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Title: *Make it snappy:* Predictability and speech rate effects on child response latency and social desirability judgements.

Background

The amount of time it takes a conversation partner to respond is pragmatically meaningful. People infer that long response latencies are indicative of a reduced willingness to cooperate (1). Adults report lower rapport with conversation partners when response latencies are slower (2). Furthermore, among children, faster turn-taking is associated with higher ratings of peer social engagement (3), and children indicate a reduced desire to interact with speakers who exhibit slower conversational responding (4).

However, generating fast responses involves high cognitive demand, requiring listeners to concurrently plan their own upcoming turn (5), and predict the content (*what* the utterance is about) and timing (*when* the utterance will end) of their partner's current turn (6).

It is therefore unsurprising that children's response latencies remain much longer than adults' into middle childhood (~1000-ms) (7), given that working memory capacity continues to develop throughout this time (8). Nevertheless, previous research has found that children as young as 3-5-years-old can make content-based predictions which facilitate early response planning (9). This therefore suggests that the cognitively demanding component of this process may be the need to make predictions about timing, rather than content.

Indeed, response timing is far from straightforward, even for adults. On the one hand, some findings indicate that adults produce faster responses when hearing faster speech rates (10,11). This has been described as 'entrainment'. In contrast, Roberts, Torreira & Levinson (12) found that faster speech (in a telephone corpus) was linked to longer response latencies, which could be the result of a higher cognitive demand of processing faster speech.

Given their reduced capacity for cognitive load, it is possible that children might take longer to respond to faster than to slower speech rates. Conversely, given previous findings that children disprefer slower responders (4), they may entrain to the speech rate of their conversation partner, showing faster responses to faster speech rates.

We carried out two studies with children aged 7-8-years (N=36 per study) to investigate the following questions:

- RQ1: How do predictability and speech rate influence children's response latencies?
- RQ2: How does speech rate influence children's social impressions of their conversation partner?

Method

Children were presented with a computer game which involved verbally answering yes/no questions from two virtual characters ('Fast' vs. 'Slow' speaker). We manipulated the *content predictability* of the questions (Predictable vs. Unpredictable) and the *speech rate* of the pre-recorded audio (Fast vs. Slow). In Study 1, the *Fast* speech rate was created by reducing the length of the original audio files by 10%, whilst the *Slow* speech rate represented a 50% increase. In contrast, in Study 2, both conditions evenly differed from baseline by 20%.

To investigate RQ2, at the end of the game, participants provided social judgements about the *Fast* vs. *Slow* speakers on a scale of 0-100. In Study 1, participants rated each character's friendliness, intelligence, and the extent to which they would enjoy chatting to them and would want to be friends with them. In Study 2, two additional statements were added, namely whether the speakers seemed fun / would be good at having a conversation. In both studies, participants were also asked to choose which character they would prefer to play the game with if they were going to repeat the task.

Results

RQ1: Response latencies

Linear mixed effects models examined the effect of *speech rate* and *content predictability* on participants' response latencies. In Study 1, *Slow* questions (M=798.65-ms) elicited earlier responses than *Fast* questions (M=1021.85-ms) (b= 221.83, p<.001). Participants also responded quicker to *Predictable* questions (M=836.56-ms) than *Unpredictable* questions (M=981.95-ms) (b= -101.96, p =.056). The same pattern of results was observed in Study 2, with participants responding earlier to *Slow* (M=712.54-ms) than *Fast* (M=879.28-ms) questions (b= 164.93, p<.001), and *Predictable* (M=707.62-ms) than *Unpredictable* questions (M=886.76ms) (b= -138.20, p < .05). There were no interaction effects (see Figure 1).

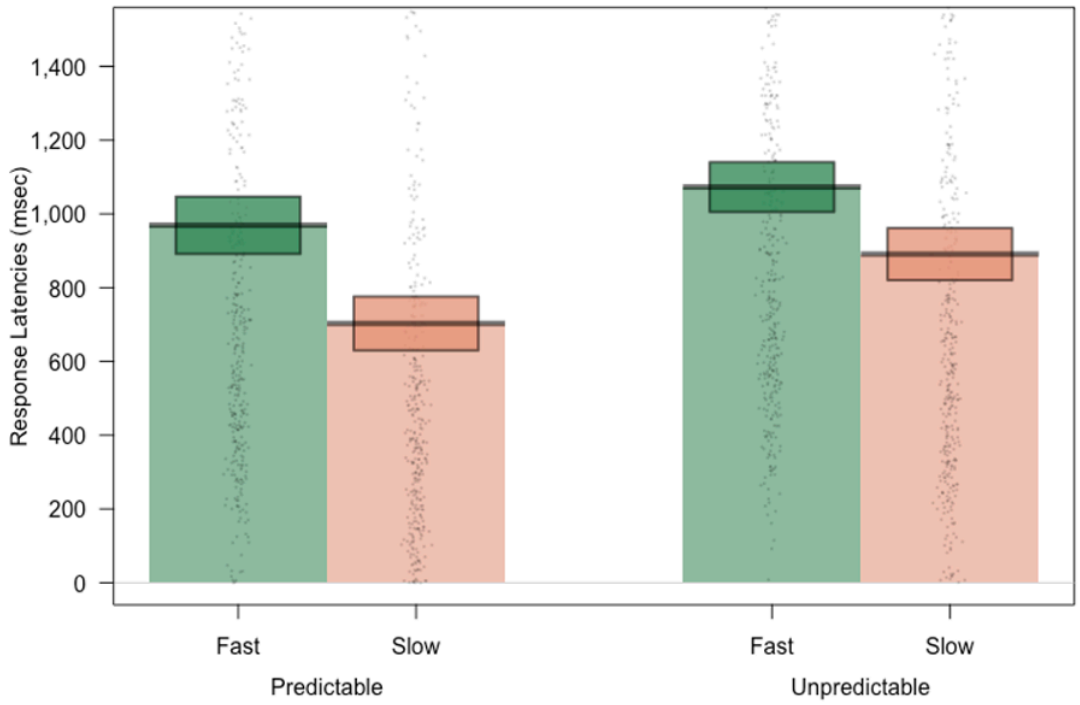
RQ2: Social judgements

Paired t-tests examined how *speech rate* influenced participants' social judgements. In both studies participants rated the *Fast* speaker as significantly smarter than the *Slow* speaker (p <.05, d=.48). In Study 1, they also indicated that they would *enjoy chatting* with the *Fast* speaker (M=78.58) more than the *Slow* speaker (M=56.78) (p <.01, d=.67). Across both studies, no other comparisons were significant.

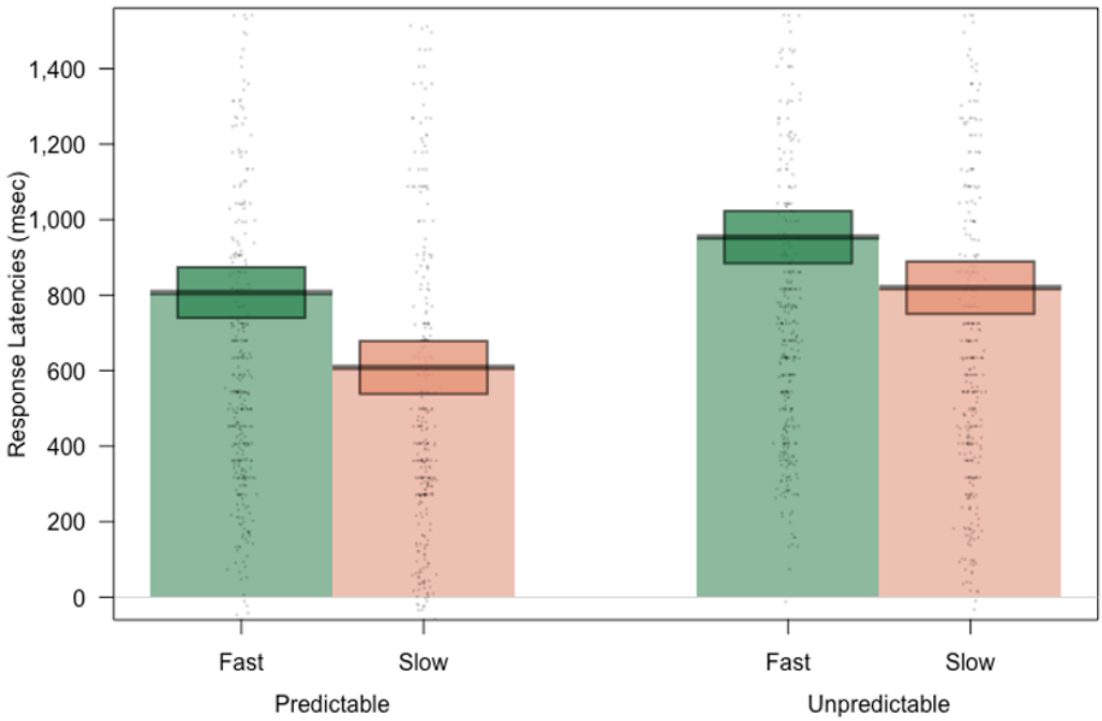
In Study 1, when participants were asked who they would like to play alongside in another round of the game, they were significantly more likely to select the *Fast* speaker than the *Slow* speaker (p <.01). However, in Study 2, although the means were in this direction (*Fast* speaker= 56%), this was not significant (p =.505).

Figure 1. *Response Latencies by Predictability x Speech Rate Condition*

Study 1:



Study 2:



Conclusions

Across both studies, we found that children responded earlier to *Predictable* questions than *Unpredictable* questions. Our novel finding is, however, that in both studies, children responded earlier to *Slow* questions than *Fast* questions. This is not in line with entrainment. However, it does align with certain findings from the adult literature (12,13), where it has been interpreted as an effect of cognitive load (5). Future research is needed to investigate whether cognitive load limits are the key, or whether slower speech rates may have facilitated more time for comprehension and response planning *during* the utterance.

We also found evidence of social preferences favoring fast over slow speakers. In both studies, children perceived the *Slow* speaker to be significantly less clever than the *Fast* speaker. In Study 1, participants also indicated that they would enjoy interacting more with the *Fast* speaker than the *Slow* speaker, and they were significantly more likely to select the *Fast* speaker to play with again.

That said, in Study 2, when the speech conditions differed equally from 'baseline', the *Slow* speaker was rated less unfavourably. Overall, whilst *Slow* speech rates were consistently associated with lower ratings of perceived intelligence, the extent to which children were willing to engage with the *Slow* speaker appeared to crucially depend on *how slowly* they spoke. Given the importance of speech latency in relation to social rapport (2,3), future research on this relationship is sorely needed.

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