An ERP Examination of Pronoun Resolution in Schizophrenia

Tali Ditman[1], Kana Okano[2], Gena Gorlin[2], Donald Goff[1], & Gina R. Kuperberg[1,2]
[1]Massachusetts General Hospital/Harvard Medical School;[2]Tufts University

Introduction

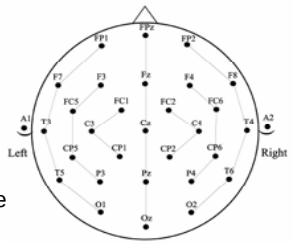
A rich understanding of language requires comprehenders to go beyond the meaning of individual words to construct a global representation. Patients with schizophrenia are impaired in constructing this representation in part due to difficulty establishing referential coherence. Referential coherence involves linking one word – the *anaphor* – with a previously presented word in the discourse (e.g., linking 'he' in "John went to the store because he needed to buy milk" with 'John') – the referent.

This impaired use of cohesion markers, such as pronouns, is well documented during production and has been postulated to be a trait-marker of schizophrenia. It may arise because patients are unable to maintain multiple referents online for later resolution, and/or because they are unable to use contextual information or real-world knowledge to link the correct anaphor with the correct antecedent. The present study employed event-related potentials (ERPs) to examine these possibilities.

Task

1 Referent/Match: In the park Mark inspected the beehive until ***he*** got stung.	2 Referent/Match: In the park Mark and Jacob inspected the beehive until ***he*** got stung.
1 Referent/Mismatch: In the park Mark inspected the beehive until s***he*** got stung.	2 Referent/Mismatch: In the park Mark and Jacob inspected the beehive until s***he*** got stung.

Patients and healthy matched controls read sentences that contained an ambiguous pronoun, failing pronoun, or unambiguous pronoun.
30 items/condition
64 fillers with repeated names
Task: Does the sentence make sense?



Participants

	Controls	SCZ patients
N	20	16
Male/Female	13M/7F	13M/3F
Age	45.55 (7.98)	39.44 (12.71)
Premorbid IQ	107.74 (8.84)	102.17 (9.65)
Years of Education*	14.8 (1.51)	12.8 (2.04)
Hollingshead SES	3.3 (1.22)	2.87 (1.41)

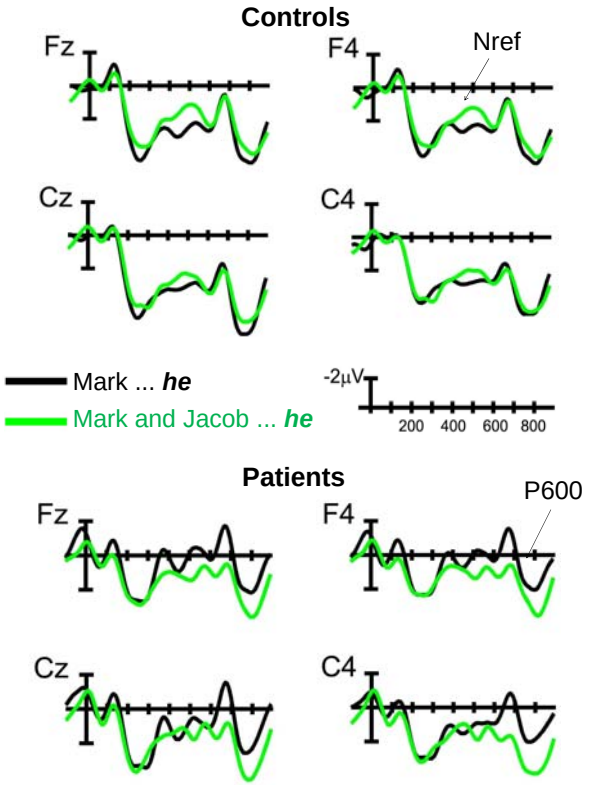
*$p < .01$

Predictions

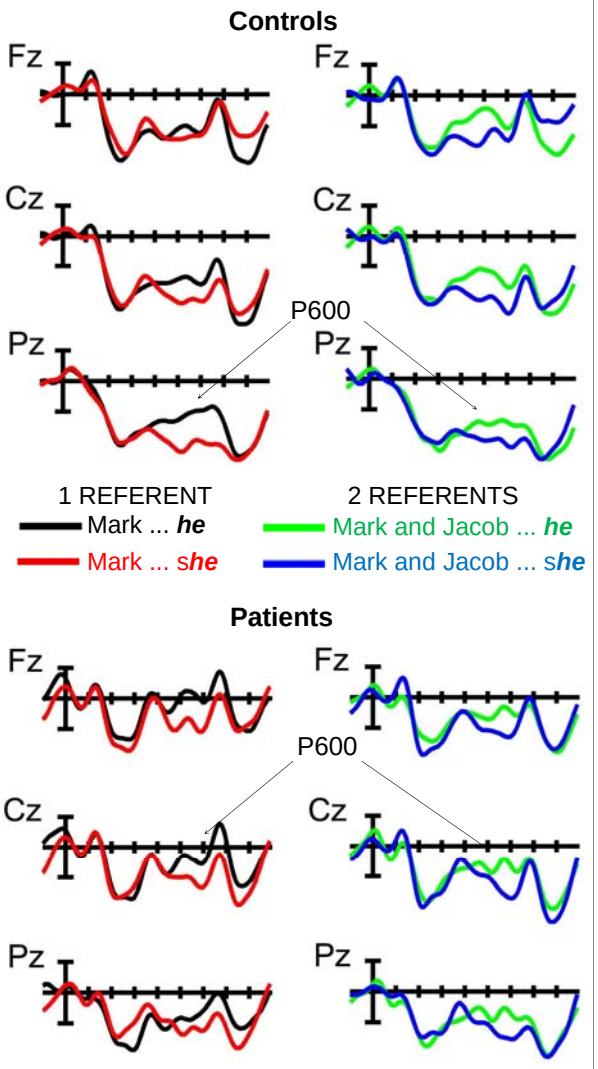
Nref: In healthy adults, a larger Nref is evoked to ambiguous anaphors relative to unambiguous anaphors (e.g., van Berkum et al.); presumed to index working memory demands associated with maintaining referent information prospectively.. *We predicted an attenuated Nref in response to ambiguous pronouns (1 Referent Match vs 2 Referent/Match) in patients..*

P600 component: P600 amplitude is larger to pronouns that mismatch antecedent gender relative to matching pronouns in healthy adults (e.g., Osterhout et al.). It is linked to semantic-syntactic integration costs (Kuperberg et al.), which may be impaired in patients. *We predicted an attenuated P600 effect (Mismatch vs Match) in patients.*

Results: Ambiguous pronouns



Results: Gender-violated pronouns



Discussion

•Ambiguous pronouns led to the evocation of an Nref in healthy controls, but not in patients with schizophrenia. Rather, in patients a larger P600 amplitude was evoked, suggesting a relationship between working memory impairment and referential coherence failures.

•Both patients and controls showed a larger amplitude P600 relative to gender-violated pronouns relative to matching pronouns.

Acknowledgements

Research was supported by a NARSAD Young Investigator Award (TD) and NIMH (R01 MH071635), NARSAD (with the Sidney Baer Trust) and a Claflin Distinguished Scholars Award.(GRK).