, Pennsylvania State University FALL 2017
PSUXLING UNDERGRADUATE EXHIBITION IN LINGUISTICS, Pennsylvania State University FALL 2017
YOUNG LANGUAGE SCIENCE SCHOLAR SPEAKER SERIES, Pennsylvania State University SPRING 2017

HONORS AND AWARDS

DEPARTMENTAL STUDENT MARSHAL SPRING 2018
Department of Germanic and Slavic Languages and Literatures, Pennsylvania State University
RECIPIENT, Judith F. Kroll Undergraduate Research Award SPRING 2017
Center for Language Science, Pennsylvania State University
RECIPIENT, PIRE Undergraduate Research Fellowship SPRING 2017
Center for Language Science, Pennsylvania State University
MEMBER, Delta Phi Alpha, National German Honor Society SPRING 2016
MEMBER, Phi Beta Kappa, National Honor Society SPRING 2015
RECIPIENT, President Sparks Academic Achievement Award SPRING 2015
SCHOLAR FALL 2014-SPRING 2018
Schreyer Honors College, Pennsylvania State University
DEAN'S LIST FALL 2013-SPRING 2018

LANGUAGE SKILLS

HIGH PROFICIENCY in German, BASIC KNOWLEDGE of French