Effect of Conflicting Gender Cues on the Cognitive Availability of Nonbinary *They*

by

Hannah Kirsch

Submitted to the Undergraduate Faculty of the

Dietrich School of Arts and Sciences in partial fulfillment

of the requirements for the degree of

Bachelor of Philosophy

University of Pittsburgh

2022

UNIVERSITY OF PITTSBURGH

DIETRICH SCHOOL OF ARTS AND SCIENCES

This thesis was presented

by

Hannah Kirsch

It was defended on

April 8, 2022

and approved by

Dr. Michael Walsh Dickey, Associate Professor, Communication Science and Disorders

Dr. Melinda Ciccocioppo, Lecturer, Psychology

Dr. Nikole Patson, Associate Professor, Psychology

Thesis Advisor: Dr. Tessa Warren, Professor, Psychology

Effect of Conflicting Gender Cues on the Cognitive Availability of Nonbinary *They*

Hannah Kirsch

University of Pittsburgh, 2022

This thesis aimed to investigate how conflicting gender cues affect the comprehension and production of nonbinary *they*. Nonbinary *they* is of great academic interest because it represents a unique linguistic change and invites perspectives from various academic disciplines. It is also of growing interest to the public due to the social debates surrounding nonbinary *they* and an increasing presence in mainstream media. We conducted two studies to investigate how conflicting gender cues affect interpretation and production of nonbinary *they*. Experiment 1 was a comprehension study and investigated how a manipulation of gender cue conflict affected how often participants interpreted the word *they* as referring to a character that goes by they/them pronouns. Results showed that participants were more likely to interpret *they* as referring to a character that goes by they/them pronouns more often in a condition with high gender cue conflict, consistent with more gender cue conflict attracting more attention (Chun & Turke-Brown, 2007),. Experiment 2 was a production study that investigated disambiguation and audience design strategies in two conditions, one a nonbinary character whose gender cues conflicted and one without. Results showed that participants produced more plural markers and produced plural *they* and *them* less often in the condition with gender cue conflict. These data patterns suggested that participants may have been engaging in audience design and disambiguation strategies but did not reach statistical significance.

Table of Contents

List of Figures

Preface

First and foremost, I would like to extend my sincerest appreciation and gratitude to Dr. Tessa Warren. I am incredibly grateful for not only the countless hours she dedicated to creating, conducting, and editing this project, but also the years of invaluable mentorship, unwavering encouragement, and belief in me. This thesis would not have been possible without her tremendous support and expertise. From the bottom of my heart, thank you. I would also like to thank Dr. Michael Walsh Dickey for guiding me through the process of learning how to create models and read outputs in R, serving on my defense committee, and his consistent enthusiasm for my research endeavors during my time as an undergraduate student. I am extremely grateful to Dr. Melinda Ciccocioppo and Dr. Nikole Patson, for dedicating their time to and expertise to my defense. I would also like to extend my appreciation to the University of Pittsburgh Honors College for the opportunity to make this project into a reality. Furthermore, a special thank you to Paula Pelletier for putting pencil to paper to create the original drawings for Experiment 2. Finally, I would like to thank the members of the University of Pittsburgh Language and the Brain Laboratory for cheering me on every step of the way throughout the process of completing this thesis.

1.0 Introduction

In English, most people consider the word *they* to be a strictly plural pronoun. However, *they* also has a long history (dating back to the fourteenth century) of being used to refer to singular individuals whose gender is irrelevant, unknown, or intentionally hidden (LaScotte, 2016). In recent years, a new use of *they* has emerged, known as nonbinary *they*. Nonbinary *they* is used to refer to someone who prefers gender neutral (they/them) pronouns which are commonly preferred by nonbinary people who identify outside of the gender binary (Understanding Non-Binary People, 2016). The current study aims to understand how the gender cues (such as name and appearance) of a referent affect the interpretation and production of nonbinary *they.*

Because *they* is usually used either as a plural or a singular without gender specification, the new use of *they* to refer to someone with a known gender identity is highly salient to comprehenders and speakers and represents a highly unusual linguistic change. This opens a unique, virtually untouched, window of opportunity to investigate the cognitive mechanisms that are used to process and produce nonbinary *they* as well as the factors that affect them. Because of this novelty, academic interest in nonbinary *they* is widespread. The interdisciplinary nature of nonbinary *they* attracts interest from various academic perspectives and contributions from many different fields, including cognitive psychology, social psychology, and linguistics.

Non-binary *they* is also of massive social interest outside of academic communities. The use of *they* as a preferred pronoun has been the subject of growing attention from the public eye and is viewed as highly politicized. It has been hotly debated, especially as a growing number of celebrities announce a switch to gender neutral pronouns. One argument often used by those with a strong resistance to non-binary *they* to justify not using *they/them* for a non-binary individual is

that it is too difficult to refer to one person as *they* (Steinmetz, 2019). However, this cannot be right because we frequently use *they* to refer to one person when gender is unknown, irrelevant, or intentionally hidden (Lascotte, 2016).

Nonetheless, non-binary *they* is not such a situation. Processing non-binary *they* is difficult even with significant effort from the comprehender due to competition from both the gender-irrelevant use of singular *they* and plural *they* (Arnold et al., 2021). The current study will expand the work on conflict and competition while processing non-binary *they* and will strengthen the argument that *they* is able to be interpreted singularly. Furthermore, it will investigate the cognitive mechanisms that make interpretation less and more difficult. It will also shed light on the factors that will increase or decrease the ability to comprehend non-binary *they.* In this way, findings from this study would support the increasing number of people who go by they/them pronouns by setting the stage for future research that focuses on making the interpretation and production of nonbinary *they* easier.

Previous research suggests that the interpretation of *they* is generally difficult because of the lack of gender and number information that accompany using *they* to refer to a gender-unspecific referent (Sanford & Filik, 2007). However, when gender cues, or information that people use to judge someone's gender, are available, they are heavily used by observers (Liu & Ruths, 2013). In order to address how gender cues such as name and appearance may affect the difficulties of interpreting and producing nonbinary *they*, it is important to recognize and control for the linguistic factors that may affect comprehension. Past research suggests that number of competing referents in a discourse and the order of mention of the referents can affect the salience of each referent. Specifically, it is more difficult to identify the correct referent of a pronoun if there is more than one possible referent. It is also more difficult if the intended referent does not

appear first in the discourse (Arnold et al., 2000). In order to test how these factors might affect the interpretation of nonbinary *they,* Arnold et al. (2021) performed an experiment that tested the effect of where a nonbinary referent appears in a sentence, explicit introduction of pronouns, number of characters in a discourse, and increased practice on the comprehension of nonbinary *they* in brief narratives. Participants were introduced to three characters and were assigned to either the explicit condition, in which the pronouns of each character appeared with their picture or implicit condition, in which the characters' pronouns were not provided. One of the experimental characters was a nonbinary referent, Alex, who goes by they/them pronouns. Some participants completed eight training stories about Alex and others completed four. Participants then read sentences containing *they* about only Alex, or Alex and another character in which Alex was mentioned either first or second. Then, participants answered a critical question that indicated their chosen referent, either Alex (nonbinary interpretation) or Alex and the other character (plural interpretation).

Arnold et al. (2021) found that overall, participants in the explicit condition interpreted *they* as nonbinary (referring to Alex) more often than the participants in the implicit condition. In the one-character condition, participants nearly always interpreted *they* as referring to Alex. Furthermore, participants interpreted *they* as referring to Alex more often in the two-character sentence condition when Alex was mentioned first, but still less than in the one-character condition. Researchers found no effect of number of training stories on how often participants interpreted *they* as nonbinary. Additionally, researchers found that participants' experiences with individuals that identify outside of the gender binary did not affect interpretation of nonbinary *they.* In other words, Arnold et al. found that explicit introduction of pronouns, a nonbinary referent appearing first in a sentence and a nonbinary referent being the only referent in a sentence

increased the interpretation of *they* as nonbinary. Familiarity with individuals that identify outside of the gender binary, that is, do not identify as male or female, has not been shown to predict the likelihood of a participant to interpret nonbinary *they*

The current study seeks to expand upon these findings by considering how other factors such as gender cues, or information that people use to judge a person's gender, might also affect the interpretation of *they*. A study by Liu and Ruths (2013) investigated how two gender cues, gendered appearance and name, affect how people interpret someone's gender. Participants completed a gender judgement task in which they were shown real users' Twitter profiles. Researchers manipulated whether participants just saw the user's profile picture or the user's profile picture and first name. Participants were then asked to determine the gender of the user (either male or female). Results revealed a 20 percent increase in participant's accuracy in the gender judgement task when participants saw both a user's profile picture and name as opposed to just their profile picture. This means that both someone's appearance and name are strong cues that observers rely on in other to judge the gender of others.

When gender cues are absent, interpreting pronouns may be difficult. Sanford and Filik (2007) investigated the processing cost of singular *they* and *them* by testing the effects of using singular, gender-specific pronouns (*him* and *her*) and plural pronouns (*they* and *them*) to refer to a gender unspecific referent on participants' processing difficulties. Participants' eyes were tracked while reading a brief narrative. The narrative consisted of three sentences: the first established context and set the scene, the second introduced a gender-unspecific referent (either singular or plural) and contained either a singular pronoun (*him* or *her*) or a plural pronoun (*they* or *them*), and the third sentence was included so that the test sentence was not the last sentence the participants read.

Sanford and Filik (2007) analyzed their results based on fixations on different regions of the narratives and participants' reading times. They found that in sentences with the pronoun *them* and a singular, gender-unspecific referent (e.g. someone, a person) participants' reading times were longer than in sentences with the pronoun *them* and a plural, gender-unspecific referent (e.g. some people). Similarly, researchers found that readings times were longer for sentences with a singular pronoun (*him* or *her*) and a plural referent. Sanford and Filik concluded that this is evidence for a number mismatch effect between the plural pronoun *them* and a singular referent of unknown gender and between the singular pronouns *him* and *her* and a plural referent. Furthermore, they claim that overall, their study is evidence for a significant processing difficulty of singular *they* and *them* due to the preservation of the plural meaning of the words during processing. In relation to nonbinary *they*, these conclusions suggest that interpreting and producing nonbinary *they* may be difficult due to the processing cost of the gender and number mismatch effects. The current study seeks to address this difficulty by investigating how the presence of differentially conflicting gender cues may increase or decrease ease of interpreting and producing nonbinary *they.*

Firstly, we investigated whether increased conflict between the apparent gender of a character's appearance and name influences the likelihood that comprehenders will interpret *they* as referring to the character. We did this by creating three conditions: *no conflict, some conflict,* and *most conflict* that corresponded to cartoon stimuli with differential amounts of gender cue conflict. Participants were informed that the characters in the *some conflict* and *most conflict* conditions went by they/them pronouns. Participants read brief narratives about the cartoons containing the word *they* and for each narrative answered a content question to check for attention. Critically, the narrative used a *they* that could in some cases be interpreted as referring

to either a nonbinary character or a pair of characters. A target question revealed how participants interpreted *they.* We predicted that participants would interpret *they* as referring to the nonbinary referent more often for the *most conflict* condition than the *some conflict* condition. This prediction is based on the hypothesis that the perceived inconsistencies of the gender cues in the *most conflict* condition will attract participant's attention, leading to better memory of the pronouns for the *most conflict* condition because prior research shows that increased attention is directly related to increased memory (Chun & Turke-Browne, 2007). Additionally, we predicted that participants would interpret *they* as nonbinary more often in both the *some conflict* and *most conflict* conditions than in the *no conflict* condition, because the characters in the *some conflict* and *most conflict* conditions are introduced as using they/them pronouns, and in past research, an explicit statement that a character used gender-neutral pronouns led to higher use of the pronouns (Arnold et al., 2021).

Secondly, we investigated the production of nonbinary *they.* In this study, participants wrote brief narratives about scenes depicting two characters. One character was constant across the two scenes and went by he/him pronouns and presented as male. In the *no conflict* condition, the second character went by she/her pronouns and presented as female. In the *conflict* condition the second character has high gender cue conflict because they presented as female, had a traditionally male name, and went by they/them pronouns. We predicted that participants would engage in audience design strategies and avoid producing confusing language by disambiguating intended referents for the word *they* because previous studies of audience design have shown that people readily cater their language choices to make themselves easier to understand (Gann & Barr, 2014; Ferreira, 2019). Furthermore, we predicted that participants would produce more plural markers in contexts involving a nonbinary referent in order to specify when the intended

referent is plural rather than nonbinary. Finally, we predicted that participants would produce fewer singular pronouns for a nonbinary referent (*they* and *them*) than a constant character due to competition from the plural interpretation of *they*.

2.0 Experiment One: Comprehension

The first experiment tested participants' interpretations of nonbinary *they* for three conditions: *some conflict, most conflict,* and a baseline *no conflict* condition. We were interested in how differential amounts of gender cue conflict would affect how often participants would interpret the word *they* as referring to an individual that goes by they/them pronouns. It was hypothesized that participants would interpret the word *they* as referring to a nonbinary referent more often in conditions with higher amounts of gender cue conflict.

2.1 Methods

2.1.1 Participants

60 undergraduate students (32 females, 28 males) at the University of Pittsburgh were recruited from the Introduction to Psychology Subject Pool. The racial breakdown for the sample was 78.3% white, 11.7% Asian, 5% Black or African American, and 5% other. 6.7% of the sample identified as Hispanic or Latinx. All participants were over the age of 18 and fluent in English. Participants were compensated with course credit.

2.1.2 Materials

This study had a between-subjects design and included a manipulation of amount of gender cue conflict between items using three different conditions which were created by manipulating

cartoon character stimuli. The *some conflict* condition included a cartoon of a female presenting person, Rebecca, with a traditionally female name who uses they/them pronouns. The *most conflict* condition included a cartoon of a female presenting person, Joshua, with a traditionally male name who uses they/them pronouns. See Figure 1. These experimental characters in the *some conflict* and *most conflict* conditions were presented in a narrative with one of two constant characters: Emily, a female presenting person with a traditionally female name who uses she/her pronouns, and Michael, a male presenting person with a traditionally male name who goes by he/him pronouns. We also included a *no conflict* condition that did not have any gender cue conflict nor characters that go by they/them pronouns as a baseline. Narratives in the *no conflict* condition included both constant characters. See Figure 2. The first sentence of each target narrative introduced two characters by name as the agents of the event. The second sentence started with a *they* and introduced another event. A multiple-choice question after the narrative queried the interpretation of *they* by asking who was the agent of the event in the second sentence. These conditions were tested using two different lists, List 1, which tested both the *no conflict* and *some conflict* conditions, and List 2, which tested the *no conflict* and *most conflict* conditions. See Figure 2. List 1 and List 2 were presented on two different surveys. Participants were not permitted to sign up for both surveys. Because of an oversight during stimulus/list creation, our lists included many fewer *no conflict* trials than *some* or *most* conflict trials, so our focus will be on the comparison between the *some* and *most conflict* conditions.

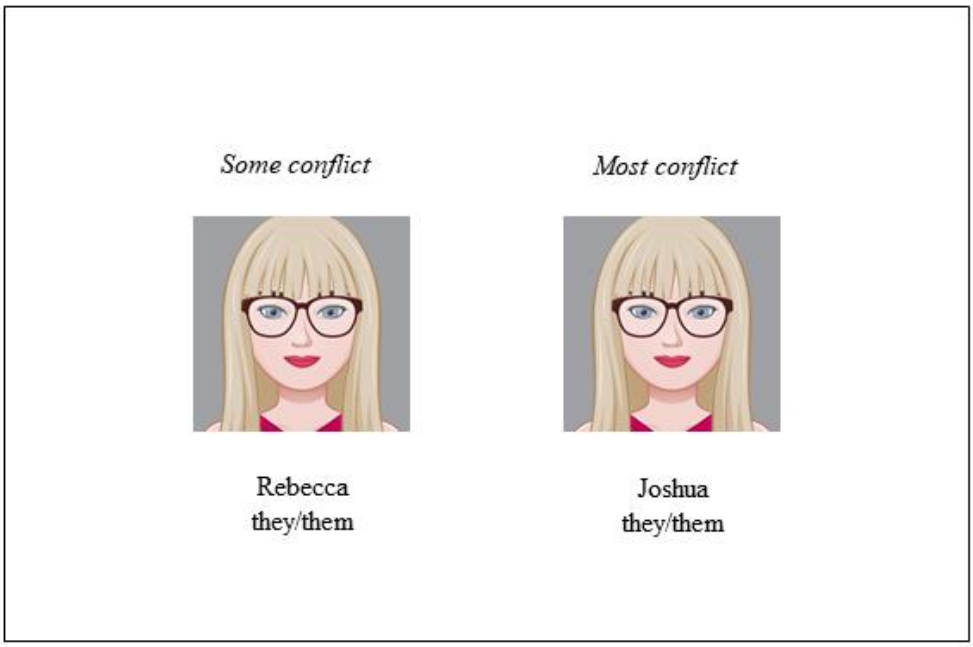


Figure 1 Interpretation Conditions

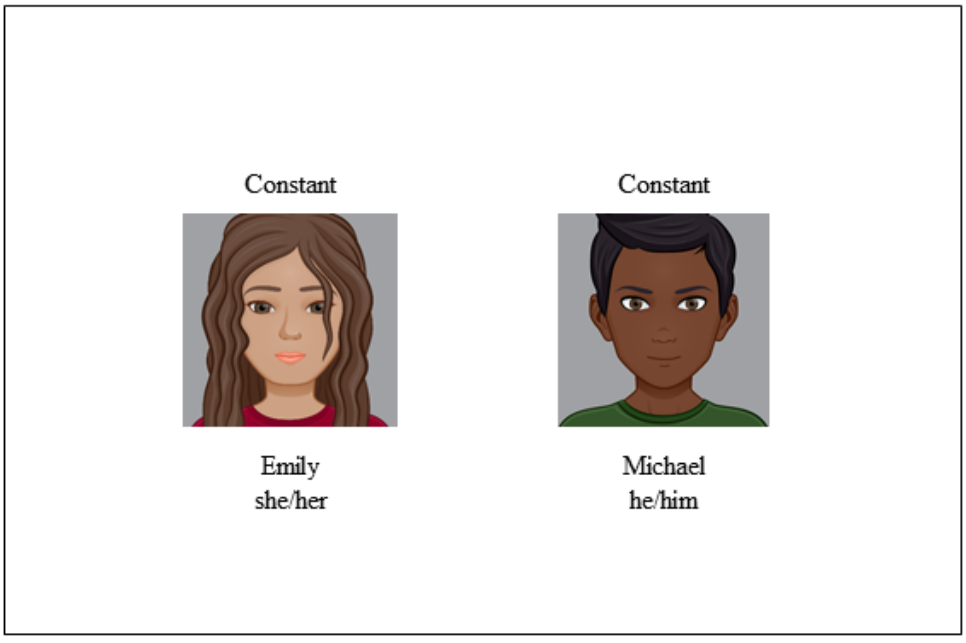
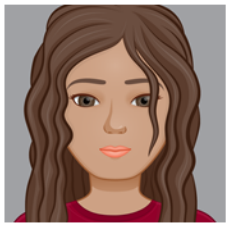


Figure 2 Experiment 1 Constant Characters

Both surveys consisted of three parts: demographic information, training items, and experimental stimuli. The demographic portion of the survey included questions about age, race, ethnicity, age at which the participant began to learn English, gender identity, and two measures of familiarity with people two identify outside of the gender binary: a self-reported familiarity rating on a scale of one (*Not at all familiar*) to ten (*Very familiar*) and number of people that the participant knows personally that do not identify as male or female.

The training items consisted of three different cartoon characters, the characters' names and pronouns, and fill in the blank pronoun comprehension questions. The three cartoons corresponded to the two constant characters and the character unique to either the *some conflict* condition (List 1) or *most conflict* condition (List 2). The cartoons were created using online cartoon maker Cartoonify.de. Each training item was accompanied by three fill-in-the-blank pronoun comprehension questions to ensure that participants were paying attention and learning each character's pronouns. See Figure 3 for an example of a training item. See Appendix A for the full list of training items.

This is Emily, and she goes by she/her pronouns.



Complete the sentences about Emily.

___ hair is brown.

Emily likes to talk with ___ sister.

When Emily goes to the beach ___ ___ to swim.

Figure 3 Experiment 1 Constant Training Item Example

The experimental stimuli consisted of 31 short narratives presented in two lists. Each list included 19 filler narratives and 12 experimental narratives. Two narratives were borrowed from Arnold et al., 2021. Each narrative was accompanied by a multiple-choice content question to check for attention, and a multiple-choice target question to determine the participant's interpretation of *they*. See Figure 4 for an example of an experimental stimulus. See Appendix B for the full list of experimental stimuli.

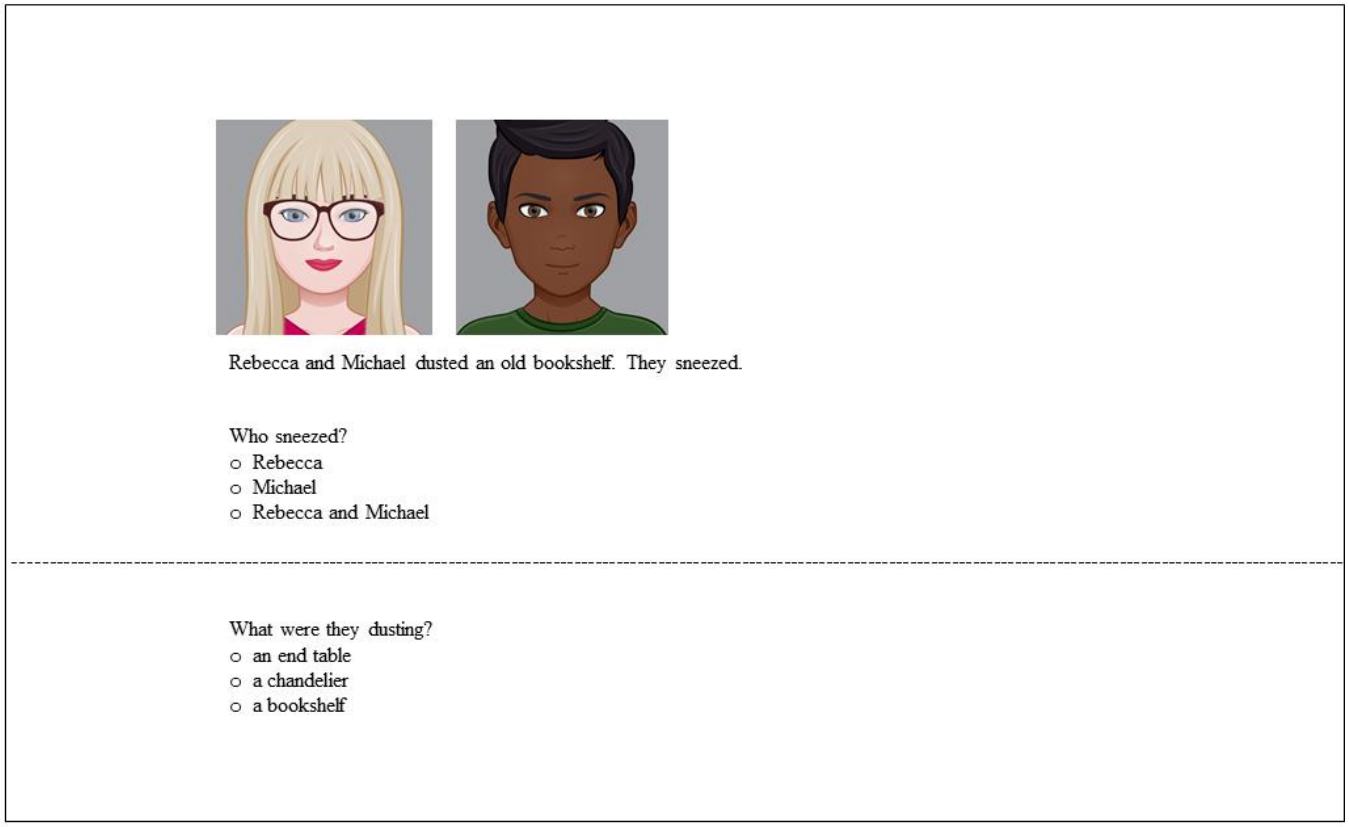


Figure 4 Experiment 1 *Some Confict* Experimental Item Example

2.1.3 Procedures

The surveys were posted on the University of Pittsburgh research study website, Sona Systems, and were accessed using Qualtrics survey software. Participants completed the surveys using their personal computers or mobile devices and worked at their own pace. Before beginning the survey, participants indicated consent consistent with the IRB protocol that we obtained for the study.

After the survey began, participants were instructed to answer the demographic questions. Then, participants completed the training items. The participants were informed that they were

about to see pictures of cartoon characters are well as their names and pronouns. They were asked to learn this information and continue with the survey when they were ready. Participants viewed each of the three training items individually. After each training item, participants were instructed to answer the fill-in-the-blank questions about the character in the training item. The character's name and picture were visible to the participants while they answered the fill-in-the-blank questions.

Next, participants completed the experimental portion of the survey. Participants were instructed to read the following sentences about the cartoon characters and answer the subsequent questions. Each narrative was presented individually, and pictures of the characters in the narrative were presented above the narrative. The narrative and pictures remained on the screen while the participant answered the target question, which indicated their interpretation of the word *they.* Participants then answered a content question about the narrative to check for attention. Only the content question was visible on the screen while participants answered these questions. Answer options for the content and target questions were presented in random order.

2.2 Results

2.2.1 Data Exclusion

Participant data was excluded from analysis if fewer than 80% of the content questions were answered correctly. Two participants were excluded for this reason. Additionally, one participant was excluded due to failure to complete the survey and one participant was excluded

for answering the pronoun questions for one of the training items incorrectly. 56 total participants were included in the final analysis.

2.2.2 Analysis

Interpretation of nonbinary *they* was coded binomially. Each trial in which the participant interpreted *they* as referring to a plural referent was coded as a zero. Each trial in which the participants interpreted *they* as referring to a nonbinary referent was coded as one. Figure 5 shows the proportion of nonbinary *they* interpretations in all three conditions. We ran a generalized linear mixed-effects model using R to examine the differences between the means of the *some conflict* and *most conflict* conditions while accounting for random effects across subjects. The *some conflict, no conflict,* and *most conflict* conditions were coded as -0.5, 0, and 0.5, respectively. Model glmer(Int_NonBinary ~ StimType_SM + (1 | Subject), family = binomial) tested how the two experimental conditions, *some conflict* and *most conflict* affected participants' interpretations of nonbinary *they* and revealed a significant effect of condition ($\beta = 0.43$, SE = 0.21, $p = 0.04$). Participants were more likely to interpret *they* as nonbinary in the *most conflict* than the *some conflict* condition.

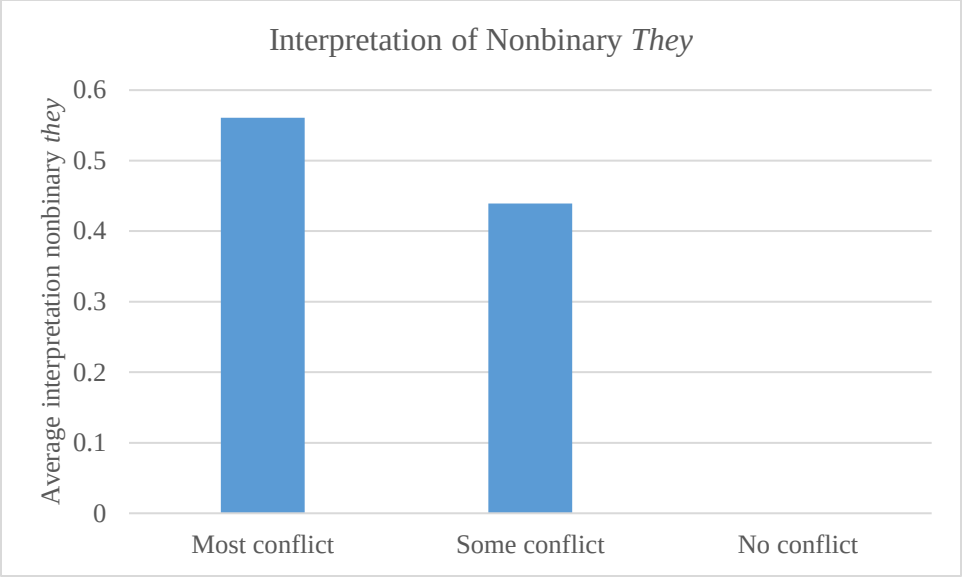


Figure 5 Interpretation of Nonbinary *They*

Additionally, we ran analyses to search for any effects of self-rated familiarity with individuals who identify outside of the gender binary and number of people the participant knows personally that identify outside of the gender binary. Self-rated familiarity measures were collected on a scale of one to ten and were centered at zero for analysis. Number of individuals measures were collected in four levels (None, 1-3, 3-6, More than 6) which were also centered for analysis. Results showed no effect of self-rated familiarity on the likelihood of interpreting *they* as referring to a nonbinary referent ($\beta = 0.01$, $SE = 0.04$, $p = 0.74$) nor number of individuals ($\beta = -0.20$, $SE = 0.15$, $p = 0.17$). There was also no interaction between self-rated familiarity and condition ($\beta = 0.04$, $SE = 0.09$, $p = 0.61$) nor number of individuals and condition ($\beta = 0.09$, $SE = 0.31$, $p = 0.78$). These null effects are consistent with the findings in Arnold et al. (2021), who also found no or a non-replicable relationship between rates of nonbinary *they* interpretation and these same demographic measures.

3.0 Experiment Two: Production

Experiment 2 aimed to uncover whether and how participants might use audience design and disambiguation strategies in when producing narratives containing nonbinary *they*. We examined this by comparing the narratives for two different conditions: *conflict* and *no conflict.* It was hypothesized that participants would engage in disambiguation strategies more often in the *conflict* condition. For example, nonbinary *they* and plural *they* avoidance would suggest that participants were engaging in audience design by avoiding the production of a narrative in which *they* is ambiguous. We also predicted an increase in plural markers, such as words like "both" and "the two" in the *conflict* condition. This would indicate that participants explicitly specified the intended referent of plural *they* more often when nonbinary *they* was plausible in the context, suggesting audience design. Additionally, we analyzed how often participants changed referents in their narratives but did not originally formulate a hypothesis about this measure. Changing referents fewer times in the *conflict* condition could also point towards audience design because it may reflect a strategy for helping their audience track their intended referent for *they.*

3.1 Methods

3.1.1 Participants

60 participants (42 females, 16 males, 1 nonbinary, 1 did not answer) were recruited from the University of Pittsburgh Introduction to Psychology Subject Pool. The racial breakdown of the

sample was 65% white, 21.7% Asian, 6.7% other, 5% Black or African American, 1.7% did not respond. 8.3% of the sample identified as Hispanic or Latinx. All participants were over the age of 18 and fluent in English. Participants were compensated with course credit.

3.1.2 Materials

This study had a within-subjects design and included a manipulation of gender cue conflict between items using two different conditions. The *no conflict* condition included a female presenting person, Sarah, with a traditionally female name who uses she/her pronouns. The *conflict* condition included a female presenting person, Jacob, with a traditionally male name who goes by they/them pronouns. These conditions were tested using six different lists: 1a, 1c, 1d, 2a, 2c, and 2d. Participants in lists 1a, 1c, and 1d saw a different characters for both conditions than participants in lists 2a, 2c, and 2d. In other words, the picture for the *conflict* character that was used in lists 1a, 1c, and 1d was used as the *no conflict* character in lists 2a, 2c, and 2d, and vice versa. See Figure 5. All lists included a constant character, Matthew, a male presenting person with a traditionally male name who uses he/him pronouns. See Figure 6. Each list was presented on a different survey. Participants were only permitted to sign up for one survey.

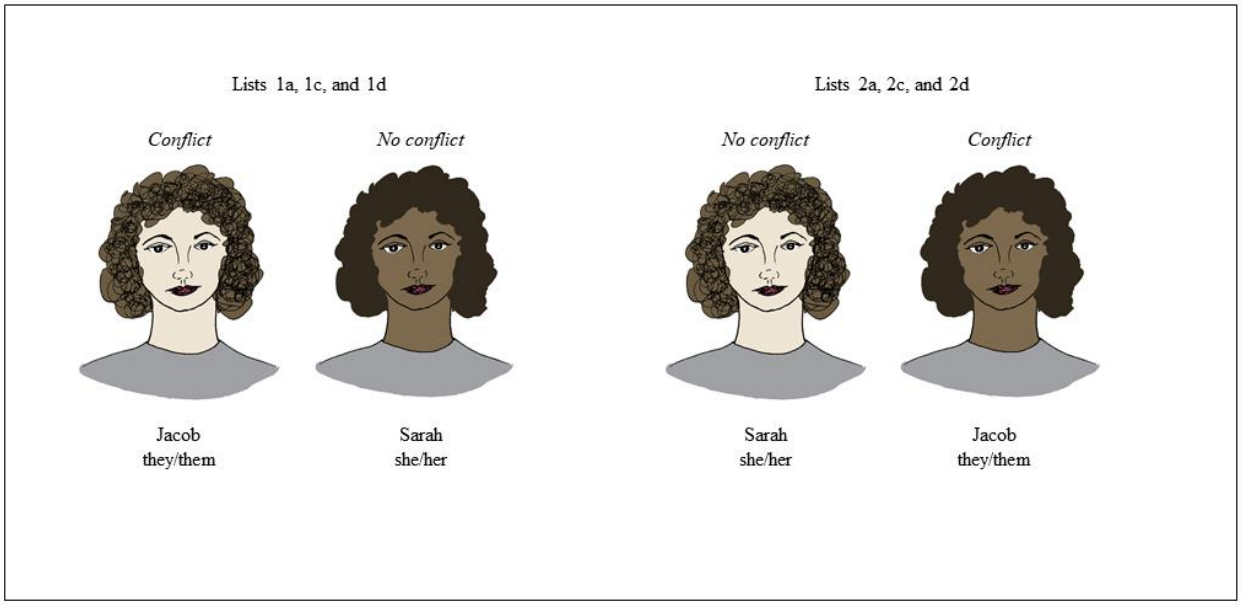


Figure 6 Production Conditions

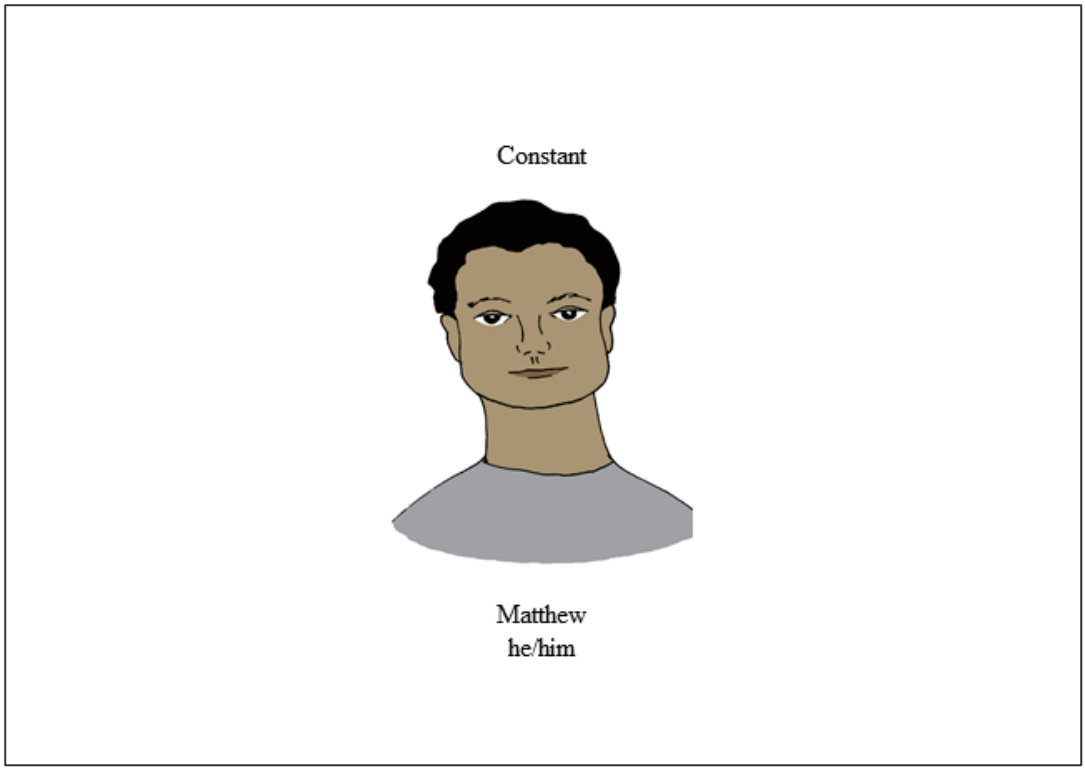


Figure 7 Experiment 2 Constant Character

Experiment 2 also consisted of a demographic information section, training section, and experimental section. The demographic information section was the same as Experiment 1. The training items were similar to those in Experiment 1. They consisted of three different characters which corresponded to the constant character, and the characters from the *no conflict*, and *conflict* conditions and were followed by three pronoun comprehension questions. See Figure 7 for an example. Characters were hand-drawn and digitized using Adobe Photoshop. See Appendix C for a full list of training items.

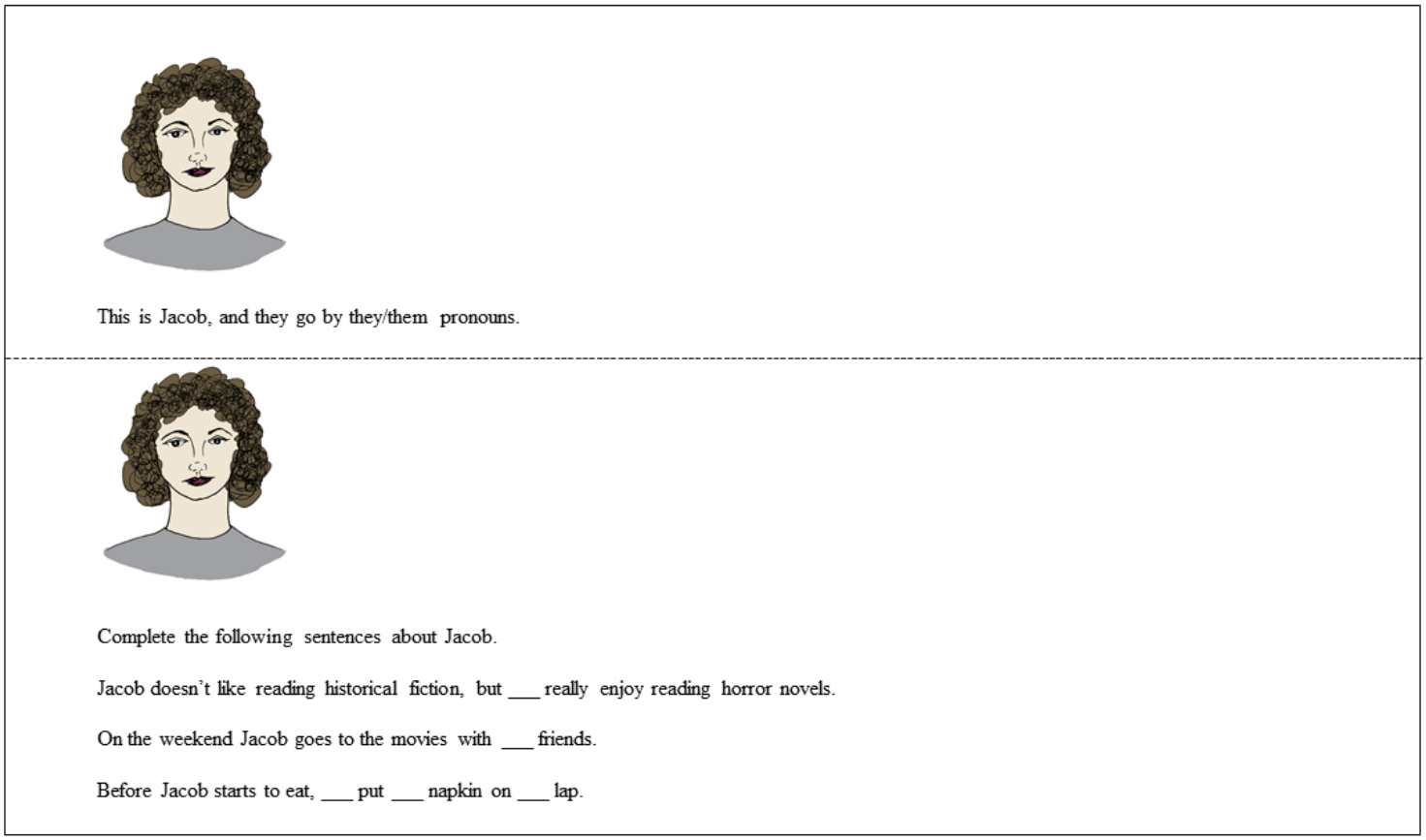


Figure 8 Experiment 2 *Conflict* Training Item Example

The experimental stimuli consisted of 12 scenes depicting the constant character and the character from the *no conflict* or *conflict* condition. See Figure 8 for an example. Scenes were hand-drawn and digitized using Adobe Photoshop. Two scenes were presented per list and each

participant saw one scene for the *no conflict* condition and one scene for the *conflict* condition. See Appendix D for a full list of experimental stimuli.

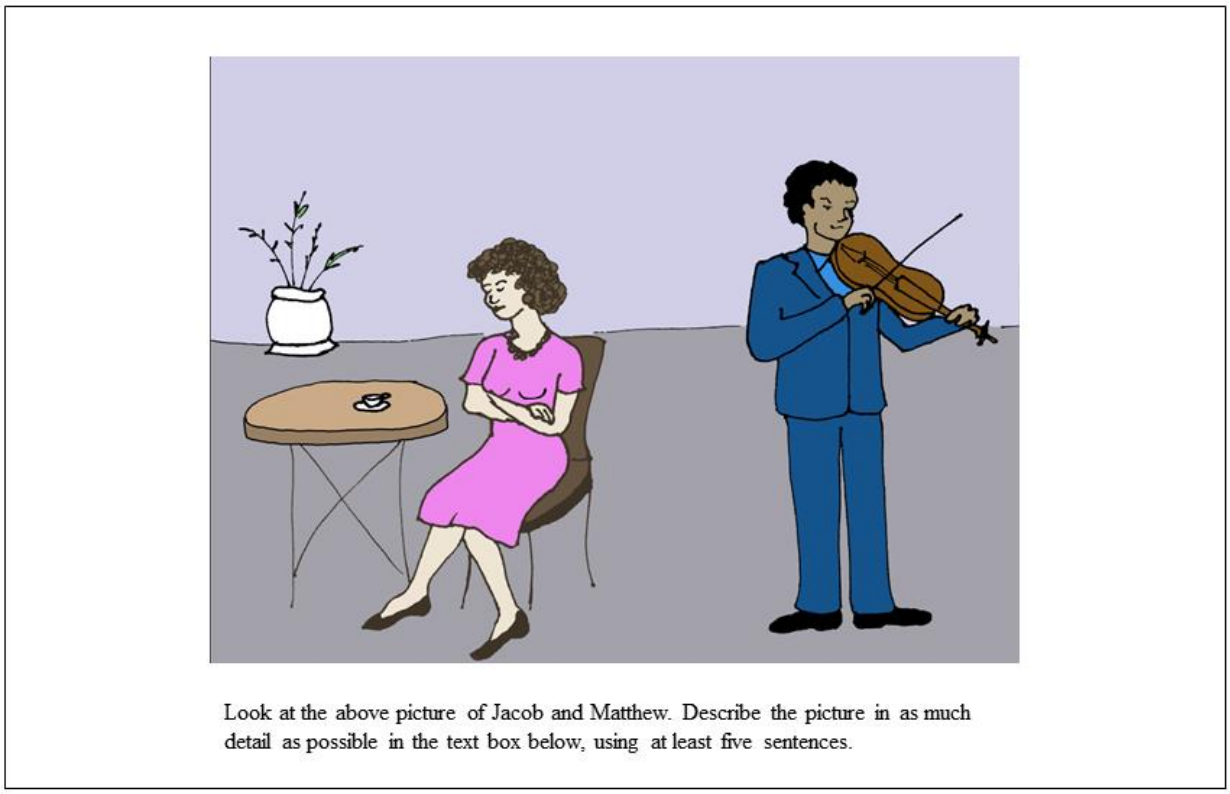


Figure 9 Experiment 2 *Conflict* Experimental Item Example

3.1.3 Procedures

The surveys were accessed and completed in the same manner as Experiment 1. The consent form, demographic questions, and instructions for the training items were also the same as Experiment 1. First, participants completed the training items for the constant character and *no conflict* condition and completed the experimental item for the *no conflict* condition immediately afterward. Then, participants completed the training item for the *conflict* character and completed the corresponding experimental item. While completing the experimental items, participants were

instructed to look at the above picture of two characters and to describe the picture in as much detail as possible in the text box, using at least five sentences. Training items and experimental items were not visible on the screen at the same time.

3.2 Results

3.2.1 Data Exclusion

Four participants were excluded due to failure to complete the survey. One participant was excluded due to lack of fluency in their written narratives. Two participants were excluded due to failure to learn the names of the characters. One participant was excluded because they provided an unequal number of sentences for the *conflict* and *no conflict* responses. Three participants were excluded because incorrect pronouns were used for the nonbinary referent. One participant was excluded because incorrect pronouns were used for the constant referent. Three participants were excluded due to mixing up the names and/or pronouns of the characters. 45 total participants were included in the final analysis.

3.2.2 Analysis

The number of plural markers, or words that denote plurality, for example “the two” “both” and “together”, were counted manually for each trial. The measure of plural markers is relevant to our hypotheses about audience design and disambiguation because an increased number of plural markers for the *conflict* condition would indicate increased effort to disambiguate *they* as referring

to a plural entity. We averaged the number of plural markers across trials for each condition and graphed them. See Figure 10. The *conflict* and *no conflict* conditions were coded as 0.5 and -0.5, respectively. Generalized linear mixed-effects model glmer(NumMarkers ~ Cond + (1 | Subject), family = poisson (link = "log")) revealed that the differences between conditions did not reach statistical significance ($\beta = 0.57$, SE = 0.38, $p = 0.13$), although they were in the predicted direction, with more plural markers in the *conflict* condition.

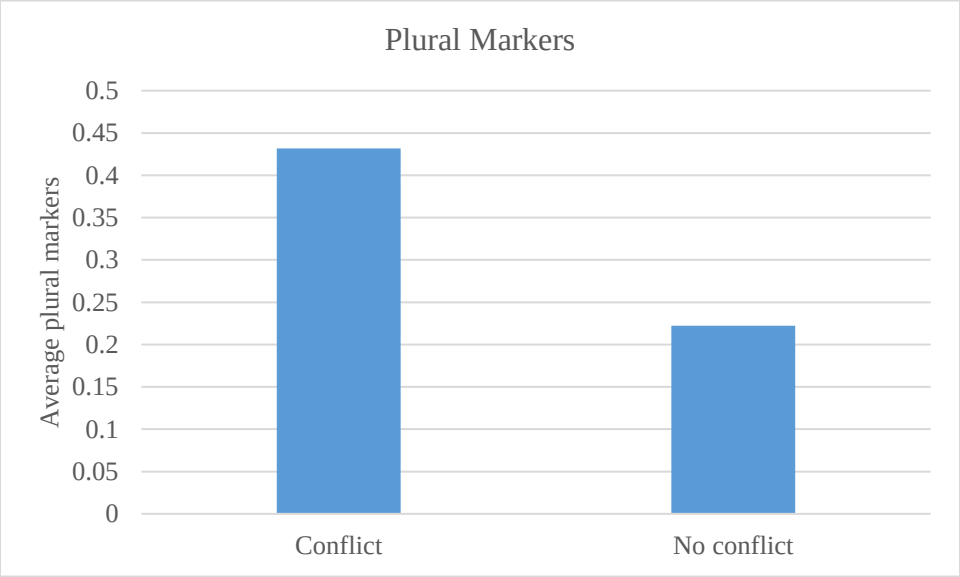


Figure 10 Plural Markers

The number of times participants produced plural *they* and *them* were also counted manually and averaged across all trials for each condition. See Figure 11. The generalized linear mixed-effects model glmer(PluralTheyThem ~ Cond + (1 + Cond|Subject), family = poisson (link = "log")) returned that condition did not have a reliable effect on the number of times participants produced plural *they* and *them* ($\beta = 0.19$, SE = 0.70, $p = 0.79$). However, the directions of the means is as would be predicted according to audience design: there were more plural uses of *they* and *them* in the *no conflict* condition than in the *conflict* condition, consistent with the possibility

that producers were less likely to use plural *they* when there was a possible competing nonbinary interpretation for *they*.

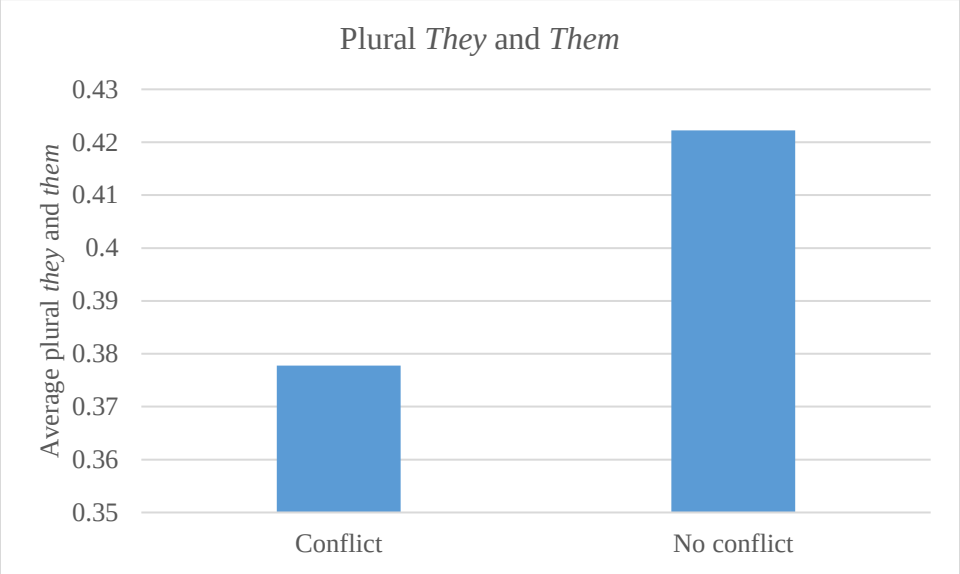


Figure 11 Plural *They* and *Them*

While coding, we noticed that in the *conflict* condition, participants seemed to group information about characters together more often than in the *no conflict* condition. In other words, participants produced narratives in which they changed referents less often in the *conflict* condition. This was of interest because a reduction in referent switching could indicate an attempt to make tracking the participant's intended referent easier, which also reflects audience design. To measure this phenomenon, the number of times participants switched referents within each narrative was counted manually and graphed. See Figure 12. A simple paired t test indicated that this finding was significant ($p = 0.013$), however, when a generalized linear mixed-effects model glmer(RefChanges ~ Cond + (1 + Cond | Subject), family = poisson) was used to account for random effects, the effect was not reliable ($\beta = -0.17$, $SE = 0.13$, $p = 0.17$).

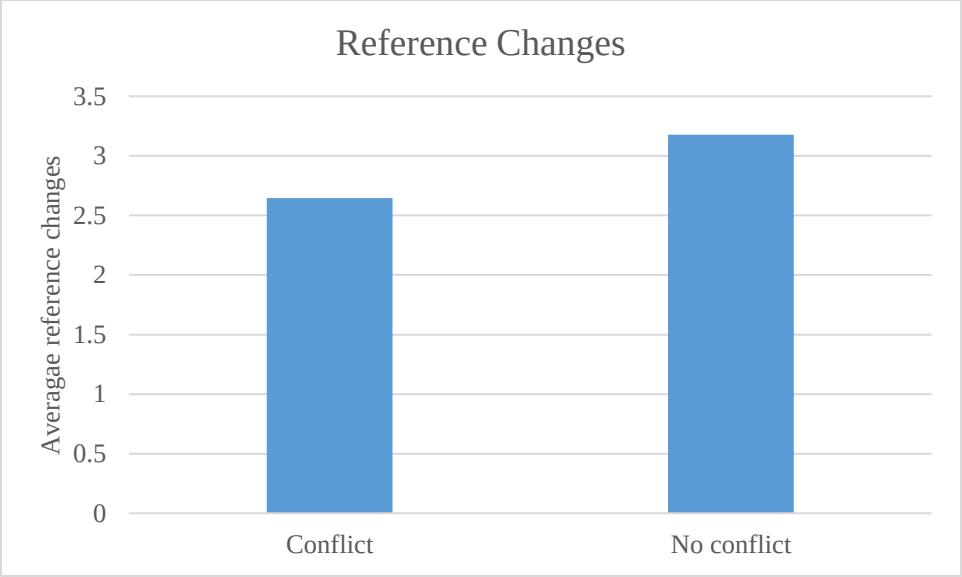


Figure 12 Reference Changes

Additionally, the number of times participants used singular pronouns to refer to experimental characters (*conflict* and *no conflict* conditions) and the constant character were counted manually. Experimental characters were coded as -0.5 and the constant character as 0.5. Number of pronouns was analyzed across conditions using a two-way ANOVA test. Results showed that there was no effect of conflict and no interaction between conflict and type of character (experimental or constant). See Figure 13. The direction of the means of the singular pronouns produced for the experimental characters across conditions is as predicted according to audience design: there were less singular pronouns produced for the experimental character in the *conflict* condition than in the *no conflict* condition, consistent with the possibility that producers were less likely to use nonbinary *they* when there was another competing interpretation for *they*. However, within the c*onflict* condition, participants produced a nearly equal number singular pronouns for the experimental character and the constant character. This finding is inconsistent with predictions according to audience design because if participants were engaging in nonbinary *they* avoidance due to competition from plural *they*, we would expect to see fewer uses of

nonbinary *they* than singular pronouns for the constant character (*he* and *him*) because there is no competing interpretation of *he* or *him.* Additionally, participants produced the most pronouns for the experimental character in the *no conflict* condition and the effect of character type was marginally reliable (p = .074).

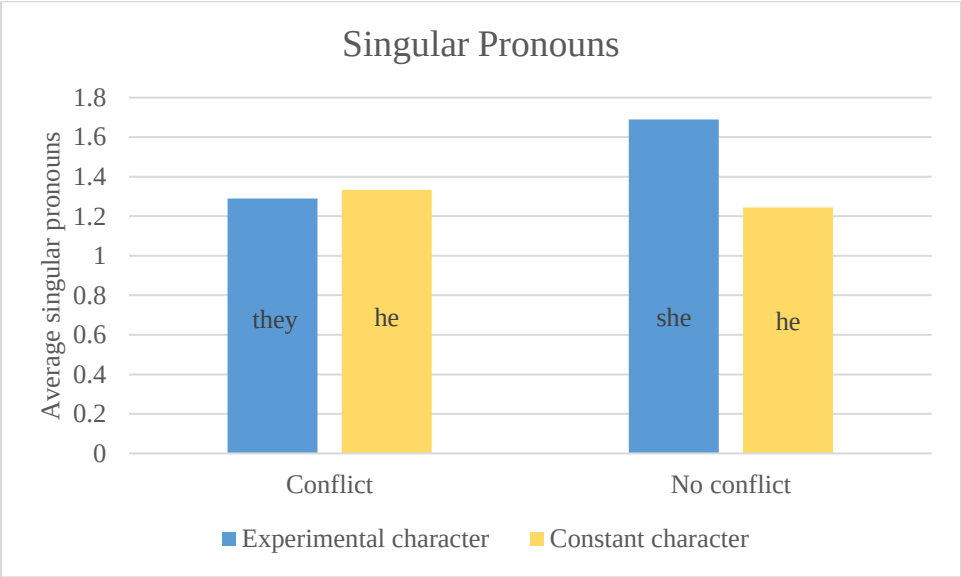


Figure 13 Singular Pronouns

Finally, generalized linear mixed-effects models were used to examine how the self-rated familiarity with people that identify outside of the gender binary and number of individuals that a participant knows personally that identify outside of the gender binary on the likelihood to produce nonbinary *they*. Similarly to Experiment 1, there was no effect of self-rated familiarity on the production of nonbinary *they* (β = 0.01, SE = 0.03, p = 0.75). Additionally, there was no effect of number of individuals that a participant knows that identify outside the gender binary (β = 0.10, SE = 0.11, p = 0.38).

4.0 Discussion

In Experiment 1, participants interpreted the word *they* as referring to an individual that goes by they/them pronouns more often in the *most conflict* condition than in the *some conflict* condition, and never in the *no conflict* condition. In other words, a character with higher amounts of gender cue conflict facilitated interpretation of nonbinary *they*. This effect was fully reliable and was consistent with our predictions and supports the original hypothesis that participants would interpret the word *they* as referring to a nonbinary referent more often in conditions with higher amounts of gender cue conflict due to increased attention to the higher conflict stimulus.

In Experiment 2, many of the data patterns were in the expected directions but did not reach statistical significance. Participants produced more plural markers, such as "both", "the two", and "together" more often in the *conflict* condition than in the *no conflict* condition. This is likely due to participants' attempts to disambiguate plural *they* from nonbinary *they*. Additionally, participants produced plural *they* and *them* more often in the *no conflict* condition than in the *conflict* condition. In other words, participants produced plural *they* and *them* more often in a context where producing nonbinary *they* was not necessary or relevant. A possible explanation for plural *they* avoidance in contexts with a nonbinary referent is to evade ambiguity between nonbinary *they* and plural *they*. These patterns are consistent with our hypothesis that participants would use plural markers and *they* avoidance to disambiguate the intended referent or referents in their narratives. We did not enter Experiment 2 with a specific prediction about reference changes. The pattern that participants changed referents more often in the *no conflict* condition than in the *conflict* condition was observed while coding for other measures, and upon analysis, was found to be true, although not statistically reliable. A possible reason for this phenomenon is that the

ambiguity of *they* in the *conflict* condition makes tracking the intended referent more difficult, and because of this, participants attempted to make referent tracking easier for themselves by changing referents less often. Similarly, participants could have been engaging in audience design by attempting to make referent tracking easier for the readers of their narratives. Although a modulation of reference changes was not included in one of our original hypotheses, the pattern is consistent with our broad prediction that participants would engage in disambiguation strategies more often in the *conflict* condition than in the *no conflict* condition due to the ambiguity of the word *they*.

The data for number of pronouns produced for the experimental characters and constant characters in each condition partially behaved as expected. The data pattern for the experimental characters was as expected across conditions. Participants produced fewer pronouns for the experimental character in the *conflict* condition than in the *no conflict* condition, which is consistent with our prediction that participants would engage in pronoun avoidance as a disambiguation strategy. Surprisingly, there was a greater difference between the number of pronouns produced for the experimental and constant characters in the *no conflict* condition than in the *conflict* condition, and the experimental character in the *no conflict* condition received the most pronouns overall. Additionally, the experimental character and constant character in the *conflict* condition received nearly equal numbers of pronouns. This was not consistent with our predictions about disambiguation strategies because if participants had engaged in nonbinary *they* avoidance, they would have produced fewer pronouns for the experimental character than the constant character in the *conflict* condition.

There were a number of interesting instances in Experiment 2 that did not occur often enough to warrant coding or analysis. One example of this was the production of different

conjugations of the verb "to be" for nonbinary *they* and plural *they*. For example, in the *conflict* condition, one participant wrote "they is" to describe the action of the nonbinary referent, but later wrote "they are" to describe the location of both referents. According to Merriam-Webster Dictionary, the use of "they is" is incorrect. However, even though "they is" violates the traditional plural grammar and morphology that is usually associated with the word *they* in plural, singular gender-nonspecific, and nonbinary uses, this strategy is incredibly effective at communicating that the intended referent is an individual. In the context of this experiment, the use of "they is" contrasted with "they are" is an efficient way to specify whether the intended referent is the nonbinary referent or both the nonbinary referent and constant character. We did not expect this phenomenon to occur; however, it is consistent with the prediction that participants would use disambiguation strategies in the *conflict* condition and raises an interesting topic about the future of the grammatical structure of nonbinary *they*.

Another interesting occurrence from this experiment was the use of singular markers. One participant wrote about both referents "It looks like they are in an indoor location, possibly one of their houses". This is an interesting sentence because in many other contexts, the meaning would be ambiguous (one person has one house, or one person has multiple houses), but in this context, is fairly specific. The participant used the phrase "one of their" to communicate that the intended referent was either the nonbinary referent or the constant character, but not both. This means that the participant was not necessarily using this phrase to disambiguate nonbinary *they* from plural *they*, but nonetheless avoided ambiguity between the two.

5.0 Limitations and Conclusions

A major limitation of both Experiment 1 and Experiment 2 was the subject pool. Because we used the University of Pittsburgh Introduction to Psychology Pool, there was very little variability and was not representative of the population. Because of this, it is possible that our data did not reveal data patterns or significant differences that could have been visible had a more representative population been used. For example, differences between conditions may have been obscured by the tendency for younger populations to be more accepting of individuals that identify outside of the gender binary and to be more flexible with the emergence of nonbinary *they*, which could have led to an increased likelihood of the producing and interpreting nonbinary *they*.

Additionally, in hindsight, we would reword the instructions for Experiment 2 to better address the question of audience design. For example, it might be useful to tell participants that their descriptions of the scenes would later be used by another participant to recreate the picture. This would directly inform participants that their narratives were of importance to another individual and might have encouraged an increase in audience design and disambiguation strategies.

Overall, these experiments provided novel results about a topic of active interest both in academia and in the public. From Experiment 1, we discovered that gender cue conflict is a significant factor that affects how often participants interpret *they* as referring to an individual who goes by they/them pronouns. Specifically, results revealed that higher gender cue conflict conditions encourage the interpretation of nonbinary *they*. Experiment 2 produced interesting data patterns that suggest that audience design and disambiguation strategies, such as the use of plural

markers and reduction in referent changes may be relevant to how people produce narratives with nonbinary *they*.

Appendix A Experiment 1 Training Items

Appendix A.1 List 1

Constant

This is Emily, and she goes by she/her pronouns.

Complete the sentences about Emily.

___ hair is brown.

Emily likes to talk with ___ sister.

When Emily goes to the beach ___ ___ to swim.

Constant

This is Michael, and he goes by he/him pronouns.

Complete the sentences about Michael.

Michael does the shopping for ___ family.

When Michael goes to the library, ___ ___ to find new mystery novels.

___ shirt is green.

Some conflict

This is Rebecca, and they go by they/them pronouns.

Complete the sentences about Rebecca.

When Rebecca goes to the park, ___ ___ to sit in the grass.

___ glasses are black.

Rebecca often hangs out with ___ cousins.

Appendix A.2 List 2

Constant

This is Emily, and she goes by she/her pronouns.

Complete the sentences about Emily.

___ hair is brown.

Emily likes to talk with ___ sister.

When Emily goes to the beach ___ ___ to swim.

Constant

This is Michael, and he goes by he/him pronouns.

Complete the sentences about Michael.

Michael does the shopping for ___ family.

When Michael goes to the library, ___ ___ to find new mystery novels.

___ shirt is green.

Most conflict

This is Joshua, and they go by they/them pronouns.

Complete the sentences about Joshua.

When Joshua goes to the park, ___ ___ to sit in the grass.

___ glasses are black.

Joshua often hangs out with ___ cousins.

Appendix B Experiment 1 Experimental Items

Items marked with an *r* contain the *some conflict* character, Rebecca, and were presented in List 1.. Items marked with a *j* contain the *most conflict* character, Joshua, and were presented in in List 2. Items that are not marked with *r* or *j* do not contain either character and presented in both lists.

Item	Condition	Stimulus
1	Filler	Michael decided to take a road trip. He made it all the way to California.
2r	Filler	Rebecca, Emily, and Michael ran a marathon. Emily got first place.
2j	Filler	Joshua, Emily, and Michael ran a marathon. Emily got first place.
3r	Some conflict	Rebecca and Emily went to the store. They carried their groceries in a basket.
3j	Most conflict	Joshua and Emily went to the store. They carried their groceries in a basket.
4	No conflict	Michael and Emily went to an amusement park and rode roller coasters all day. They felt sick afterwards.
5r	Some conflict	Rebecca and Michael went running in a park. They fell down.
5j	Most conflict	Joshua and Michael went running in a park. They fell down.
6r	Filler	Rebecca and Emily were making a cake. She set a timer.
6j	Filler	Joshua and Emily were making a cake. She set a timer.
7r	Filler	Michael washed a car with Rebecca. He left to get a towel.
7j	Filler	Michael washed a car with Joshua. He left to get a towel.
8r	Some conflict	Rebecca and Michael dusted an old bookshelf. They sneezed.
8j	Most conflict	Joshua and Michael dusted an old bookshelf. They sneezed.
9	Filler	Michael found a lost dog. He returned it to its owner.
10	Filler	Emily went to an art museum. She took a lot of photos.
11r	Some conflict	Rebecca and Emily moved houses. They shattered a mirror in the process.
11j	Most conflict	Joshua and Emily moved houses. They shattered a mirror in the process.
12r	Filler	Rebecca fell asleep on a flight to Japan. The seats were surprisingly comfortable.
12j	Filler	Joshua fell asleep on a flight to Japan. The seats were surprisingly comfortable.
13	No conflict	Emily and Michael attended a painting class. They both thought it was great.
14r	Some conflict	Rebecca and Michael took a yoga class. They talked to the teacher afterwards.

14j	Most conflict	Joshua and Michael took a yoga class. They talked to the teacher afterwards.
15r	Filler	Rebecca, Emily, and Michael went to a movie. Rebecca ordered a large popcorn to share.
15j	Filler	Joshua, Emily, and Michael went to a movie. Joshua ordered a large popcorn to share.
16r	Filler	Rebecca made a batch of cookies and got burnt on the hot pan.
16j	Filler	Joshua made a batch of cookies and got burnt on the hot pan.
17r	Some conflict	Rebecca and Emily were building a dresser. They dropped a bag of screws.
17j	Most conflict	Joshua and Emily were building a dresser. They dropped a bag of screws.
18r	Filler	Rebecca was stung by a bee while planting some flowers in the front yard.
18j	Filler	Joshua was stung by a bee while planting some flowers in the front yard.
19r	Some conflict	Rebecca and Michael cleaned the house. They vacuumed up a marble.
19j	Most conflict	Joshua and Michael cleaned the house. They vacuumed up a marble.
20	Filler	Emily went to the gym. She ran on the treadmill.
21r	Filler	Rebecca and Emily made breakfast. She dropped a plate.
21j	Filler	Joshua and Emily made breakfast. She dropped a plate.
22r	Filler	Rebecca went to the library and spent an hour picking out a book to read.
22j	Filler	Joshua went to the library and spent an hour picking out a book to read.
23r	Some conflict	Rebecca and Michael stayed up too late. They yawned.
23j	Most conflict	Joshua and Michael stayed up too late. They yawned.
24	Filler	Michael and Emily wanted to go to a concert. He paid for the tickets.
25r	Filler	Rebecca, Emily, and Michael got ice cream cones. Michael ordered strawberry.
25j	Filler	Joshua, Emily, and Michael got ice cream cones. Michael ordered strawberry.
26r	Some conflict	Rebecca and Emily visited a friend’s house. They knocked on the door.
26j	Most conflict	Joshua and Emily visited a friend’s house. They knocked on the door.
27	Filler	Emily overslept and was an hour late to work.
28	Filler	Emily went to a potluck with Michael. She brought macaroni and cheese.
29	Filler	Michael lost a twenty dollar bill. He spent an hour trying to find it.
30r	Some conflict	Rebecca and Michael watched a movie. They turned up the volume.
30j	Most conflict	Joshua and Michael watched a movie. They turned up the volume.
31	Filler	Emily babysat for a friend. She put the baby to bed at eight.

Appendix C Experiment 2 Training Items

Appendix C.1 Lists 1a, 1c and 1d

No conflict

This is Sarah, and she goes by she/her pronouns.

Complete the following questions about Sarah.

Sarah said that ___ likes to go to the beach.

Sarah wanted to visit ___ cousins.

After Sarah stayed up really late, ___ slept in last weekend.

Conflict

This is Jacob, and they go by they/them pronouns.

Complete the following questions about Jacob.

Jacob doesn't like reading historical fiction, but ___ really enjoy reading horror novels.

On the weekends, Jacob goes to movies with ___ friends.

Before Jacobs starts to eat, ___ put ___ napkin on ___ lap.

Constant

This is Matthew, and he goes by he/him pronouns.

Complete the questions about Matthew.

Matthew went for a run and then ___ took a nap.

Matthew likes to swim after ___ lies in the sun for a while.

Matthew likes to make fancy dinners for __ family.

Appendix C.2 Lists 1a, 1c, and 1d

No conflict

This is Sarah, and she goes by she/her pronouns.

Complete the following questions about Sarah.

Sarah said that ___ likes to go to the beach.

Sarah wanted to visit ___ cousins.

After Sarah stayed up really late, ___ slept in last weekend.

Conflict

This is Jacob, and they go by they/them pronouns.

Complete the following questions about Jacob.

Jacob doesn't like reading historical fiction, but ___ really enjoy reading horror novels.

On the weekends, Jacob goes to movies with ___ friends.

Before Jacobs starts to eat, ___ put ___ napkin on ___ lap.

Constant

This is Matthew, and he goes by he/him pronouns.

Complete the questions about Matthew.

Matthew went for a run and then ___ took a nap.

Matthew likes to swim after ___ lies in the sun for a while.

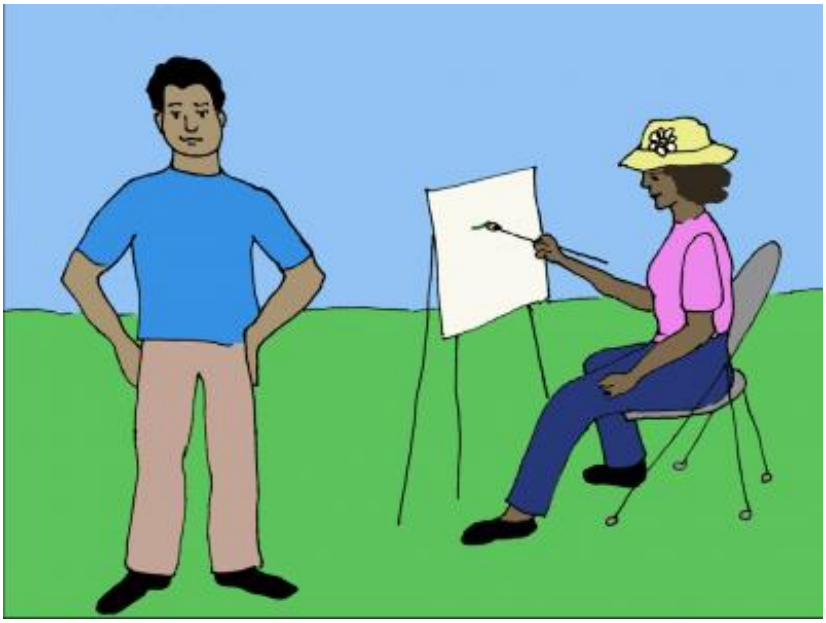
Matthew likes to make fancy dinners for __ family.

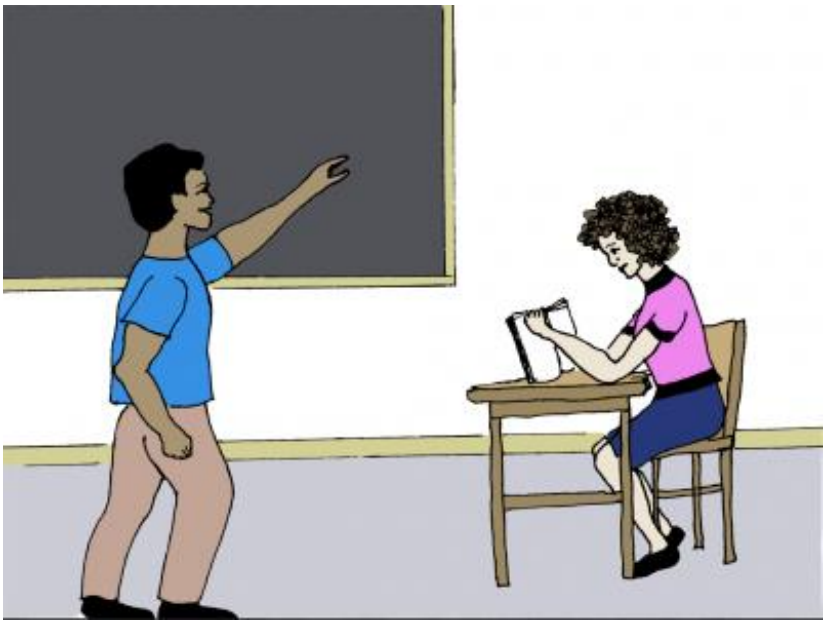
Appendix D Experiment 2 Experimental Items

Appendix D.1 List 1a and 2a

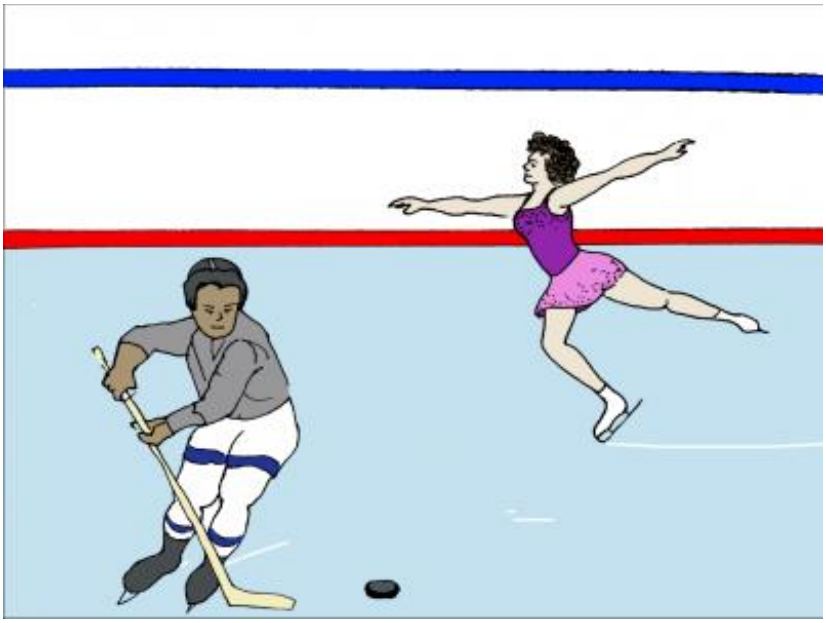
.

Appendix D.2 List 1c and 2c





Appendix D.3 List 1d and 2d



Bibliography

Arnold, J. E., Eisenband, J. G., Brown-Schmidt, S., & Trueswell, J. C. (2000). The rapid use of gender information: Evidence of the time course of pronoun resolution from eyetracking. *Cognition*, *76*(1), B13-26. https://doi.org/10.1016/s0010-0277(00)00073-1

Arnold, J. E., Mayo, H. C., & Dong, L. (2021). My pronouns are they/them: Talking about pronouns changes how pronouns are understood. *Psychonomic Bulletin & Review*, *28*(5), 1688–1697. https://doi.org/10.3758/s13423-021-01905-0

Chun, M. M., & Turk-Browne, N. B. (2007). Interactions between attention and memory. *Current Opinion in Neurobiology*, *17*(2), 177–184. https://doi.org/10.1016/j.conb.2007.03.005

Ferreira, V. S. (2019). A Mechanistic Framework for Explaining Audience Design in Language Production. *Annual Review of Psychology*, *70*, 29–51. https://doi.org/10.1146/annurev-psych-122216-011653

Gann, T. M., & Barr, D. J. (2014). Speaking from experience: Audience design as expert performance. *Language, Cognition and Neuroscience*, *29*(6), 744–760. https://doi.org/10.1080/01690965.2011.641388

LaScotte, D. K. (2016). Singular *they*: An Empirical Study of Generic Pronoun Use. *American Speech*, *91*(1), 62–80. https://doi.org/10.1215/00031283-3509469

Liu, W., & Ruths, D. (2013). What's in a name? Using first names as features for gender inference in Twitter", In. *Symposium on Analyzing Microtext*,.

Merriam-Webster. (n.d.). *Singular Nonbinary 'They': Is it 'they are' or 'they is'?* Retrieved March 30, 2022, from https://www.merriam-webster.com/words-at-play/singular-nonbinary-they-is-or-they-are

Sanford, A. J., & Filik, R. (2007). “They” as a gender-unspecified singular pronoun: Eye tracking reveals a processing cost. *Quarterly Journal of Experimental Psychology*, *60*(2), 171–178. https://doi.org/10.1080/17470210600973390

Steinmetz, K. (2019, December 13). *This is Why Singular ‘They’ Is a Controversial Subject*. Time. https://time.com/5748649/word-of-year-they-merriam-webster/

Understanding Non-Binary People: How to Be Respectful and Supportive. (2016, July 9). National Center for Transgender Equality. https://transequality.org/issues/resources/understanding-non-binary-people-how-to-be-respectful-and-supportive