Singular *they* in transition: ERP evidence and individual differences

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The English use of singular *they* to refer to a non-specific antecedent or an individual of unknown gender dates back to the 1300s [1]. Recently, *they* has emerged as a the most common personal pronoun for individuals who identify as gender nonbinary, and a coherent subset of English speakers will accept *they* when referring to a specific, antecedent of known gender (e.g., *Sarah*$_i$ slept because *they*$_i$ were tired.) [2,3]. Most research in this area adopts explicit offline judgments rather than online processing. The present work employs ERPs to examine the processing of nonbinary *they*, in comparison with binary gender pronouns. Gender mismatches such as *The boy thought that she would win the race* typically evoke a larger P600 than gender matches [4-7]. This P600 is thought to reflect the processes involved in diagnosing and attempting to repair a structural mismatch. Another component that can be elicited in this situation is an Nref, which has been argued to reflect extra work involved in either positing an unheralded referent outside the sentence [6] or linking the pronoun with a counter stereotypically gendered antecedent within the sentence [5].

The present work compared the processing of singular (*he/she*) and plural (*they*) pronouns that matched or mismatched the subject in the sentence. 120 items like (1) were constructed and pseudorandomly presented with 30 matching pronoun filler items using a Latin square design. Participants were 78 undergraduates attending a school where every student is introduced to preferred pronouns, taught about nonbinary gender identities, and encouraged to provide their preferred pronouns as part of orientation. They were told they were going to read sentences about named individuals who would be referenced with their preferred pronouns. The names were strongly associated with either male or female identities, which was established via a web-based survey on a separate group of participants. As an attention check, after each trial, participants were asked to identify the gender they would associate with each name. After the ERP study, participants completed a survey querying their attitudes towards and familiarity with transgenderism and nonbinary gender, as well as an acceptability survey of *they* with various antecedents. All analyses and the study design were preregistered.

Both mismatched singular pronouns and mismatched plural pronouns elicited a larger posterior positivity compared to their matched controls during the 450-1150 ms time window after the pronoun was presented (i.e., P600 effects). The mismatched singular pronouns also elicited a larger frontal negativity compared to matched controls in this window, consistent with an Nref effect. In contrast, the mismatched plural pronouns showed little or no reliable enhanced frontal negativity, which was confirmed by a cluster-based permutation analysis. These results replicate our previous finding with a smaller sample size (n=21) from the same population. This finding suggests that both types of mismatch triggered processing difficulty, but the mismatching singular pronouns also initiated additional referential work. Though robust for all groups, the P600 effect between the mismatched and matched plural pronouns decreased as participants' age increased. This could be because processing singular *they* becomes easier with increased exposure to it in a college environment. Intriguingly, offline acceptability judgments did not affect online ERPs. We compared 26 participants who were accepting of *they* with various singular named antecedents with 44 participants who rejected *they* in these contexts. These two groups did not show reliable differences in terms of their P600 and Nref effects. Thus, even individuals who are familiar with and robustly accepting of singular *they* exhibit difficulty processing it in comprehension. Importantly, this difficulty does not result in referential failure as it does for mismatched *he/she*. This work sheds light on the way in which the grammar of *they* is in transition. We see clear evidence for a coherent group of speakers who explicitly accept judgments of singular *they*. This group still exhibits implicit processing difficulty in online ERP measures. At the same time, this processing difficulty may be reduced for individuals with increased exposure to a non-binary accepting environment.

References
[1] Balhorn, M. (2004) The rise of epicene they. Journal of English Linguistics 32(2), 79-104.
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[4] Osterhout & Mobley. (1995). Event-Related potentials elicited by failure to agree. JML
[5] Canal, Garnham & Oakhill (2015). Beyond gender stereotypes in language. Frontiers
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[7] Prasad, Morris, Feinstein (2018) The P600 for singular 'they'. CUNY

(1) Sample item with critical pronoun in bold (actual stimuli were not bolded)
Matched Singular (MA_SI): *Lillian had just gotten back from vacation, so **she** felt exhausted.*
Mismatched Singular (MM_SI): *Lillian had just gotten back from vacation, so **he** felt exhausted.*
Matched Plural (MA_PL): *Lillian and Paul had just gotten back from vacation, so **they** felt exhausted.*
Mismatched Plural (MM_PL) *Lillian had just gotten back from vacation, so **they** felt exhausted.*

Figure 1. Scalp topographies in the 450-1150 ms time window of the comparisons between singular matched (MA_SI) and mismatched (MM_SI), plural matched (MA_PL) and mismatched (MM_PL), as well as singular and plural mismatched (MM_SI and MM_PL).

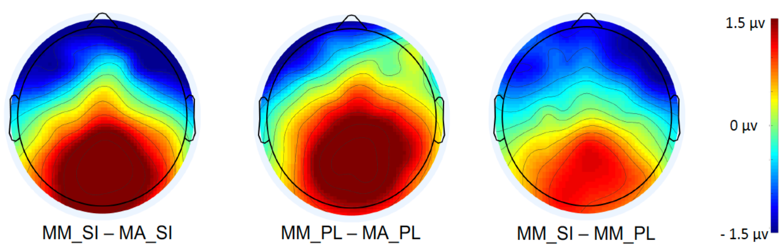

Table 1. By-subject and by-item analyses for the P600 effect. (df_{F1} = 1,77, df_{F2}= 1,119).

Comparison	450-750 ms	750-950 ms	950-1150 ms
MM_SI-MA_SI	F_1 = 53.43***, F_2 = 66.08***	F_1 = 42.63***, F_2 = 48.87***	F_1 = 29.14***, F_2 = 26.07***
MM_PL-MA_PL	F_1 = 75.18***, F_2 = 111.6***	F_1 = 55.54***, F_2 = 79.66***	F_1 = 36.57***, F_2 = 45.73***
MM_SI-MM_PL	F_1 = 11.69**, F_2 = 12.54***	F_1 = 20.53***, F_2 = 24.19***	F_1 = 8.52**, F_2 = 9.03**

***p < .001, **p < .01

Table 2. By-subject and by-item analyses for the Nref effect. (df_{F1} = 1,77, df_{F2}= 1,119).

Comparison	450-750 ms	750-950 ms	950-1150 ms
MM_SI-MA_SI	F_1 = 14.86***, F_2 = 25.32***	F_1 = 3.54†, F_2 = 4.93*	F_1 = 3.85†, F_2 = 4.67*
MM_PL-MA_PL	F_1 < 1, F_2 < 1	F_1 < 1, F_2 < 1	F_1 = 1.39, F_2 = 1.74
MM_SI-MM_PL	F_1 = 12.44***, F_2 = 20.47***	F_1 = 3.71†, F_2 = 5.93*	F_1 = 3.21†, F_2 = 4.07*

***p < .001, **p < .01,*p < .05, $^{\dagger}p$ < .08