Don't Rush the Navigator: Disambiguating Strategies Require Cognitive Flexibility

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Background

Difficulties recognizing contextual ambiguity often arise because individuals are burdened with contextual and environmental complexity (e.g., foreground and background information; Broadbent, 1958; Chun, 2000; Liberman & Whalen, 2003; and Wolpert, Doya & Kawato, 2003).

Kraljic and Brennan (2005) found that speakers in these contexts are often not aware of the ambiguity at all.

Cognitive load can be reduced when a speaker's productions are egocentric, though they may be ambiguous for a listener (Rayner, Carlson, & Fraizer, 1983).

Horton and Keysar (1996) suggest that revision through monitoring and adjustment aids interlocutors in avoiding miscommunication.

Goal: to determine the effects of cognitive load on disambiguation behavior in the presence of communication breakdown.

Method

Participants
17 undergraduate students with no diagnosed hearing, visual or speech impairments (12 females, mean age: 22.8 years).

Stimuli
Auditory: 3 types of pre-recorded statements.
1. Container + Object: "Put the paperclip in the cauldron on the stop sign."
2. Container: "Put the flowerpot on the circle."
3. Object: Put the hammer on the rectangle."

Picture Images:
Container + Object, Object, Container, & Geometric Shapes

Video:
Correct: Correct object was moved.
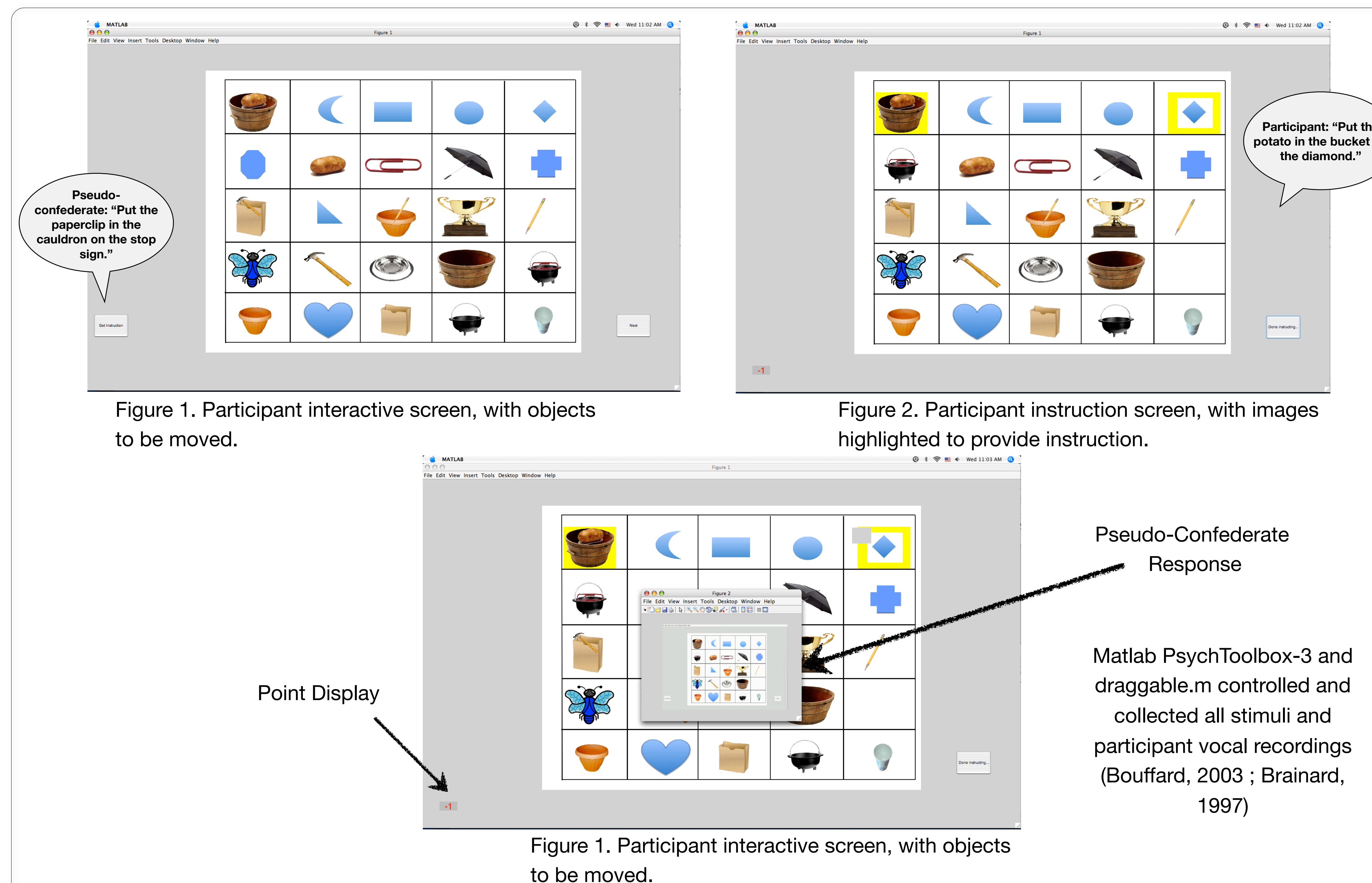Incorrect: Incorrect objects were moved.

Point Display:
Imposed time constraint (7sec). Production time < 7sec = + point, > 7 sec = - point
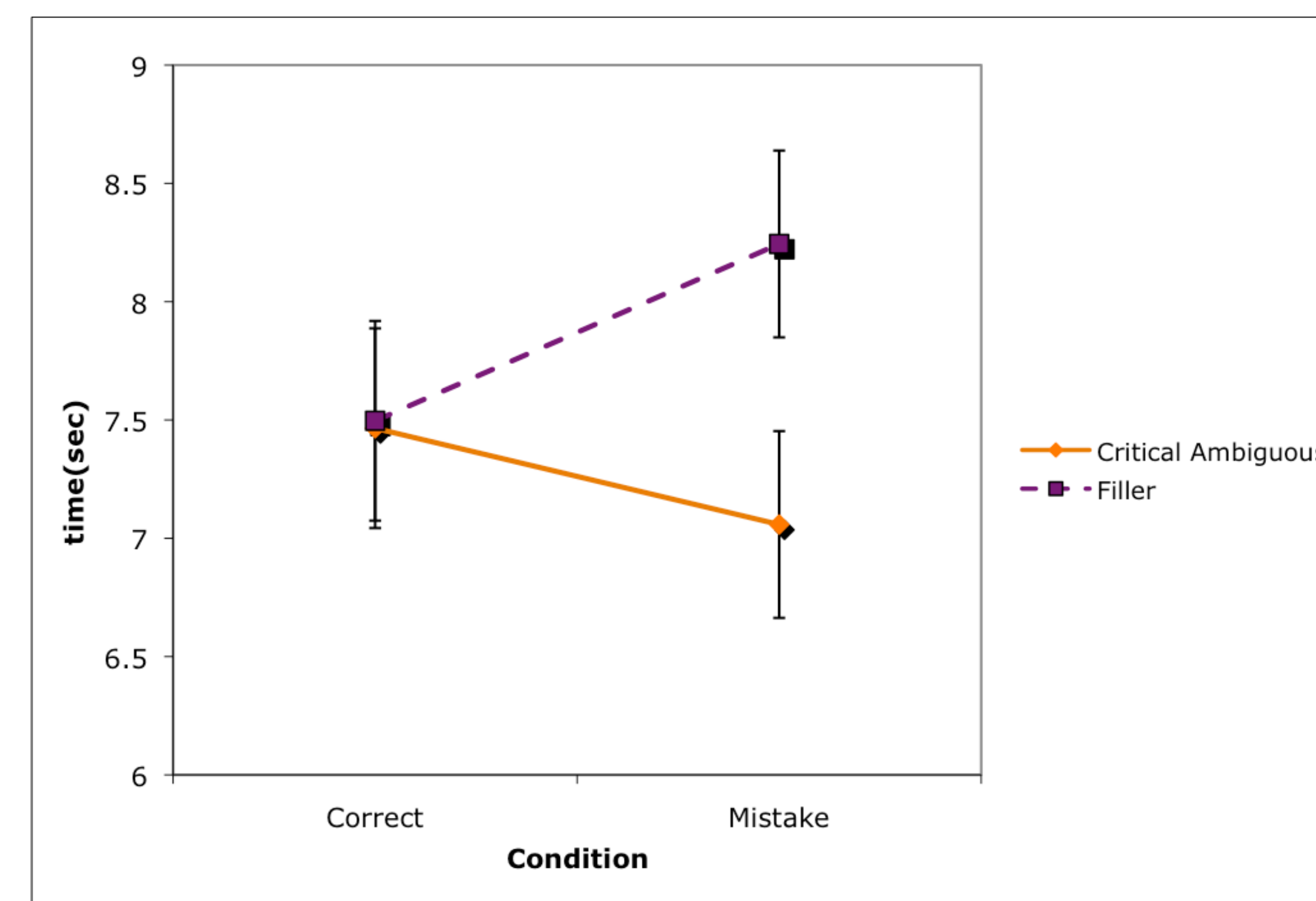
Procedure

4 Conditions:
2 (Speeded or Unhurried) x 2 (Mistake or Correct)

Figure 1. Participant interactive screen, with objects to be moved.

Figure 2. Participant instruction screen, with images highlighted to provide instruction.

Pseudo-Confederate Response

Matlab PsychToolbox-3 and draggable.m controlled and collected all stimuli and participant vocal recordings (Bouffard, 2003 ; Brainard, 1997)

Point Display

Figure 1. Participant interactive screen, with objects to be moved.

Results

Mixed fixed/random effects model: Pseudo-Confederate Response x Statement Type interaction: $F(1, 685)=5.672, p < .05$

Figure 4. Means and standard errors for production time (at voice onset, for Unhurried statements) in seconds for the Condition x Statement type Interaction

Mixed fixed repeated measures model: Task Speed x Pseudo-Confederate Response interaction: $F(1,23) = 10.925, p < .005$

Figure 5. Means and standard errors for proportion of disambiguation for the Task Speed x Pseudo-Confederate Response Interaction
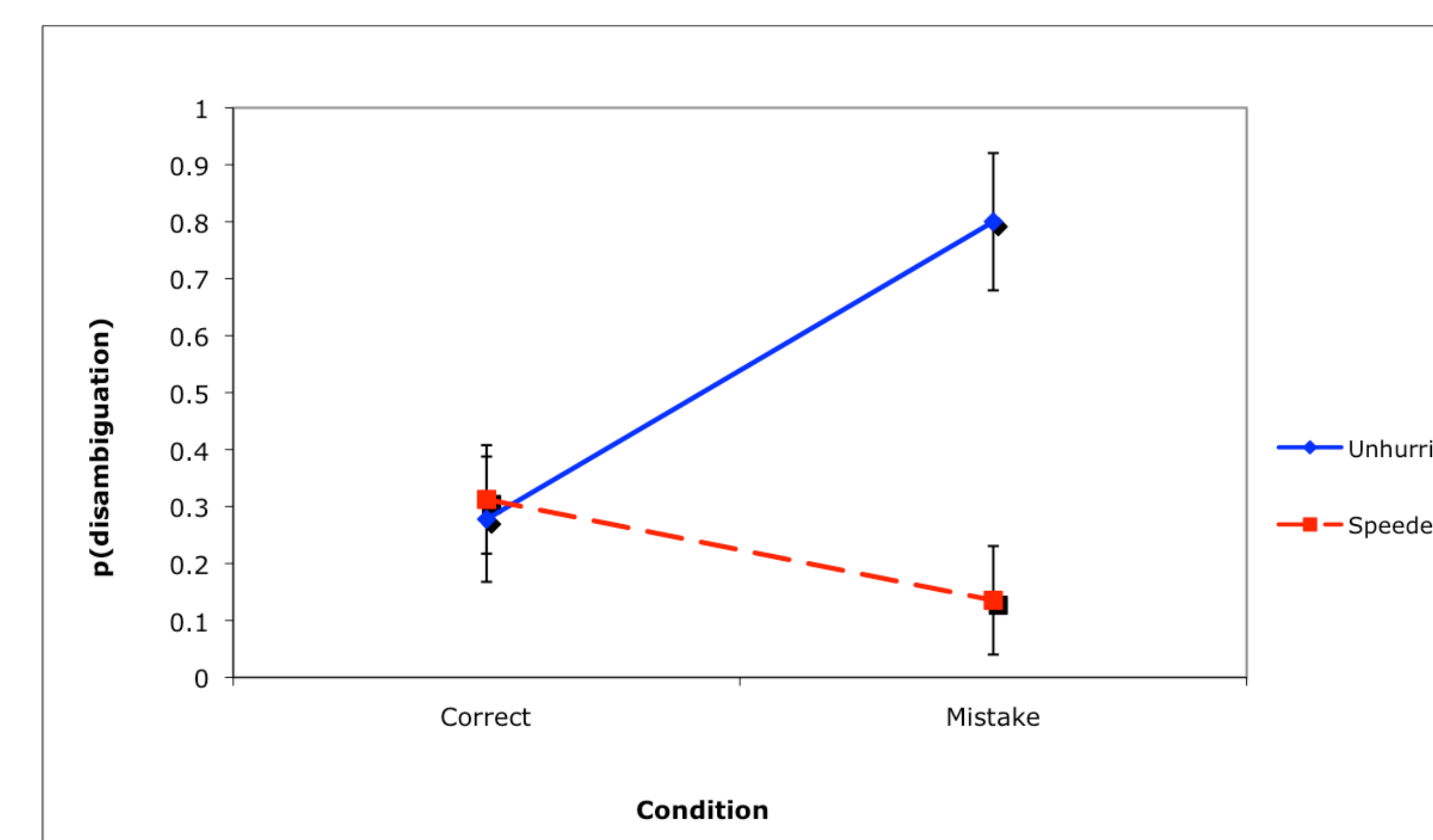
Discussion

When interlocutors are constrained cognitively, they may revert to an "ease of production" strategy because it prevents the cognitive system from becoming overtaxed (Horton & Gerrig, 2005; Roßnagel, 2000).

Evidence from the Unhurried Condition shows, at the time of and during production, a disambiguation strategy may be found or turned "on", thus decreasing production time.

These results provide a theoretical reconciliation between a Monitoring & Adjustment model (Horton & Keysar, 1996) and a "one-bit" model (Brennan, Galati & Kulen, 2010; Galati & Brennan, 2010) of language production.

If interlocutors have the time, they may find the most efficient disambiguating strategy, through trial and error (Monitoring & Adjustment). Once the best strategy is formulated, it should persist.

Current work in our lab supports this notion, via a split speeded/unspeeded task.

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