Disfluency in Spontaneous Speech: Social Attribution and Behavioral Consequences

Jonathan Him Nok Lee (jonhnlee@sas.upenn.edu) & Anna Papafragou
Department of Linguistics, University of Pennsylvania

Abstract

Speech disfluency such as filled pauses (*um* and *uh*) is commonly associated with negative speaker evaluation, yet findings from previous studies relied on scripted, lab-recorded speech. Here, in two experiments, we investigate how filled pauses influence social judgment and decision making using unscripted, multi-sentence discourse extracted from spontaneous speech corpora. We find that filled pauses led to lower perceived readiness and certainty, regardless of speaker expertise (Experiment 1). However, disfluent experts were judged as more careful than disfluent novices, indicating a context-dependent social benefit of disfluency. In a follow-up decision task (Experiment 2), listeners were less likely to choose to ask disfluent speakers again (as opposed to someone else), an effect mediated by perceived readiness but not certainty. By integrating spontaneous speech and speaker profiles, this study demonstrates the importance of socially situated accounts of language processing and the dynamic nature of social evaluation in communication.

Keywords: disfluency; filled pause; social attribution; social cognition; judgment and decision making

Introduction

Disfluency in Speech Processing

Speech disfluencies have been broadly described as interruptions in the normal, fluent speech stream (Diachek et al., 2024; Diachek & Brown-Schmidt, 2023, 2024). Disfluencies include a variety of speech hesitation phenomena such as filled pauses (also called *fillers*, e.g., English *ums* and *uhs*), silent pauses (also called *unfilled pauses*, e.g., "It's a… candle), repetitions (e.g., "the, the candle"), false starts (also called *repairs*, e.g., "It's a… What's a candle?"), etc. Disfluencies occur naturally and ubiquitously in everyday interactions: large-scale corpora of spontaneous speech show that even speakers normally perceived as fluent produce so-called "disfluencies" at a rate of ~8% of word count (Zhang, 2020; see also Bortfeld et al., 2001; Branigan et al., 1999).

A prominent view treats disfluencies as involuntary outcomes of speaking challenges (Levelt, 1983, 1989; Mahl, 1987; O'Donnell & Todd, 1991). For instance, previous psycholinguistic studies have argued that disfluencies mainly arise from cognitive difficulties, including lexical retrieval difficulties, utterance planning difficulties, speaker distractions, and other aspects of production (Arnold et al., 2003, 2007; Beattie & Butterworth, 1979; Bóna & Bakti, 2020; Clark & Fox Tree, 2002; Clark & Wasow, 1998; Fraundorf & Watson, 2014; Heller et al., 2015; Kosmala & Morgenstern, 2019; Lickley, 2015; Loy et al., 2018; Schachter et al., 1991; Schnadt, 2009; Schnadt & Corley, 2006; Tottie, 2011). Disfluencies can also arise from limited speaker knowledge or uncertainty (Brennan & Schober, 2001; Brennan & Williams, 1995; Smith & Clark, 1993). Furthermore, some studies have argued that disfluencies arise from speaker dishonesty (e.g., lying and deception) because inventing new situations exhausts the cognitive abilities required for speaking fluently (Brennan & Schober, 2001; Brennan & Williams, 1995; King et al., 2018; Loy et al., 2016, 2017, 2018).

Other studies have pointed out that disfluencies can also function as purposeful signals, akin to nonverbal communication tools. According to this view, speakers may strategically plan disfluencies, as they would for any word, using them to signal varying degrees of delay in speech or to manage conversational turn-taking with interlocutors (Allwood et al., 1990; Clark & Fox Tree, 2002; Finlayson & Corley, 2012; James, 1972; Kirjavainen et al., 2022; Kısa et al., 2024; Lake et al., 2011; Smith & Clark, 1993; Tian et al., 2017). For example, disfluency can be used to strategize turn-taking during political interviews (Silber-Varod et al., 2023) or signal a change in topic (Lomotey, 2021; Mahendra & Bram, 2019; Swerts, 1998; Utami, 2018). In general, disfluency indicates that the speaker needs more time to plan what to say or how to say it.

Social Evaluation of Disfluency

Depending on their precise source, disfluencies have been extensively argued to carry social costs. To the extent that listeners attribute them to cognitive difficulties, disfluencies can lead to negative evaluations of the speaker's competence (Charoenruk & Olson, 2018; Fox Tree, 2007; Hosman & Wright, 1987; Kohtz & Niebuhr, 2017; Niebuhr et al., 2016; Niebuhr & Fischer, 2019; Vrij & Winkel, 1991; Zuckerman et al., 1981). For example, in the study of Charoenruk and Olson (2018), participants were asked to rate the attributes of different telephone survey interviewers by listening to their audio recordings where the same sets of questions were read aloud with various amounts of filled pauses. Disfluent speakers were judged as less confident, less easy to understand, less reliable, and less trustworthy. Other studies have argued that disfluency affects the confidence that listeners have in the speaker's knowledge and is even an indicator of deception (Brennan & Schober, 2001; Brennan & Williams, 1995; Collard et al., 2008; Fox Tree, 2007; King et al., 2018; Loy et al., 2016, 2017, 2018).

Moreover, studies of production data have linked disfluency with lack of readiness, since preparation for public speaking (e.g., via rehearsal, training, etc.) can help speakers produce fewer disfluencies (Choi et al., 2015; Grenne, 1984; Lickley, 2015; Yaruss et al., 1999). Additionally, disfluencies are commonly linked to speaker uncertainty and/or lack of confidence (Brennan & Schober, 2001; Brennan & Williams, 1995; Kirkland et al., 2023; Pon-Barry & Shieber, 2011; Smith & Clark, 1993). Unsurprisingly, many sources of professional advice recommend avoiding disfluency, asserting, for instance, that it distracts listeners during classroom instruction (Saunders & Wong, 2020) and undermines the persuasiveness of public speaking (Cohen, 2012).

Despite the prevalence of negative evaluations in the literature, some studies have raised the possibility that disfluency can have positive social effects. Attorneys with disfluencies in their opening statements were judged to be more friendly than those without (Barge et al., 1989). In a different context, Postma et al. (1990) proposed that disfluency reflects a speaker's effort to avoid content errors, with increased cognitive effort ensuring content accuracy. In such cases, listeners may perceive disfluent speakers as being careful and thoughtful (Fridland, 2023). In clinical contexts, experienced physicians were found to produce more disfluencies than trainees yet demonstrate higher diagnostic accuracy. It was argued that disfluencies signal the cognitive load involved in complex reasoning, reflecting both uncertainty and thoughtfulness of the experienced physicians (Womack et al., 2012). These findings suggest that the evaluation of disfluency is not purely a bottom-up perception process but also involves top-down information about the speaker (see also Orena & White, 2015; Toftness et al., 2018).

So far, the literature has presented mixed judgments on disfluency: predominantly negative, but with some positive interpretations. There are, however, certain limitations to our current knowledge. First, previous studies on the social evaluation of disfluency often included single, lab-recorded sentences read aloud, in which disfluencies were made distinctly salient (Charoenruk & Olson, 2018; Schleef, 2019, 2023, a.o.). Scripted speech is acoustically and perceptually different from spontaneous speech, even if both include the same words produced by the same speakers (Cucchiarini et al., 2002; Gao, 2025; Howell & Kadi-Hanifi, 1991; Laan, 1992; Nakamura et al., 2008). Even semi-naturalistic speech elicited in deception studies was argued to exaggerate the use of (dis)fluencies (De keersmaecker et al., 2024; De Luca et al., 2024; Pistono et al., 2024). Moreover, it is difficult for speakers to maintain phonetic consistency across experimental conditions in the lab (in terms of, among others, voice quality, pitch, rhythm, volume, intonation, and emotion). Evidence has shown that listeners are highly sensitive to subtle phonetic differences – including those that speakers cannot consciously control – which can in turn influence social inferences about the speakers (Campbell-Kibler, 2010; Eckert, 2008; Labov, 1963; Lee, 2021; Lee, Chui, et al., 2022; Lee et al., 2023, 2024; Lee, Tao, et al., 2022; Podesva, 2011). Consequently, when participants evaluate lab-recorded sentences, their judgments may be influenced by multiple phonetic cues, not solely the presence or absence of disfluency.

Second, in prior experiments, disfluent speakers were presented under biased profiles, such as defendants (Hosman & Wright, 1987), suspects in criminal cases (Vrij & Winkel, 1991), or people who tell lies half of the time (King et al., 2018; Loy et al., 2016, 2017, 2018). In the literature of social meaning and pragmatics, the social meanings of linguistic forms are viewed as fluid and perspective-dependent: the same linguistic forms can be interpreted and evaluated differently based on different contextual cues, including speaker profiles (for a review, see Beltrama, 2020). Biased profiles may then predispose listeners to interpret disfluencies negatively, associating them with deception and/or negative personality traits. We conclude that the study of disfluency could benefit from integrating spontaneous speech and richer empirical methods for social evaluation.

Current Study

In the current study, we ask whether the findings from previous social evaluation studies of disfluency extend to the unscripted forms of language use, where disfluency naturally occurs (see Diachek & Brown-Schmidt, 2024). In two experiments, we examine the effects of disfluency on social judgement and decision making. We focus on filled pauses as they are the most studied and often negatively evaluated type of disfluency (Arnold et al., 2003, 2007; Fox Tree, 2007; King et al., 2018; Kirkland et al., 2023; Loy et al., 2017, 2018). We introduce a new experimental paradigm that uses multi-sentence discourse extracted from spontaneous speech as stimuli, instead of single, lab-recorded sentences typical of previous studies. We also explicitly manipulate speaker expertise, a factor known to have strong effects on trait judgments (see Pornpitakpan, 2004 for a review). Our evaluation measures go well beyond what has been included in past studies and seeks to link speech phenomena to speaker's abilities or preferences.

Experiment 1

We tested whether three speaker attributes, readiness, carefulness, and certainty in the conversation, were judged differently in the presence or absence of filled pauses, and in ways that might interact with speaker knowledge. Even though disfluency has been hypothesized to indicate both readiness (Choi et al., 2015; Grenne, 1984; Lickley, 2015; Yaruss et al., 1999) and carefulness (Fridland, 2023; Postma et al., 1990; Womack et al., 2012), there is currently no evidence that listeners actually perceive speakers producing such acoustic features as more ready or careful. Other experimental studies show that disfluency can be interpreted as indicating uncertainty (Brennan & Schober, 2001; Brennan & Williams, 1995; Pon-Barry & Shieber, 2011; Smith & Clark, 1993), but these studies did not include manipulation of speaker expertise.

Methods

Participants A total of 360 native English speakers (M_{age} = 19.72, SD_{age} = 1.53; 204 females, 151 males, 5 prefer not to say) were recruited. Of these, 335 were recruited on SONA at the University of Pennsylvania, and 25 were US undergraduates recruited on Prolific. SONA participants obtained course credits for participation in the experiments, and Prolific participants were compensated $2.50 (hourly rate: $9.00).

Materials We used naturalistic speech from corpora and online interviews in the Santa Barbara Corpus of Spoken American English (Du Bois et al., 2000, 2003; Du Bois & Englebretson, 2004, 2005), the Switchboard Telephone Speech Corpus (Graff et al., 2001), and the Walking Around Corpus (Brennan et al., 2015). We selected 10 unscripted, spontaneous multi-sentence items as *filled pause* (*FP*) test stimuli (duration: *M* = 19.78s, *SD* = 1.68s; word count: *M* = 50.40, *SD* = 13.80). Half of these stimuli were produced by female speakers, half by male speakers; half of them were formal speech (e.g., legal consultation, dietician giving advice to their client), half were casual speech (e.g., conversation between friends). Each *FP* test stimulus contained only 4 filled pauses (overall rate = 7.94 filled pauses per 100 words) with a mean duration of .38s (*SD* = .11s) but no other types of disfluencies, in accordance with the naturalistic rate of filled pauses (Zhang, 2020). This duration aligned closely with those reported for filled pauses reported in spontaneous speech. For example, a large-scale corpus study by Shriberg (2001) reported a modal duration of .30s for filled pauses in native English. In a study on L2 English, Okazawa (2014) found the mean duration of filled pauses by L2 speakers to be .43s. Similar mean durations have been reported for other languages: .30-.48s in native Danish (Navarretta, 2015) and .41s in native Hungarian (Gósy, 2023). While we were unable to access the original audio materials used in most prior social studies of filled pauses, and few of these studies reported detailed stimulus characteristics, we can benchmark our materials against the subset that did. For example, Fraundorf and Watson (2011), a memory study of filled pause, reported a rate of 1.86 per 100 words with a mean duration of 0.20s in their lab-recorded audio stimuli. In our test set, filled pauses occurred more frequently (7.94 per 100 words) and were substantially longer on average (0.38s), suggesting that they were at least as perceptible, if not more so, than those in Fraundorf and Watson.

Next, we digitally removed all filled pauses in the stimuli without replacing them with silence to create the set of *No-FP* test stimuli using the phonetics software *Praat* (Boersma & Weenink, 2019). All edits were conducted and perceptually validated by the same trained phonetician to ensure that the stimuli contained no audible clicks, discontinuities, or unnatural pitch movements. Also, all audio stimuli were normed by separate groups of native speakers (*n* = 240).

Procedure The main study was implemented via Qualtrics (Qualtrics, 2024) and administered online. For the test trials, we crossed Filled Pause (*FP* vs. *No-FP*, manipulated within-subjects) with Speaker Expertise (Expert vs. Novice, manipulated between-subjects). In each trial, the participants read a context paragraph of 2-3 sentences, including information about Speaker Expertise in the first sentence. Table 1 shows an example of a context paragraph: in the Expert condition, the speaker was a professor; in the Novice condition, the speaker was a college student.

Then, participants listened to the audio recording, with or without filled pauses. Table 2 shows an example of the transcripts of *FP* and *No-FP* stimuli.

Table 1: Sample text for different speaker expertise.

Speaker expertise	Context paragraph
Expert	Jim is a professor of electrochemistry. He is expressing his view on the future of superconductors.
Novice	Jim is a college student. He is expressing his view on the future of superconductors.

Table 2: Transcript of sample stimulus (*FP* vs. *No-FP*).

Filled pause	Transcript of the audio stimuli
FP	Well, with the superconductors, **uh**, that's gonna make it, you know, so economical. **Uh**, we should have an enormous supply of it. They'll be able to, **uh**, grow circuitry that is so complicated. They'll be able to get these fantastic, **uh**, circuits, like say for a whole television set just on one chip.
No-FP	Well, with the superconductors, that's gonna make it, you know, so economical. We should have an enormous supply of it. They'll be able to grow circuitry that is so complicated. They'll be able to get these fantastic circuits, like say for a whole television set just on one chip.

Next, participants were asked to rate their impression of the speaker along a 1-7 Likert scale using a novel social evaluation measure. The measure covered three in-the-conversation speaker attributes: readiness, carefulness, and certainty, with three pairs of positive/negative adjectives drawn from the literature to characterize distinctions within each attribute. Readiness was measured by *disorganized in this conversation–organized in this conversation* (Yaruss et al., 1999), *unprepared in this conversation–prepared in this* *conversation* (Choi et al., 2015), and *unready in this conversation–ready in this conversation* (Lickley, 2015). Carefulness was measured by *thoughtless in this conversation–thoughtful in this conversation* (Womack et al., 2012), *careless in this conversation–careful in this conversation* (Fridland, 2023; Postma et al., 1990; Womack et al., 2012), and *incautious in this conversation–cautious in this conversation* (Lickley & Bard, 1998). Certainty was measured by *uncertain in this conversation–certain in this conversation* (Brennan & Schober, 2001; Brennan & Williams, 1995), *unsure in this conversation–sure in this conversation* (Brennan & Williams, 1995), and *not confident in this conversation–confident in this conversation* (Kirkland et al., 2023).

Each participant saw 20 trials (10 test trials, with 5 *FP* and 5 *No-FP*, and 10 filler trials) in randomized order and was only asked to rate one of the three attributes for all trials to avoid possible connections between attributes. Accordingly, each attribute was rated by 120 participants. The order of items per attribute was randomized for each participant.

Results

Cronbach's α was computed for each group of participants (i.e., for each attribute). Results showed that our data had good internal consistency (readiness: α = .83; carefulness: α = .89; certainty: α = .80). Separate Structural Equation Modeling (SEM) was conducted for each attribute using the *lavaan* (Rosseel, 2012) package in R (R Core Team, 2020). Post hoc analyses of latent interactions were performed using the *semTools* package (Schoemann & Jorgensen, 2021) with the guidelines proposed by Marsh et al. (2004).

The latent factor structures were examined using confirmatory factor analysis. All models had good model fit (Browne & Cudeck, 1992; Byrne, 1998; Hu & Bentler, 1999) – Readiness: χ^2 (6) = 1.87, *p* = .93, CFI = 1.00, TLI = 1.00, RMSEA < .001, SRMR = 0.002; Carefulness: χ^2 (6) = 3.00, *p* = .81, CFI = 1.00, TLI = 1.00, RMSEA < .001, SRMR = 0.01; Certainty: χ^2 (6) = 6.74, *p* = .35, CFI = 1.00, TLI = 1.00, RMSEA = .01, SRMR = 0.01.

Figure 1 shows the mean ratings for the three attributes. As shown in Figure 1(A), there was a significant effect of Filled Pause: disfluent speakers were judged to have significantly lower level of readiness than fluent speakers, *B* = -.24, SE = .01, *z* = -2.45, *p* = .01. However, there were no significant effects of Speaker Expertise (*B* = -.08, SE = .12, *z* = -.70, *p* = .49) or interaction effects between the two factors (*B* = .09, SE = .14, *z* = 66, *p* = .51).

Regarding carefulness in Figure 1(B), there were no significant effects of Filled Pause (*B* = -.17, SE = .11, *z* = -1.55, *p* = .12) or Speaker Expertise (*B* = -.04, SE = .11, *z* = -.33, *p* = .75). However, there were significant interaction effects between the two factors, *B* = .29, SE = .14, *z* = 2.02, *p* = .04. Post hoc analyses showed that disfluent experts were judged to be more careful than disfluent novices, *B* = .26, SE = .11, *z* = 2.45, *p* = .01, but a similar interaction effect was not significant when comparing fluent experts and fluent novices, *B* = -.04, SE = .11, *z* = -.32, *p* = .75. In addition, disfluent experts were not judged to be more careful than fluent experts, *B* = .12, SE = .09, *z* = 1.29, *p* = .20, similarly between disfluent and fluent novices, *B* = -.17, SE = .15, *z* = -1.18, *p* = .24.

As for certainty, Figure 1(C) shows a significant effect of Filled Pause, such that disfluent speakers were judged as being significantly less certain than fluent speakers, *B* = -.25, SE = .08, *z* = -3.13, *p* = .002. There were no significant effects of Speaker Expertise on certainty (*B* = -.17, SE = .11, *z* = -1.53, *p* = .13) or interaction effects between the two factors (*B* = -.20, SE = .11, *z* = -1.75, *p* = .08).

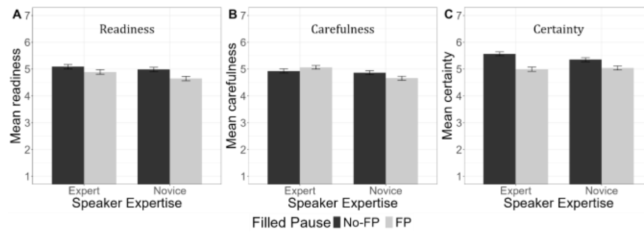

Figure 1: Mean ratings for the three attributes in Experiment 1: (A) Readiness; (B) Carefulness; (C) Certainty.

Discussion

Results from Experiment 1 showed that filled pauses incurred a social cost at the conversation-level of speaker evaluation: disfluent speakers were judged to be significantly less ready and certain than fluent speakers, regardless of speaker expertise. However, filled pauses offered a social benefit for certain speakers: experts were thought to be more careful than novices when they were disfluent (but not when they produced the same utterances fluently). These findings go beyond past work (Brennan & Schober, 2001; Brennan & Williams, 1995; Choi et al., 2015; Fridland, 2023; Lickley, 2015; Postma et al., 1990; Womack et al., 2012) by offering specific evidence on how listeners draw speaker-specific social inferences from disfluency in spontaneous speech.

How can we reconcile the fact that disfluent speakers were rated negatively as less ready and less certain, yet disfluent experts were seen positively as more careful than novices? While these judgments may appear contradictory, they reflect a common phenomenon in social evaluation: the same behaviors can lead to positive judgments in some dimensions but negative judgments in others. Mixed judgments occur mostly when different traits/attributes are evaluated based on separate or orthogonal dimensions (Brambilla et al., 2011; Cuddy et al., 2008; Kervyn et al., 2009). In our data, bivariate analysis showed that readiness, carefulness, and certainty had almost no correlation, indicating that they were three orthogonal attributes separately evaluated on different dimensions.

In addition, the positive bias toward experts can be attributed to their higher reward valence. Disfluency, as a form of expectancy violation in communication, disrupts the expectation of fluent speech. Prior research has consistently shown that, when such violations are construed positively, expertise amplifies the perceived positivity due to the higher reward valence associated with experts (Burgoon, 1993, 2015; Burgoon & Hale, 1988). This explains why, in our data, filled pauses produced by experts were interpreted more favorably than those by novices, and disfluent experts were more likely to be perceived as careful rather than merely hesitant as assumed by prior studies (Brennan & Schober, 2001; Brennan & Williams, 1995; Smith & Clark, 1993). Our findings demonstrate the significance of speaker expertise (among different possible speaker identities) for theoretical models of disfluency processing.

The present data leaves open the question whether disfluency further affects social behaviors beyond explicit social evaluations (and whether any such effects can be linked to readiness, carefulness, or certainty specifically). In the next experiment, we address this question.

Experiment 2

In Experiment 2, we introduced an implicit measure of how filled pauses feed into listeners' social choices using a task modeled after Fairchild et al. (2020). Specifically, we had people imagine that they were the addressees in the interactions in Experiment 1 and asked them how willing they would be to ask the same speaker in the future. If disfluency leads to overall negative social inferences, participants should be more likely to switch to a new speaker, even without any additional information about them. Conversely, if participants draw positive social inferences from the use of disfluency in some cases (e.g., when experts speak), they might prefer to remain with the current speaker as opposed to switching. To better understand the results, we further examined which specific speaker attributes from Experiment 1 contributed to participants' social choices.

Methods

Participants 120 new native English-speaking US undergraduates (M_{age} = 20.55, SD_{age} = 1.90; 66 females, 49 males, 5 prefer not to say) were recruited on Prolific. Participants were compensated $2.50 (hourly rate: $9.00).

Materials and Procedure We used the same materials from Experiment 1 with the following change. After reading each context paragraph and listening to the audio recording, participants were asked the following question: "Imagine the speaker was talking to you in this conversation. How likely would you be to ask this person again (as opposed to someone else) the next time you are in a similar situation?" They were asked to indicate their answers using a 1-7 Likert scale (1 = *unlikely*; 7 = *likely*).

Results

We conducted mixed-effects regression on the likelihood ratings obtained in Experiment 2 using the R *lmer* packge (Kuznetsova et al., 2017). We included Speaker Expertise (Expert vs. Novice), Filled Pause (*FP* vs. *No-FP*), and their interaction effects as the fixed-effect predictors. The random effects included random slopes of all fixed effects for Participants and Items respectively. Figure 2 shows the mean likelihood ratings for Experiment 2. There was a significant difference in likelihood ratings between the *FP* and *No-FP* conditions, B = -.27, SE = .13, t (51.50) = -2.15, p = .04. Participants were more likely to ask the same speaker again, rather than someone else, when the speaker was fluent compared to disfluent. Speaker Expertise was not a significant predictor of the likelihood ratings, B = -.34, SE = .20, t (29.39) = -1.73, p = .10, nor was the interaction between that factor and Filled Pause, B = .13, SE = .20, t (10.59) = .62, p = .55.

Could the social choices in Experiment 2 be connected to the patterns in Experiment 1? To investigate the mediating effects of speaker attributes on the association between filled pauses and future social decisions, we conducted a secondary, theory-driven, cross-sample mediation analysis using SEM on aggregated data from both experiments. Carefulness was trimmed from the model for model specification and better model estimation. The resulting mediation model examined the pathways whereby Filled Pause affected certain speaker attributes (Experiment 1), which, in turn, influenced future Decision Making (Experiment 2).

Following the recommendation of Preacher and Kelley (2011), the effect size of mediating effects was estimated using the standardized indirect effects. Indirect effects were estimated using 1,000 bootstrap samples from the original data. If the 95% bias-corrected and accelerated (BCa) bootstrap confidence intervals (CI) did not include zero, the indirect effect was considered significant at the .05 level (Preacher & Hayes, 2008).

Figure 3 shows the path diagram of the mediation model. Results showed a good model fit, χ^2 (16) = 18.00, p = .32, CFI = 1.00, TLI = 1.00, RMSEA = .01, SRMR = .01. Filled Pause was associated with lower levels of readiness, β = -.06, SE = .07, z = -2.82, p = .01, as well as lower levels of certainty, β = -.35, SE = .06, z = -6.16, p < .001. Readiness was positively associated with the likelihood of interacting with the same speaker again, β = .16, SE = .06, z = 2.92, p = .003. By contrast, there was no significant association between Certainty and future Decision Making, β = .08, SE = .06, z = 1.31, p = .19. The direct effect of Filled Pause on Decision Making was also not significant, β = -.15, SE = .10, z = -1.56, p = .12. Bootstrapping analyses showed that the indirect effect of Filled Pause on Decision Making through Readiness was significant, β = -.03, SE = .02, z = -2.08, p = .04, but the same indirect effect through Certainty was not significant, β = -.03, SE = .02, z = -1.24, p = .22.

Notably, listeners' later social avoidance was not directly based on the perception of filled pauses but on the mental process of social attributing disfluent speakers – specifically, their *readiness* (but not certainty) in the conversation. This distinction challenges existing models that primarily link disfluency to speaker uncertainty (Brennan & Schober, 2001; Brennan & Williams, 1995; Smith & Clark, 1993; Zuckerman et al., 1981) but aligns with the view that the production of filled pauses arises from cognitive difficulties (e.g., difficulties in lexical retrieval and utterance planning, impacting perceived readiness) during sentence production (Arnold et al., 2003, 2004, 2007; Collard et al., 2008; Corley et al., 2007; Fox Tree, 1995, 1997, 2001; Heller et al., 2015; Schnadt & Corley, 2006).

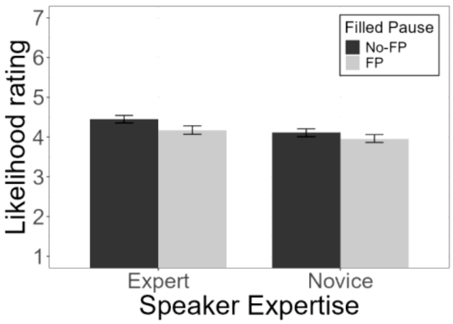

Figure 2: Likelihood ratings in Experiment 2 (1 = *Unlikely to ask this person again*. 7 = *Likely to ask this person again*).

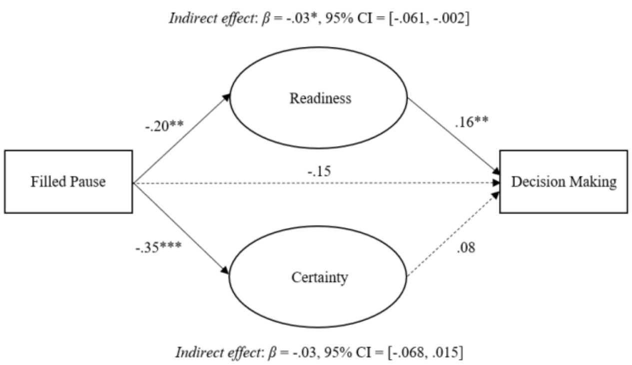

Figure 3: Path diagram for the mediation model of filled pauses, speaker readiness, speaker certainty, and listener's decision making (i.e., the likelihood that the speaker will be asked again as a conversation partner) (Experiments 1-2).

Discussion

Why did perceived speaker readiness, but not certainty, influence listeners' future social choices? Previous studies have suggested that competence- or agency-related traits play an important role in determining someone's perceived utility and reliability in social interactions (Carrier et al., 2014; Gebauer et al., 2014). When filled pauses reduced perceived readiness, listeners may (unconsciously) question the speaker's ability to reliably provide useful information, leading to a decision to avoid the speaker in similar future encounters. In contrast, certainty has been considered an attitude strength variable, but research has shown that it does not consistently predict social behaviors. First, certainty lacks stability over time; people may not maintain the same level of certainty in the future, making it a less reliable predictor of long-term interpersonal decisions (Craig et al., 2005; Prislin, 1996; Rucker et al., 2014; Sheeran & Abraham, 2003). Second, although certainty may enhance the strength of an argument, it does not reliably predict its social influence on others (Luttrell et al., 2016; Marks & Miller, 1985). Hence, certainty may not be a robust determinant of interpersonal choices as readiness does. These considerations help explain why certainty did not impact future social choices in our study.

General Discussion

In testing the social attribution and decisions related to disfluency, we made several key methodological departures from past work. First, we used multi-sentence, unscripted, spontaneous speech, thereby capturing communication where disfluency normally occur. Second, we included a systematic manipulation of speaker expertise. Third, we adopted expanded evaluation measures to obtain a more nuanced and comprehensive understanding of how disfluency affect judgment and decision-making.

Our data reveals a set of novel patterns. Experiment 1 clarified the speaker attributes computed dynamically during conversation. Disfluent speakers were judged as less ready and less certain in the conversation, indicating some social costs; on a positive note, disfluent experts were viewed as more careful than disfluent novices. In Experiment 2, disfluency affected listeners' social choices: participants showed avoidance in interacting with disfluent speakers again. Together, we show that disfluency does not always lead to purely negative social judgments, even though they can selectively lead to social costs.

Building on the literature of social meaning (see Beltrama, 2020 for review), our study highlights the fluid and context-dependent nature of disfluency. Unlike lexical items with fixed meanings, disfluency does not have a stable, predefined social interpretation. Instead, their social evaluation varies depending on context and top-down knowledge about the speaker: the same acoustic signal can be perceived positively or negatively, depending on who is speaking and in what situation (see Experiment 1, the role of speaker expertise). Our study helps reconcile disparate findings in prior research by reinforcing the idea that disfluency can elicit both positive and negative social responses depending on context. Thus, our findings comport with the view that sentence processing is socially situated (e.g., factor in speaker's distraction or language disorder; see Arnold et al., 2007). We call for an interdisciplinary approach that integrates insights from phonetics, psycholinguistics, sociolinguistics, and social psychology, as these fields mutually inform one another in understanding how naturally produced speech is processed, interpreted, and evaluated as a dynamic phenomenon embedded into social interactions.

Acknowledgments

The authors are grateful to Mark Liberman for providing access to corpora hosted by the Linguistic Data Consortium (LDC) and to Eddie Chong and Michael Rovine for their statistical input. They also thank Mark Liberman and members of the Language and Cognition Lab for their discussion and feedback.

This study was supported by the Integrated Language Science and Technology (ILST) initiative within the

MindCORE Center for Outreach, Research, and Education at the University of Pennsylvania.

During the preparation of this work the authors used ChatGPT and Gemini to support language refinement, manuscript organization, conceptual brainstorming, and technical tasks such as code generation and statistical analysis. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

References

Allwood, J., Nivre, J., & Ahlsén, E. (1990). Speech Management—on the Non-written Life of Speech. *Nordic Journal of Linguistics*, *13*(1), 3–48. https://doi.org/10.1017/S0332586500002092

Arnold, J. E., Fagnano, M., & Tanenhaus, M. K. (2003). Disfluencies Signal Theee, Um, New Information. *Journal of Psycholinguistic Research*, *32*(1), 25–36. https://doi.org/10.1023/A:1021980931292

Arnold, J. E., Kam, C. L. H., & Tanenhaus, M. K. (2007). If you say thee uh you are describing something hard: The on-line attribution of disfluency during reference comprehension. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *33*(5), 914–930. https://doi.org/10.1037/0278-7393.33.5.914

Arnold, J. E., Tanenhaus, M. K., Altmann, R. J., & Fagnano, M. (2004). The Old and Thee, uh, new: disfluency and reference resolution. *Psychological Science*, *15*(9), 578–582. https://doi.org/10.1111/j.0956-7976.2004.00723.x

Barge, J. K., Schlueter, D. W., & Pritchard, A. (1989). The effects of nonverbal communication and gender on impression formation in opening statements. *Southern Communication Journal*, *54*(4), 330–349. https://doi.org/10.1080/10417948909372766

Beattie, G. W., & Butterworth, B. L. (1979). Contextual Probability and Word Frequency as Determinants of Pauses and Errors in Spontaneous Speech. *Language and Speech*, *22*(3), 201–211. https://doi.org/10.1177/002383097902200301

Beltrama, A. (2020). Social meaning in semantics and pragmatics. *Language and Linguistics Compass*, *14*(9), e12398. https://doi.org/10.1111/lnc3.12398

Boersma, P., & Weenink, D. (2019). *Praat: doing phonetics by computer* (6.0.47). http://www.praat.org/

Bóna, J., & Bakti, M. (2020). The effect of cognitive load on temporal and disfluency patterns of speech. *Target. International Journal of Translation Studies*, *32*(3), 482–506. https://doi.org/10.1075/target.19041.bon

Bortfeld, H., Leon, S. D., Bloom, J. E., Schober, M. F., & Brennan, S. E. (2001). Disfluency Rates in Conversation: Effects of Age, Relationship, Topic, Role, and Gender. *Language and Speech*, *44*(2), 123–147. https://doi.org/10.1177/00238309010440020101

Branigan, H., Lickley, R., & McKelvie, D. (1999). Non-linguistic influences on rates of disfluency in spontaneous speech. *Proceedings of the 14th International Conference of Phonetic Sciences (ICPhS 14)*, 387–390.

Brennan, S. E., & Schober, M. F. (2001). How Listeners Compensate for Disfluencies in Spontaneous Speech. *Journal of Memory and Language*, *44*(2), 274–296. https://doi.org/10.1006/jmla.2000.2753

Brennan, S. E., Schuhmann, K., & Batres, K. (2015). *The Walking Around Corpus*. Linguistic Data Consortium.

Brennan, S. E., & Williams, M. (1995). The Feeling of Another′s Knowing: Prosody and Filled Pauses as Cues to Listeners about the Metacognitive States of Speakers. *Journal of Memory and Language*, *34*(3), 383–398. https://doi.org/10.1006/jmla.1995.1017

Browne, M. W., & Cudeck, R. (1992). Alternative Ways of Assessing Model Fit. *Sociological Methods & Research*, *21*(2), 230–258. https://doi.org/10.1177/0049124192021002005

Burgoon, J. K. (1993). Interpersonal Expectations, Expectancy Violations, and Emotional Communication. *Journal of Language and Social Psychology*, *12*(1–2), 30–48. https://doi.org/10.1177/0261927X93121003

Burgoon, J. K. (2015). Expectancy Violations Theory. In *The International Encyclopedia of Interpersonal Communication* (pp. 1–9). Wiley. https://doi.org/10.1002/9781118540190.wbeic102

Burgoon, J. K., & Hale, J. L. (1988). Nonverbal expectancy violations: Model elaboration and application to immediacy behaviors. *Communication Monographs*, *55*(1), 58–79. https://doi.org/10.1080/03637758809376158

Byrne, B. M. (1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming*. Lawrence Erlbaum Associates Publishers.

Campbell-Kibler, K. (2010). The sociolinguistic variant as a carrier of social meaning. *Language Variation and Change*, *22*(3), 423–441. https://doi.org/10.1017/S0954394510000177

Carrier, A., Louvet, E., Chauvin, B., & Rohmer, O. (2014). The Primacy of Agency Over Competence in Status Perception. *Social Psychology*, *45*(5), 347–356. https://doi.org/10.1027/1864-9335/a000176

Charoenruk, N., & Olson, K. (2018). Do Listeners Perceive Interviewers' Attributes from their Voices and Do Perceptions Differ by Question Type? *Field Methods*, *30*(4), 312–328. https://doi.org/10.1177/1525822X18784500

Choi, C. W., Honeycutt, J. M., & Bodie, G. D. (2015). Effects of Imagined Interactions and Rehearsal on Speaking Performance. *Communication Education*, *64*(1), 25–44. https://doi.org/10.1080/03634523.2014.978795

Clark, H. H., & Fox Tree, J. E. (2002). Using uh and um in spontaneous speaking. *Cognition*, *84*(1), 73–111. https://doi.org/10.1016/S0010-0277(02)00017-3

Clark, H. H., & Wasow, T. (1998). Repeating Words in Spontaneous Speech. *Cognitive Psychology*, *37*(3), 201–242. https://doi.org/10.1006/cogp.1998.0693

Cohen, S. (2012, October 22). *Tips on Public Speaking: Eliminating the Dreaded "Um."* Https://Extension.Harvard.Edu/Blog/Tips-on-Public-Speaking-Eliminating-the-Dreaded-Um/#:~:Text=Removing%20%E2%80%9Cum%E2%80%9D%20from%20your%20vocabulary&text=Pause%2C%20think%2C%20answer.,You%20want%20to%20say%20next.

Collard, P., Corley, M., MacGregor, L. J., & Donaldson, D. I. (2008). Attention Orienting Effects of Hesitations in Speech: Evidence From ERPs. *Journal of Experimental Psychology: Learning Memory and Cognition*, *34*(3), 696–702. https://doi.org/10.1037/0278-7393.34.3.696

Corley, M., MacGregor, L. J., & Donaldson, D. I. (2007). It's the way that you, er, say it: Hesitations in speech affect language comprehension. *Cognition*, *105*(3), 658–668. https://doi.org/10.1016/j.cognition.2006.10.010

Craig, S. C., Martinez, M. D., & Kane, J. G. (2005). Ambivalence and Response Instability. In S. C. Craig & M. D. Martinez (Eds.), *Ambivalence and the Structure of Political Opinion* (pp. 55–71). Palgrave Macmillan. https://doi.org/10.1057/9781403979094_4

Cuddy, A. J. C., Fiske, S. T., & Glick, P. (2008). Warmth and Competence as Universal Dimensions of Social Perception: The Stereotype Content Model and the BIAS Map. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (1st ed., Vol. 40, pp. 61–149). Academic Press. https://doi.org/10.1016/S0065-2601(07)00002-0

De keersmaecker, B., Hartsuiker, R. J., & Pistono, A. (2024). (Don't) believe me, I'm telling the truth! Speech disfluency and eye contact as cues to veracity, intention, and truth judgement. *Language, Cognition and Neuroscience*, *39*(10), 1263–1277. https://doi.org/10.1080/23273798.2024.2382728

De Luca, A., Clark, A., & Dellwo, V. (2024). NumberLie: a game-based experiment to understand the acoustics of deception and truthfulness. *Proceedings of INTERSPEECH 2024*, 3659–3663. https://doi.org/10.21437/Interspeech.2024-2082

Diachek, E., & Brown-Schmidt, S. (2023). The Effect of Disfluency on Memory for What Was Said. *Journal of Experimental Psychology: Learning Memory and Cognition*, *49*(8), 1306–1324. https://doi.org/10.1037/xlm0001156

Diachek, E., & Brown-Schmidt, S. (2024). Linguistic features of spontaneous speech predict conversational recall. *Psychonomic Bulletin and Review*. https://doi.org/10.3758/s13423-023-02440-w

Diachek, E., Brown-Schmidt, S., & Duff, M. (2024). Attentional Orienting and Disfluency-Related Memory Boost Are Intact in Adults With Moderate-Severe Traumatic Brain Injury. *Journal of Speech, Language, and Hearing Research : JSLHR*, *67*(6), 1803–1818. https://doi.org/10.1044/2024_JSLHR-23-00385

Du Bois, J. W., Chafe, W. L., Meyer, C., Thompson, S. A., Englebretson, R., & Martey, N. (2000). *Santa Barbara corpus of spoken American English Part I*. Linguistic Data Consortium.

Du Bois, J. W., Chafe, W. L., Meyer, C., Thompson, S. A., Englebretson, R., & Martey, N. (2003). *Santa Barbara corpus of spoken American English Part II*. Linguistic Data Consortium.

Du Bois, J. W., & Englebretson, R. (2004). *Santa Barbara Corpus of Spoken American English Part III*. Linguistic Data Consortium.

Du Bois, J. W., & Englebretson, R. (2005). *Santa Barbara Corpus of Spoken American English Part IV*. Linguistic Data Consortium.

Eckert, P. (2008). Variation and the indexical field. *Journal of Sociolinguistics*, *12*(4), 453–476. https://doi.org/10.1111/j.1467-9841.2008.00374.x

Fairchild, S., Mathis, A., & Papafragou, A. (2020). Pragmatics and social meaning: Understanding under-informativeness in native and non-native speakers. *Cognition*, *200*, 104171. https://doi.org/10.1016/j.cognition.2019.104171

Finlayson, I. R., & Corley, M. (2012). Disfluency in dialogue: an intentional signal from the speaker? *Psychonomic Bulletin & Review*, *19*(5), 921–928. https://doi.org/10.3758/s13423-012-0279-x

Fox Tree, J. E. (1995). The Effects of False Starts and Repetitions on the Processing of Subsequent Words in Spontaneous Speech. *Journal of Memory and Language*, *34*(6), 709–738. https://doi.org/10.1006/jmla.1995.1032

Fox Tree, J. E. (1997). Pronouncing "the" as "thee" to signal problems in speaking. *Cognition*, *62*(2), 151–167. https://doi.org/10.1016/S0010-0277(96)00781-0

Fox Tree, J. E. (2001). Listeners' uses of um and uh in speech comprehension. *Memory & Cognition*, *29*(2), 320–326. https://doi.org/10.3758/BF03194926

Fox Tree, J. E. (2007). Folk notions of um and uh, you know, and like. *Text and Talk*, *27*(3), 297–314. https://doi.org/10.1515/TEXT.2007.012

Fraundorf, S. H., & Watson, D. G. (2011). The disfluent discourse: Effects of filled pauses on recall. *Journal of Memory and Language*, *65*(2), 161–175. https://doi.org/10.1016/j.jml.2011.03.004

Fraundorf, S. H., & Watson, D. G. (2014). Alice's adventures in um-derland: Psycholinguistic sources of variation in disfluency production. *Language, Cognition and Neuroscience*, *29*(9), 1083–1096. https://doi.org/10.1080/01690965.2013.832785

Fridland, V. (2023). *Like, Literally, Dude: Arguing for the Good in Bad English*. Viking.

Gósy, M. (2023). Occurrences and Durations of Filled Pauses in Relation to Words and Silent Pauses in Spontaneous Speech. *Languages*, *8*(1). https://doi.org/10.3390/languages8010079

Graff, D., Walker, K., & Miller, D. (2001). *Switchboard Cellular Part 1 Transcribed Audio*. Linguistic Data Consortium.

Grenne, J. O. (1984). Speech preparation processes and verbal fluency. *Human Communication Research*, *11*(1), 61–84. https://doi.org/10.1111/j.1468-2958.1984.tb00038.x

Heller, D., Arnold, J. E., Klein, N., & Tanenhaus, M. K. (2015). Inferring Difficulty: Flexibility in the Real-time Processing of Disfluency. *Language and Speech*, *58*(2), 190–203. https://doi.org/10.1177/0023830914528107

Hosman, L. A., & Wright, J. W. (1987). The effects of hedges and hesitations on impression formation in a simulated courtroom context. *Western Journal of Speech Communication*, *51*(2), 173–188. https://doi.org/10.1080/10570318709374263

Howell, P., & Kadi-Hanifi, K. (1991). Comparison of prosodic properties between read and spontaneous speech material. *Speech Communication*, *10*(2), 163–169. https://doi.org/10.1016/0167-6393(91)90039-V

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

James, D. (1972). Some aspects of the syntax and semantics of interjections. *Papers from the Eighth Regional Meeting of the Chicago Linguistic Society*, 162–172.

King, J. P. J., Loy, J. E., & Corley, M. (2018). Contextual Effects on Online Pragmatic Inferences of Deception. *Discourse Processes*, *55*(2), 123–135. https://doi.org/10.1080/0163853X.2017.1330041

Kirjavainen, M., Crible, L., & Beeching, K. (2022). Can filled pauses be represented as linguistic items? Investigating the effect of exposure on the perception and production of um. *Language and Speech*, *65*(2), 263–289. https://doi.org/10.1177/00238309211011201

Kirkland, A., Gustafson, J., & Székely, É. (2023). Pardon my disfluency: The impact of disfluency effects on the perception of speaker competence and confidence. *Proceedings of INTERSPEECH 2023*, *2023-August*, 5217–5221. https://doi.org/10.21437/Interspeech.2023-887

Kısa, Y. D., Goldin-Meadow, S., & Casasanto, D. (2024). Gesturing during disfluent speech: A pragmatic account. *Cognition*, *250*, 105855. https://doi.org/10.1016/j.cognition.2024.105855

Kohtz, L. S., & Niebuhr, O. (2017). How long is too long? How pause features after requests affect the perceived willingness of affirmative answers. *Proceedings of INTERSPEECH 2017*, *2017-August*, 3792–3796. https://doi.org/10.21437/Interspeech.2017-50

Kosmala, L., & Morgenstern, A. (2019). Should “uh” and “um” be categorized as markers of disfluency? The use of fillers in a challenging conversational context. In L. Degand, G. Gilquin, L. Meurant, & A. C. Simon (Eds.), *Fluency and Disfluency Across Languages and Language Varieties* (pp. 67–89). Presses universitaires de Louvain.

Kuznetsova, A., Brockhoff, P. B., & Christensen, R. H. B. (2017). lmerTest Package: Tests in Linear Mixed Effects Models. *Journal of Statistical Software*, *82*(13), 1–26. https://doi.org/10.18637/jss.v082.i13

Laan, G. P. (1992). Perceptual differences between spontaneous and read aloud speech. In *Proc. of the Institute of Phonetic Sciences Amsterdam* (Vol. 16, pp. 65–79). Institute of Phonetic Sciences, University of Amsterdam.

Labov, W. (1963). The Social Motivation of a Sound Change. *Word*, *19*(3), 273–309. https://doi.org/10.1080/00437956.1963.11659799

Lake, J. K., Humphreys, K. R., & Cardy, S. (2011). Listener vs. speaker-oriented aspects of speech: Studying the disfluencies of individuals with autism spectrum disorders. *Psychonomic Bulletin & Review*, *18*(1), 135–140. https://doi.org/10.3758/s13423-010-0037-x

Lee, J. H. N. (2021). Low boundary tone: Evidence from the acoustic differences between Cantonese sentence-final particles with low-falling tone. *1st International Conference on Tone and Intonation (TAI)*, 176–180. https://doi.org/10.21437/TAI.2021-36

Lee, J. H. N., Chong, E. S. K., Chui, H., Lee, T., Luk, S., Tao, D., & Lee, N. W. T. (2023). A curvilinear association between therapists’ use of discourse particles and therapist empathy in psychotherapy. *Journal of Counseling Psychology*, *70*(5), 562–570. https://doi.org/10.1037/cou0000696

Lee, J. H. N., Chui, H., Lee, T., Luk, S., Tao, D., & Lee, N. W. T. (2022). Formality in psychotherapy: How are therapists’ and clients’ use of discourse particles related to therapist empathy? *Frontiers in Psychiatry*, *13*, 1018170. https://doi.org/10.3389/fpsyt.2022.1018170

Lee, J. H. N., Tao, D., Chui, H., Lee, T., Luk, S., Lee, N. W. T., & Fung, K. (2022). Durational Patterning at Discourse Boundaries in Relation to Therapist Empathy in Psychotherapy. *Proceedings of INTERSPEECH 2022*, 5248–5252. https://doi.org/10.21437/interspeech.2022-722

Lee, J. H. N., Yip, K.-F., Liberman, M., & Kuang, J. (2024). Some prosodic consequences of varied discourse functions in a Cantonese sentence-final particle. *Proceedings of Speech Prosody 2024*, 632–636. https://doi.org/10.21437/speechprosody.2024-128

Levelt, W. J. M. (1983). Monitoring and self-repair in speech. *Cognition*, *14*(1), 41–104. https://doi.org/10.1016/0010-0277(83)90026-4

Levelt, W. J. M. (1989). *Speaking*. MIT Press.

Lickley, R. J. (2015). Fluency and Disfluency. In M. A. Redford (Ed.), *The Handbook of Speech Production* (pp. 445–474). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118584156.ch20

Lickley, R. J., & Bard, E. G. (1998). When Can Listeners Detect Disfluency in Spontaneous Speech? *Language and Speech*, *41*(2), 203–226. https://doi.org/10.1177/002383099804100204

Lomotey, C. F. (2021). Fillers in Academic Discourse: An analysis of lectures from a Public University in Ghana. *European Journal of Applied Linguistics Studies*, *3*(2), 98–122. https://doi.org/10.46827/ejals.v3i2.248

Loy, J. E., Rohde, H., & Corley, M. (2016). Lying, in a manner of speaking. *Proceedings of Speech Prosody 2016*, *2016-January*, 984–988. https://doi.org/10.21437/speechprosody.2016-202

Loy, J. E., Rohde, H., & Corley, M. (2017). Effects of Disfluency in Online Interpretation of Deception. *Cognitive Science*, *41*, 1434–1456. https://doi.org/10.1111/cogs.12378

Loy, J. E., Rohde, H., & Corley, M. (2018). Cues to lying may be deceptive: Speaker and listener behaviour in an interactive game of deception. *Journal of Cognition*, *1*(1), 1–21. https://doi.org/10.5334/joc.46

Luttrell, A., Petty, R. E., & Briñol, P. (2016). Ambivalence and certainty can interact to predict attitude stability over time. *Journal of Experimental Social Psychology*, *63*, 56–68. https://doi.org/10.1016/j.jesp.2015.11.008

Mahendra, A. W., & Bram, B. (2019). Filler Utterances of Instructors in ELT Context. *IDEAS: Journal on English Language Teaching and Learning, Linguistics and Literature*, *7*(2), 45–60. https://doi.org/10.24256/ideas.v7i2.999

Mahl, G. F. (1987). *Explorations in nonverbal and vocal behavior*. Erlbaum.

Marsh, H. W., Wen, Z., & Hau, K.-T. (2004). Structural Equation Models of Latent Interactions: Evaluation of Alternative Estimation Strategies and Indicator Construction. *Psychological Methods*, *9*(3), 275–300. https://doi.org/10.1037/1082-989X.9.3.275

Navarretta, C. (2015). The functions of fillers, filled pauses and co-occurring gestures in Danish dyadic conversations. *Proceedings of the 3rd European Symposium on Multimodal Communication*, 55–61.

Niebuhr, O., & Fischer, K. (2019). Do not Hesitate! — Unless You Do it Shortly or Nasally: How the Phonetics of Filled Pauses Determine Their Subjective Frequency and Perceived Speaker Performance. *Interspeech 2019*, 544–548. https://doi.org/10.21437/Interspeech.2019-1194

Niebuhr, O., Voße, J., & Brem, A. (2016). What makes a charismatic speaker? A computer-based acoustic-prosodic analysis of Steve Jobs tone of voice. *Computers in Human Behavior*, *64*, 366–382. https://doi.org/10.1016/j.chb.2016.06.059

O'Donnell, W. R., & Todd, L. (1991). *Variety in contemporary English* (2nd ed.). Harper Collins Academic.

Okazawa, S. (2014). Pauses and fillers in second language learners' speech. *Studies in Language and Culture*, *23*, 52–66.

Orena, A. J., & White, K. S. (2015). I Forget What That's Called! Children's Online Processing of Disfluencies Depends on Speaker Knowledge. *Child Development*, *86*(6), 1701–1709. https://doi.org/10.1111/cdev.12421

Pistono, A., De keersmaecker, B., & Hartsuiker, R. (2024). Deceptive deception: disfluencies are incorrectly interpreted as cues to deceptive speech. In L. K. Samuelson, S. L. Frank, M. Toneva, A. Mackey, & E. Hazeltine (Eds.), *Proceedings of the Annual Meeting of the Cognitive Science Society (Vol. 46)* (pp. 4625–4631).

Podesva, R. J. (2011). Salience and the Social Meaning of Declarative Contours. *Journal of English Linguistics*, *39*(3), 233–264. https://doi.org/10.1177/0075424211405161

Pon-Barry, H., & Shieber, S. M. (2011). Recognizing Uncertainty in Speech. *EURASIP Journal on Advances in Signal Processing*, *2011*(1), 251753. https://doi.org/10.1155/2011/251753

Pornpitakpan, C. (2004). The Persuasiveness of Source Credibility: A Critical Review of Five Decades' Evidence. *Journal of Applied Social Psychology*, *34*(2), 243–281. https://doi.org/10.1111/j.1559-1816.2004.tb02547.x

Postma, A., Kolk, H., & Povel, D.-J. (1990). On The Relation among Speech Errors, Disfluencies, and Self-Repairs. *Language and Speech*, *33*(1), 19–29. https://doi.org/10.1177/002383099003300102

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. https://doi.org/10.3758/BRM.40.3.879

Preacher, K. J., & Kelley, K. (2011). Effect size measures for mediation models: Quantitative strategies for communicating indirect effects. *Psychological Methods*, *16*(2), 93–115. https://doi.org/10.1037/a0022658

Prislin, R. (1996). Attitude stability and attitude strength: one is enough to make it stable. *European Journal of Social Psychology*, *26*(3), 447–477. https://doi.org/10.1002/(SICI)1099-0992(199605)26:3<447::AID-EJSP768>3.0.CO;2-I

Qualtrics. (2024). *Qualtrics* (July 2024). https://www.qualtrics.com.

R Core Team. (2020). *R: A Language and environment for statistical computing*. https://www.r-project.org/

Rosseel, Y. (2012). lavaan: An R Package for Structural Equation Modeling. *Journal of Statistical Software*, *48*(2), 1–36. https://doi.org/10.18637/jss.v048.i02

Rucker, D. D., Tormala, Z. L., Petty, R. E., & Briñol, P. (2014). Consumer conviction and commitment: An appraisal-based framework for attitude certainty. *Journal of Consumer Psychology*, *24*(1), 119–136. https://doi.org/10.1016/j.jcps.2013.07.001

Saunders, L., & Wong, M. A. (2020). *Instruction in Libraries and Information Centers*. Windsor & Downs Press. https://doi.org/10.21900/wd.12

Schachter, S., Christenfeld, N., Ravina, B., & Bilous, F. (1991). Speech disfluency and the structure of knowledge. *Journal of Personality and Social Psychology*, *60*(3), 362–367. https://doi.org/10.1037/0022-3514.60.3.362

Schleef, E. (2019). The evaluation of unfilled pauses: Limits of the prestige, solidarity and dynamism dimensions. *Lingua*, *228*, 102707. https://doi.org/10.1016/j.lingua.2019.06.008

Schleef, E. (2023). Mechanisms of meaning making in the co-occurrence of pragmatic markers with silent pauses. *Language in Society*, *52*(1), 79–105. https://doi.org/10.1017/S0047404521000610

Schnadt, M. J. (2009). *Lexical Influences on Disfluency Production*. University of Edinburgh.

Schnadt, M. J., & Corley, M. (2006). The Influence of Lexical, Conceptual and Planning Based Factors on Disfluency Production. *Proceedings of the Annual Meeting of the Cognitive Science Society*, *28*(28), 750–755. https://escholarship.org/uc/item/9337x2hk

Schoemann, A. M., & Jorgensen, T. D. (2021). Testing and Interpreting Latent Variable Interactions Using the semTools Package. *Psych*, *3*(3), 322–335. https://doi.org/10.3390/psych3030024

Sheeran, P., & Abraham, C. (2003). Mediator of Moderators: Temporal Stability of Intention and the Intention-Behavior Relation. *Personality and Social Psychology Bulletin*, *29*(2), 205–215. https://doi.org/10.1177/0146167202239046

Shriberg, E. (2001). To 'errrr' is human: ecology and acoustics of speech disfluencies. *Journal of the International Phonetic Association*, *31*(1), 153–169. https://doi.org/10.1017/S0025100301001128

Silber-Varod, V., Niebuhr, O., Schettino, L., & Barbosa, P. A. (2023). Cultural differences of gaps and overlapping speech in political interviews. *Disfluency in Spontaneous Speech (DiSS) Workshop 2023*, 3–7. https://doi.org/10.21437/DiSS.2023-1

Smith, V. L., & Clark, H. H. (1993). On the Course of Answering Questions. *Journal of Memory and Language*, *32*(1), 25–38. https://doi.org/10.1006/jmla.1993.1002

Swerts, M. (1998). Filled pauses as markers of discourse structure. *Journal of Pragmatics*, *30*(4), 485–496. https://doi.org/10.1016/S0378-2166(98)00014-9

Tian, Y., Maruyama, T., & Ginzburg, J. (2017). Self Addressed Questions and Filled Pauses: A Cross-linguistic Investigation. *Journal of Psycholinguistic Research*, *46*(4), 905–922. https://doi.org/10.1007/s10936-016-9468-5

Tottie, G. (2011). Uh and Um as sociolinguistic markers in British English. *International Journal of Corpus Linguistics*, *16*(2), 173–197. https://doi.org/10.1075/ijcl.16.2.02tot

Utami, N. M. (2018). Communication strategies used by junior and senior teachers in teaching English at secondary school. *International Journal of Humanities and Innovation*, *1*(4), 20–29. https://doi.org/10.33750/ijhi.v1i4.26

Vrij, A., & Winkel, F. W. (1991). Cultural patterns in Dutch and Surinam nonverbal behavior: An analysis of simulated police/citizen encounters. *Journal of Nonverbal Behavior*, *15*(3), 169–184.

Womack, K., Mccoy, W., Alm, C. O., Calvelli, C., Pelz, J. B., & Haake, A. (2012). Disfluencies as Extra-Propositional Indicators of Cognitive Processing. *Proceedings of the ACL-2012 Workshop on Extra-Propositional Aspects of Meaning in Computational Linguistics (ExProM-2012)*, 1–9.

Yaruss, J. S., Newman, R. M., & Flora, T. (1999). Language and disfluency in nonstuttering children's conversational speech. *Journal of Fluency Disorders*, *24*(3), 185–207. https://doi.org/10.1016/S0094-730X(99)00009-1

Zhang, H. (2020). *The Distribution of Disfluencies in Spontaneous Speech: Empirical Observations and Theoretical Implications* [PhD dissertation]. University of Pennsylvania.

Zuckerman, M., Koestner, R., & Driver, R. (1981). Beliefs about cues associated with deception. *Journal of Nonverbal Behavior*, *6*(1), 105–114.