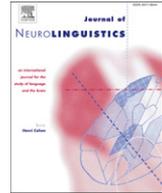




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## Social cognition of indirect speech: Evidence from Parkinson's disease

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### ABSTRACT

We examined potential neurocognitive mechanisms of indirect speech in support of face management in 28 patients with Parkinson's disease (PD) and 32 elderly controls with chronic disease. In Experiment 1, we demonstrated automatic activation of indirect meanings of particularized implicatures in controls but not in PD patients. Failure to automatically engage comprehension of indirect meanings of indirect speech acts in PD patients was correlated with a measure of prefrontal dysfunction. In Experiment 2, we showed that while PD patients and controls offered similar interpretations of indirect speech acts, PD participants were overly confident in their interpretations and unaware of errors of interpretation. Efficient reputational adjustment mechanisms apparently require intact striatal–prefrontal networks.

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## 1. Introduction

Innuendo, insinuation, politeness and other forms of indirect speech appear to be universally practiced across cultures (Brown & Levinson, 1987). In their theory of the functions of indirect speech, Pinker, Nowak, and Lee (2008) emphasized that indirect speech allows for 'plausible deniability' if an uncooperative interlocutor might react adversarially to an indirect suggestion. With plausible deniability a message can be retracted (I didn't mean it that way!) without losing face. Pinker et al. also pointed out that plausible deniability might also be selected in cases where speaker and hearer are

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mis-matched in terms of social status or relationship. Pinker et al. also argued that while direct speech can create common knowledge among groups of people, indirect speech can create 'shared individual knowledge' between individuals who would like to maintain, via plausible deniability, a relationship despite a rejected indirect request or suggestion. In short, indirect speech may constitute a mechanism that allows for 'plausible deniability' and the protection of one's own and another's reputation as a reliable cooperator. Indirect speech in this case would function as a face-saving device in service to reputation, which in turn, is crucial for development of cooperative social interactions.

One form of indirect speech that is known to be used in face-saving maneuvers is 'particularized implicature' (Grice, 1975). Particularized implicatures are indirect meanings that are dependent on the context for their recognition (in contrast to generalized implicatures – speech acts, for example – that can be recognized independent of a discourse context). In this research we examined the particularized implicatures conveyed with indirect replies, that is, replies that convey an indirect meaning by subtly violating the relevance maxim.

Previous research has demonstrated that non-impaired participants generate particularized implicatures for these types of replies, and that they do so based on their reasoning about the operation of face management in the situation. Specifically, they interpret relevance violations as conveying face-threatening (i.e., negative) information (Holtgraves, 1998).

In this project, we assessed the extent to which patients with impairment in striatal–prefrontal neurocognitive networks, patients with Parkinson's disease (PD), were sensitive to face-saving linguistic processing routines. We chose to study these issues in patients with PD as an independent literature indicated that brain systems activated during social interaction (e.g., games of social cooperation) include the striatal–prefrontal dopaminergic networks that are known to be impaired in patients with PD. Specifically a number of recent reports have identified an association between the decision to cooperate with others and striatal–prefrontal dopaminergic activity (Blakemore, Winston, & Frith, 2004; Fehr & Gächter, 2002; Fehr & Rockenbach, 2004; de Quervain et al., 2004). Thus, this patient population appears to be ideal for the study of the potential brain correlates of reputational and cooperative dynamics.

In Experiment 1, we tested the hypothesis that automatic activation of face-saving meanings occurs in non-impaired individuals in a face-threatening situation (consistent with past research) but not in patients with PD and striatal–prefrontal dysfunction.

## 2. Experiment 1

In this experiment, we used a sentence verification task similar to that used in Holtgraves (1999). Participants read scenarios and subsequent utterances and then performed a sentence verification task (decide whether a string of words is a sentence). On some trials the presented word string represented an indirect interpretation of the immediately prior utterance. For the non-impaired participants we expected decisions to be faster for these target strings when they followed an indirect reply (because the indirect meaning had been activated) than when they followed a reply that should be interpreted directly. In contrast, because of the general pragmatic deficits associated with PD (see Holtgraves, McNamara, Cappert, & Durso, *in press*), we did not expect people with PD to show this effect.

### 2.1. Method

#### 2.1.1. Participants

PD participants were 28 (2 females; 2 non-whites) individuals diagnosed with idiopathic Parkinson's disease ( $M$  age = 66.5). The majority (>90%) were either level two or three on the Hoehn and Yahr scale ( $M = 2.74$ ). Most (93%) of the participants had completed high school with half (50%) having completed some college.

More advanced Stage III, IV, or V patients were excluded during the recruitment process. The patient's diagnosis was agreed upon by a specialist in PD (Dr. Durso) and at least one other neurologist. All patients were required to have had at least one CT- or MRI scan during their illness to rule out history of brain injury. Patients with Parkinsonism from known causes (e.g., encephalitis, trauma,

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