Differences in Perceived Fluency and Utterance Fluency across Speech Elicitation Tasks: A Pilot Study

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Abstract

This pilot study focuses on whether analysis of perceived fluency and utterance fluency inform and provide support for the workability of three speech elicitation tasks designed to assess second language fluency. Nine intermediate-level French students aged 26 to 68 were asked to respond to three different speaking tasks. Temporal variables of utterance fluency were extracted using PRAAT speech analysis software and examined against holistic ratings of perceived fluency. Utterance fluency was operationalized as speech rate, phonation-time ratio and mean length of runs. Linguistic analysis featured quantitative and qualitative comparisons of ordinal and interval data. The results of this small-scale pilot study indicate that task difficulty impacts speech perception in terms of intra-rater reliability, and speech production with regard to pausing, speaking duration, and number of syllables produced. The findings also provide preliminary evidence indicating a link between PRAAT temporal fluency measurements and rater interpretation of holistic descriptors. Extracting temporal variables automatically and comparing them to holistic ratings across tasks elucidates the intricacy of the dynamics between perceived fluency and utterance fluency. For fluency assessment, it also underscores the importance of exploring perceived fluency and utterance fluency together rather than in isolation.

1. Introduction

Designing meaningful speech elicitation tasks that engage, elicit and enable second language (L2) learners to access and retrieve all the language in their repertoire is challenging. If the focus of using tasks is to inform L2 speech performance for fluency assessment purposes, then issues of task design must play a prominent role in the language test development process.

This paper begins with justifications for more research in task design for fluency assessment and reviews some of the existing research in L2 fluency. It is then followed by the methodology of a pilot research study and the conceptualization of tasks designed to trigger L2 speech production. The data analyses and results are presented with the two methods of investigation, namely holistic rating scores on the basis of established fluency criteria and measuring temporal variables of fluency using the PRAAT (Boersma & Weenink, 2010) speech analysis software program. Finally, the contributions of the present research within the context of the pilot study are discussed.

Over the last two decades, empirical research has focused on pedagogical speech elicitation tasks as a major strand in second language acquisition research (e.g. Bygate & Samuda, 2005; Bygate, Skehan, & Swain, 2001; Ellis, 2001; Skehan & Foster, 1997). Research on the impact of speech tasks on L2 language use, processing and development has led to issues of task design.

Spoken task types can leave learners at a disadvantage because their L2 speech production skills are not always primed to face these assessment items in real-life or testing situations. With the growing use of spoken task types in classroom assessments and high-stakes language tests, research is needed into the design of pedagogical tasks that enhance rather than hinder, L2 fluency.

Research to date on L2 fluency has been plagued by a lack of precision. It is often used to convey global oral proficiency to refer to a speaker who has a high command of the L2 (Kormos, 2006; Lennon, 1990; Riggenbach, 1991; Schmidt, 1992). Lennon (2000) distinguishes between two senses of fluency: a broad sense, referring to all-round oral proficiency, and a narrow sense, referring to the speed and smoothness of delivery. Although fluency in the broad sense is probably the most generic way to refer to overall L2 competency, the term is problematic because it is nonetheless vague (Fulcher, 2003). The lack of precision associated with defining fluency is therefore inherently reflected in the difficulty of assessing it. Despite the absence of widespread agreement in the research literature about the exact definition of fluency (see Segalowitz, 2010 for a comprehensive review), fluency assessment based on spoken task types remains a primary defining criterion in many L2 language tests.

In light of the issues raised, the pilot study explained in the remainder of this paper explores the effect of three elicitation tasks on L2 speech production and perception. The current research was multi-pronged and attempted to determine:

1. The differences in perceived fluency and utterance fluency across speech elicitation task types.
2. The workability of the speech elicitation tasks designed to assess L2 fluency.
3. The feasibility of using a PRAAT software script (De Jong & Wempe, 2009) to automatically measure temporal variables of utterance fluency for practical language assessment purposes.
4. For these purposes, the pilot study aimed to address this main research question:
5. How do perceived fluency and utterance fluency differ on the three speech elicitation tasks designed to assess L2 fluency?

2 Definitions

While there are a range of meanings for pedagogical task, in this paper, it is defined as "a holistic activity which engages language use in order to achieve some non-linguistic outcome while meeting a linguistic challenge, with the overall aim of promoting language learning, through process or product or both" (Samuda & Bygate, 2008, p. 69). Fluency, in terms of L2 skill performance, refers to "the rapid, smooth, accurate, lucid, and efficient translation of thought or communicative intention under the temporal constraints of on-line processing"(Lennon, 1990; 2000, p. 26) . The notion of utterance fluency refers to the temporal values of speech or the "oral features of utterances that reflect the operation of underlying cognitive processes" (Segalowitz, 2010, p. 48). Finally, the concept of perceived fluency refers to the "inferences listeners make about a speaker's cognitive fluency based on their perception of utterance fluency" (Segalowitz, 2010, p. 48).

3 Literature Review

Fluency has been identified as an important skill to assess in second language testing. Closely tied to fluency assessment, however, is the issue of task design and the development of speech tasks that sufficiently trigger L2 speaking performance. Several empirical studies have investigated L2 speech perception and production using varying elicitation tasks and scopes of measurement (De Jong, Steinel, Florijn, Schoonen, & Hulstijn, 2007; Derwing, Munro, Thomson, & Rossiter, 2009; Derwing, Rossiter, Munro, & Thomson, 2004; Kormos & Dénes, 2004; Rossiter, 2009; Skehan & Foster, 1997). In common with all these studies are methods of rating speech samples against holistic rating scales for perceived fluency, measuring temporal variables for utterance fluency and investigating correlations. However, they employed a mixture of task types, planning time conditions, measurement methods and temporal variables to investigate L2 fluency. Because fluency is multi-dimensional, the findings of the studies mentioned above are not systematically comparable due to a lack of consistency in applying a common set of objective fluency variables and operationalization methods (Kormos, 2006; Segalowitz, 2010).

Albeit with differences in operationalization, empirical research findings have revealed particular aspects of how tasks and conditions impact L2 speech performance. In general, speech rate is identified as one of the most salient temporal variables of L2 fluency (Derwing, et al., 2004; Freed, 1995; Kormos & Dénes, 2004; Lennon, 1990; O'Brien, Segalowitz, Freed, & Collentine, 2007; Riggenbach, 1991; Rossiter, 2009; Towell, Hawkins, & Bazergui, 1996). Kormos and Dénes (2004) explored variables which predict perceptions of fluency. They investigated the distinguishing fluency features of 16 Hungarian English language learners at two proficiency levels using a narrative task allowing for two minutes of planning time. The speech samples were rated for fluency using a scale that ranged from 1 to 5. Speech rate, mean length of runs, phonation time ratio and the number of stressed words produced per minute (pace) were reported as the best predictors of fluency. While Lennon (1990) and Foster and Skehan (1999) found filled pauses and unfilled pauses correlated with fluency, these speech phenomenon did not impact perceptions of fluency.

However, as Chambers (1997, p. 540) points out “becoming fluent therefore is not about speaking faster (articulation rate), but about pausing less often and pausing at the appropriate junctures in an utterance.” Given the debate in the research literature about the side effects of pause phenomenon on perceived fluency (e.g., Kormos & Dénes, 2004; Riggenbach, 1991; Towell, et al., 1996), this conclusion seems particularly relevant for speech processing in the L1 and L2 alike. Recently, this same conclusion has been echoed further by Ginther, Dimova and Yang (2010, p. 393) , “the contribution of silent pausing deserves careful attention". The examination of how pause phenomena vary at different fluency levels is worthy of further empirical research.

Along these same lines but using more contemporary methods, De Jong et al. (2007) reported an experiment which aimed to investigate the impact of task complexity on L1 and L2 Dutch speaking performance. In this study, 267 participants responded to four simple and four complex role-play monologue tasks with a 30-second planning time per task. Fluency judgements were evaluated using a six-part scale. Fluency was measured with PRAAT solely in regard to phonation time ratio and syllables per second. For L1 speakers fluency increased when tasks were complex as reported by phonation-time ratio measurements. For L2 speakers however, results showed that fluency decreased on complex tasks as reported by syllables per second. This finding is particularly salient for future research in L2 cognition and how attention capacity - albeit limited in L2 processing - is selected and distributed in speech production.

More recently, Rossiter (2009) examined perceptions of speaking fluency of 24 adult ESL students using a picture description task in a pretest and posttest format with one minute of planning time. The speech samples were rated for fluency using a Likert scale. Temporal measurements such as speech rate, unfilled pauses and mean length of run were made using SoundEdit 16. Fluency judgments correlated with the temporal measures of total pause per second and pruned syllables per second. Pausing, self-repetition, speech rate, and fillers were reported as negative features for perceived fluency. This study raises important pedagogical issues concerning the need to provide the sufficient oral practice critical to L2 skill development. While classroom practice often promotes a communicative approach, fluency building activities are often missing from instruction (Gatbonton & Segalowitz, 2005; Rossiter, Derwing, Manimtim, & Thomson, 2010).

Although these studies had different research aims, they all empirically investigated L2 fluency by employing monologue narrative elicitation tasks under time constraints, judged fluency according to rating scales, and measured temporal values of fluency. Until a well-defined holistic rubric and operationalization criteria to reliably measure L2 fluency are standardized, research will continue to vary and impact fluency performance assessment.

In response to the lack of consistency, this pilot study follows the work of Kormos and Dénes (2004) by employing monologue task types to elicit speech as well as speech rate, mean length of utterance and phonation time ratio as fluency predictors. This research also follows the work of De Jong et al. (2007) in that it will automatically measure temporal variables of fluency using PRAAT software. Finally, in response to the Rossiter et al. (2010) study, pedagogical implications of the pilot research will be discussed.

4 Methods

4.1 Participants

The pilot study investigated a small population of students (n = 9) enrolled in an intermediate French class at an Alliance Française in Denver, Colorado. With the exception of one L1 Spanish speaker (a thirty year resident of the USA) and one British English speaker, the participants were all speakers of American English. Three of the participants were retired and six were professionals. In exchange for their contributions, a 90-minute private lesson focusing on an area of difficulty was offered.

One rater took part in the pilot study: a PhD student with 12 years of ESL and French teaching experience and normal hearing. She rated the nine speech performances using an adapted version of the CEF (Common European Framework) fluency scale. The scale descriptors ranged from zero to six, with zero indicating no fluency and six indicating a high level of fluency. The rater has been involved in several language test development and fluency rating projects for large-scale testing organizations.

4.2 Sampling

The students represented in the sample were chosen for their intermediate CEFR (Common European Framework of Reference) B1/B2 French proficiency as reported by the Alliance Française placement test. Given the geographic location and the small number of students at the B1/B2 level, it was not possible to have random assignment of students. This restricted the researcher in her sampling procedure.

4.3 General Procedures

Participants were asked to respond to three different narrative speech elicitation tasks including a picture description, a story retell and an opinion question. These tasks were administered at the Alliance Française according to a standard set of procedures. A 3-minute allotment for planning preceded each speech task but participants typically started to speak after approximately 30 seconds. All speech samples were recorded using GarageBand. In order to ensure precise audio files for analysis, the speech samples were edited to remove unrelated speech and pauses at the beginning and end of each recording. The speech samples were also transcribed manually by hand. Syllables were extracted automatically using the PRAAT script from De Jong and Wempe (2009) and pauses were processed using the *TextGrid (to silences*) function.

4.4 Speaking Task Design and Development

This section provides an overview of the design procedures involved in conceptualizing and organizing the speaking tasks used in the pilot study.

To begin, a test specification document was created to describe the L2 speaking component of the pilot study and guide the overall task design and development process. In particular, the criteria specified details *on the assessment purpose, audience, domain, proficiency level, method, assessment criteria, score use and speaking construct*. Following Bygate (2005), this stage focused on the proper conceptualization and comprehension of task goals to avoid random trial and error.

Stage 2 involved reviewing the literature on task models (Robinson, 2001; Skehan & Foster, 2001), task types and the different methods to assess L2 speaking. Rather than commenting on the pros and cons of each, this section highlights the overall L2 speech-enhancing properties of the tasks designed for this pilot study. Being cognizant that L2 fluency varies according to task type and planning time, the tasks were conceptualized to emphasize fluency, or general facility and latency, in spoken French by responding to tasks about everyday life. The tasks aimed to elicit ability to formulate and produce intelligible utterances at a conversational pace. Following Skehan's (1998) model, the task design implemented the dimensions of perspective, immediacy and planning time.

To measure L2 fluency, the overall design sought to cover several task types in order to encourage a range of skills and a more complete representation of learner abilities (Luoma, 2004). As the pilot project was only concerned with L2 speaking skills, the tasks did not involve evaluating any listening or interactional aspects. Based on the literature consulted, narrative monologues including a picture description, a story retell and an open question were chosen as tasks. The picture description task depicted people working in an internet café, the story retell task described a horseback riding accident, and the open question pertained to organic farming and government intervention. Table 1 below summarizes the main features of the three speech tasks.

The task content was designed to be interesting and purposeful, but also simple and intuitive. Special care was taken to design task content targeting themes common to the geographic area to provide a Colorado flavour. The tasks did not require any particular world knowledge, special insight, or memory capability and were in the realm of familiarity of typical adult life. Building on Levelt's (1989) model of speech production, the tasks were conceptualized as activities to support L2 skill performance in that they were goal oriented, attempting to support a link from *intention to articulation.*

The final stage involved pilot testing the tasks and performing the perceived fluency and utterance fluency analysis. This portion of the project is described in the remainder of this paper. It should be noted that the tasks and administration procedures were also pre piloted on a 21-year-old non-native French major from the University of Colorado at Boulder and a 44-year-old native French speaking Aerospace engineer.

TABLE 1: Speech Task Synopsis

Task type	Targeted functions and discourse features	Dimension	Planning time	Input	Format
1. Picture description	Express factual/conceptual information/describe/comment	Immediacy/ perspective	3 minutes	Visual/written prompt	Monologue
2. Story retell	Explain/describe/recount	Immediacy/ perspective	3 minutes	Visual/written prompt	Monologue
3. Open question	Express an opinion/comment with a personal focus	Immediacy/ perspective	3 minutes	Written prompt	Monologue

4.5 Analysis

Given the small number of participants in the pilot, ordinal data (holistic ratings), interval data (temporal measures), and non-parametric statistical techniques were selected to analyze the data. Using the following methods, the study explored the pilot test results from the perspective of utterance and perceived fluency and examined how they differed across tasks at a single point in time as pertinent for language assessment.

First, to analyze the first dependent variable, utterance fluency, two types of quantitative analyses were performed on the linguistic data collected for each task. Using a PRAAT script (See Appendices B and C) specifically designed to measure speech rate automatically by finding syllable nuclei with intensity (dB), voicedness and pauses, the dependent variable of L2 utterance fluency was operationalized as follows:

1. Speech rate 1 = total number of syllables / total duration (with pauses) in seconds
2. Speech rate 2 = number of syllables / total duration (without pauses) in seconds
3. Mean length of run = average number of syllabus in utterances between pauses of .25

   PRAAT was configured to detect pauses of 0.25 seconds and above as recommended by Towell et al. (1996)

4. Phonation time ratio = total talk time / total duration

“Calculated as the percentage of the time spent speaking as percentage of the time taken to produce the speech sample” as recommended by Towell et al. (1996, p. 91)

Second, the temporal values and holistic ratings were entered as variables in SPSS. Next, the descriptive statistics and the Friedman test were calculated to measure the same subjects under the three different task conditions. Finally, the Wilcoxon Signed Rank test was computed to find out where the differences lie.

To analyze the second dependent variable, perceived fluency, I rated the three tasks at the onset of the 12-week French class using an adapted version of the CEFR. At week 6, these same three tasks were rerated again, blind (not having looked at the original ratings). Next, the intra-rater reliability figures for each task were calculated. Finally, using the quantitative analysis extracted from PRAAT, I link temporal variable measurements to rating scores and discuss intra-rater reliability and rater interpretation of holistic descriptors from a perceived fluency perspective.

5. Results

The research examined how L2 utterance fluency and perceived fluency differ on three speech tasks. Given the small data set (N=9), it was difficult to perform meaningful statistical analysis. Nonetheless, the following conclusions were inferred from the data.

To facilitate comprehension and provide context to the summary below, Task 1 refers to the picture description task, Task 2 to the horseback riding story retell task, and Task 3 to the open question about organic farming task.

5.1 Main analyses for utterance fluency

Table 2 presents the descriptive statistics for temporal variables by task, listed as t1, t2 and t3. The table includes Speech rate 1, Speech rate 2, mean length of runs (MLR), phonation-time ratio (PTR) and rating.

TABLE 2: Descriptive Statistics for Temporal Variables

Variable	N	Minimum	Maximum	Mean	Sd
Speechrate1t1	9	2.53	3.65	3.02	0.33
Speechrate1t2	9	2.49	3.18	2.80	0.22
Speechrate1t3	9	2.46	3.34	2.98	0.25
Speechrate2t1	9	5.02	6.39	5.61	0.60

Speechrate2t2	9	4.52	6.92	6.09	0.72
Speechrate2t3	9	4.69	7.11	5.67	0.73
PTRt1	9	0.43	0.69	0.54	0.08
PTRt2	9	0.38	0.56	0.47	0.06
PTRt3	9	0.41	0.62	0.53	0.07
MLRt1	9	4.41	8.32	5.46	1.24
MLRt2	9	3.71	7.35	5.09	1.03
MLRt3	9	4.45	6.45	5.51	0.77
Ratingt1	9	3.00	4.00	3.44	0.53
Ratingt2	9	3.00	4.00	3.56	0.53
Ratingt3	9	3.00	4.00	3.33	0.50

5.2 Speech rate observations

Examination of the mean for Speech rate 1 reveals a difference in syllables produced per minute across tasks. The most substantial difference is associated with a comparison of mean measures between Task 1 and Task 2, a variation of 13.2 syllables per minute. Further analyses computed by the Wilcoxon test confirm the two sets of Speech rate 1 measures are significantly different ($p<0.021$). Speech rate 2 represents greater variation between Tasks 1 and 2, a difference of 28.8 syllables per minute. However, this larger difference is expected as Speech rate 2 is measured without pauses. Because Speech rate 1 is higher for Task 1 than Task 2, and Speech rate 2 is lower for Task 1 than Task 2, this indicates that pausing is greater in Task 2. This greater pausing is also revealed by the large difference between Speech rate 1 and Speech rate 2 for Task 2.

5.3 Phonation-time ratio or (PTR) observations

The Wilcoxon test also reports a significant difference ($p<0.038$) in phonation-time ratio between Tasks 1 and 2. The values associated with PTR for Task 1 are 54% compared to 47% for Task 2, indicating a difference of 7%. The PTR of Task 1 (54%) and Task 3 (53%) are similar, possibly suggesting congruent features and difficulty.

5.4 Mean length of runs (or MLR) observations

The mean for MLR is similar for Task 1 and Task 3. This is also observed with speech rates and PTR. However, the standard deviation of the MLR in Task 1 is much greater than in Task 3. This is due to the maximum MLR value measurement of 8.32 for participant 2, increasing not only the standard deviation, but also the mean. The speech pattern of participant 2 is characterized by free flowing utterances followed by long pauses before starting again. If this result were to be removed from the set, the mean and standard deviation would be lower and therefore more similar to the two other tasks.

The descriptive statistics (see table 2) reveal a general trend indicating the influence of task difficulty on L2 speech production. To get a more scientific view of this phenomenon, further examination of the production data would need to be carried out with a larger data set. In general, Task 2 represented a more cognitively demanding task and likely required more processing. Task 2 had the lowest mean for Speech rate 1, PTR and MLR. Accordingly, it also had the highest Speech rate 2. Although the participants were not asked to formally rate the difficulty of the tasks, their informal feedback reported Task 2 as being the most taxing. Furthermore, the Wilcoxon Matched Pairs Signed Rank test was computed for all the remaining production variables and did not report any other significant differences.

TABLE 2: Descriptive Statistics for Temporal Variables

Variable	N	Minimum	Maximum	Mean	Sd
Speechrate1t1	9	2.53	3.65	3.02	0.33
Speechrate1t2	9	2.49	3.18	2.80	0.22
Speechrate1t3	9	2.46	3.34	2.98	0.25
Speechrate2t1	9	5.02	6.39	5.61	0.60
Speechrate2t2	9	4.52	6.92	6.09	0.72
Speechrate2t3	9	4.69	7.11	5.67	0.73
PTRt1	9	0.43	0.69	0.54	0.08
PTRt2	9	0.38	0.56	0.47	0.06
PTRt3	9	0.41	0.62	0.53	0.07
MLRt1	9	4.41	8.32	5.46	1.24
MLRt2	9	3.71	7.35	5.09	1.03
MLRt3	9	4.45	6.45	5.51	0.77
Ratingt1	9	3.00	4.00	3.44	0.53
Ratingt2	9	3.00	4.00	3.56	0.53
Ratingt3	9	3.00	4.00	3.33	0.50

Table 3 represents the number of syllables per participant per task. The mean value for the entire duration was 314 syllables for Task 1, 506 syllables for Task 2 and 394 syllables for Task 3. This data shows that participants are producing more speech in Task 2 compared to Task 1 and Task 3. Examination of differences in standard deviation across tasks once again suggests spread similarities between Task 1 and Task 3, and indicates more centered values in Task 2.

TABLE 3: Number of Syllables per Task

Student	**Number of Syllables**		
	Task 1	Task 2	Task 3
1	172	338	179
2	208	519	259
3	607	549	579
4	387	411	420
5	272	587	319
6	420	595	406
7	177	471	284
8	406	677	633
9	174	410	467
MEAN	313.67	506.33	394.00
MIN	172	338	179
MAX	607	677	633
Sd	151.00	108.07	149.86

5.5 Summary of analyses for utterance fluency

1. Tasks 1 and 2 are significantly different in regard to Speech rate 1 and phonation- time ratio as reported by the Wilcoxon test.

2. Task 2 is more cognitively demanding. Task 2 provokes more pausing than Tasks 1 or 3.

3. Task type impacts speaking duration. Task 2 provokes the most speech production with the longest speaking duration rate of 181 seconds (see Table 4).

4. Task type impacts the number of syllables produced per speech sample. The average number of syllables for Task 2 was 506, which is the highest mean.

5. Tasks 1 and 3 are consistently similar in regard to Speech rate 1, Speech rate 2, PTR and MLR.

5.6 Main analyses for perceived fluency

Speaking performances by all nine participants were rated against the CEFR fluency criteria. Using the rank order correlation formula, I calculated my first and second set of marks.

5.7 Intra-rater reliability observations

The intra-rater reliability figures are 85% for Task 1, 74% for Task 2, and 100% for Task 3, which indicate acceptable internal consistency. There was a difference in performance rating opinion between the two sets of speech samples when re-marked blind at 6 weeks. Interestingly the lowest intra-rater reliability figure of 74% was for Task 2, the most cognitively demanding task. This observation signals that task difficulty and rating difficulty may be related. Task difficulty may exert more stress on the rater resulting in more overall difficulty rating the fluency of the speech sample.

The intra-rater reliability figure of 85% for Task 1 is also worthy of comment. In the second set of ratings, the mark for participant number 9 was upgraded to a 4 on the fluency scale. Judging from the breakdown of temporal measurements per rating level, as explained in the next section, this upgrade was warranted in terms of Speech rate 2, PTR, MLR, but not Speech rate 1. This observation may have important repercussions on fluency perception as pausing in speech production occurs naturally. In other words, pause phenomenon, included in the calculation of Speech rate 1, may exert a greater influence in speech perception than Speech rate 2, PTR or MLR temporal variables.

Table 4 presents the temporal measurements for each participant by task. The table includes Speech rate 1, Speech rate 2, mean length of runs (MLR), phonation-time ratio (PTR), first pass CEFR rating and task speaking duration.

TABLE 4: Temporal Value Measurements by Student and Task

Student	**Task1** Sp Rate # 1	Sp Rate #2	PTR	MLR	Rating	Speaking Duration
1	2.82	5.18	0.54	4.41	4.00	61.02
2	3.65	5.28	0.69	8.32	4.00	57.05
3	3.00	6.39	0.47	4.43	3.00	202.20
4	3.03	5.02	0.60	6.34	4.00	127.68
5	2.69	6.28	0.43	4.69	3.00	101.35
6	3.13	5.04	0.62	5.75	3.00	72.28
7	3.03	6.05	0.50	5.06	3.00	58.46
8	3.31	6.21	0.53	5.27	4.00	122.57
9	2.53	5.06	0.50	4.83	3.00	68.71
MEAN	3.02	5.61	0.54	5.46	3.44	96.81
MIN	2.53	5.02	0.43	4.41	3.00	57.05
MAX	3.65	6.39	0.69	8.32	4.00	202.20
Sd	0.33	0.60	0.08	1.25	0.53	48.05

Student	Task2 Sp Rate # 1	Sp Rate #2	PTR	MLR	Rating	Speaking Duration
1	2.86	6.39	0.45	4.39	4.00	118.01
2	3.18	5.69	0.56	5.40	4.00	162.97
3	2.73	5.90	0.48	3.71	3.00	201.17
4	2.96	6.12	0.48	4.78	4.00	138.90
5	2.72	6.69	0.41	5.15	3.00	215.88
6	2.86	6.92	0.41	7.35	4.00	208.01
7	2.51	6.61	0.38	5.54	3.00	188.00
8	2.93	5.93	0.49	5.13	4.00	231.11
9	2.49	4.52	0.55	4.32	3.00	164.93
MEAN	2.80	6.09	0.47	5.08	3.56	181.00
MIN	2.49	4.52	0.38	3.71	3.00	118.01
MAX	3.18	6.92	0.56	7.35	4.00	231.11
Sd	0.22	0.72	0.06	1.03	0.53	37.48
Student	**Task3** Sp Rate # 1	Sp Rate #2	PTR	MLR	Rating	Speaking Duration
1	3.20	5.24	0.61	5.11	4.00	55.92
2	2.91	7.11	0.41	5.9	3.00	89.00
3	2.89	6.12	0.46	4.45	3.00	204.70
4	3.13	5.04	0.62	5.75	4.00	134.08
5	2.96	5.48	0.54	6.25	3.00	107.76
6	3.34	6.27	0.53	6.34	3.00	121.45
7	2.93	5.56	0.53	6.45	3.00	96.99
8	3.04	5.43	0.56	5.55	4.00	207.97
9	2.46	4.69	0.52	4.45	3.00	189.72
MEAN	2.98	5.66	0.53	5.52	3.33	134.18
MIN	2.46	4.69	0.41	4.45	3.00	55.92
MAX	3.34	7.11	0.62	6.45	4.00	207.97
Sd	0.25	0.73	0.07	0.76	0.50	54.67

5.8 Fluency rating compared to temporal variable measurement observations

These data were analyzed by comparing the fluency ratings against the temporal variables extracted from PRAAT. One important finding is that holistic perception ratings of 4 typically correspond to the highest temporal measurements. In other words, the greater the temporal variable, the higher the rating on the fluency scale. As can be seen from the data presented in Table 5, ratings of 4 and 3 generally fall into the following ranges across tasks:

TABLE 5: Temporal Value Ranges by Rating Level

Rating 4	**Range**
Speech rate #1:	3.00 - 3.65
Speech rate #2:	5.02 - 6.92
PTR:	45% - 69%
MLR:	4.38 - 7.34
Rating 3	**Range**
Speech rate #1:	2.46 - 3.34
Speech rate #2:	4.51 - 6.04
PTR:	38% - 54%
MLR:	3.71 – 5.54

With the exception of students 1 and 6 (see Table 4), these ranges tend to be relatively static across tasks. However, for Tasks 1 and 3, students 3 and 6 are interesting exceptions for two reasons. First, I hesitated between a rating assignment of 3 or 4. I settled on a 3 in accordance with the fluency rating training received, which specified when in doubt between two scores, give the lower one. Second, as can be observed from the data, the temporal values extracted for these students actually fall into the range of 4 in both tasks. Although these students were assigned a 3 from my holistic perception rating, their speech samples defy the range of a 3.

Two other observations also worth noting across tasks are the higher temporal measurements associated with students 5 and 7, whom each were assigned a 3 rating. It is possible that PRAAT software may be counting English hesitation phenomenon (um, uh, ah) as syllables, which are very prominent in student 7's speech sample. The same phenomenon may also apply for student 5, who makes use of "bon, euh, donc, alors" to fill gaps in processing. If so, the apparent use of communication strategies seems to be working in student 5's favour in terms of automatic temporal appraisal. However, to the human rater, it remains to be determined whether the use of communication strategies in L2 speech production are perceived as empty content or as fluency enhancing (for a comprehensive review on communication strategies see Dörnyei and Kormos (1998) and Færch and Kasper (1983)). More research using PRAAT software is needed to decipher whether such communication strategies and fillers are elevating the syllable counts and how communication strategies such as paraphrasing and restructuring impact fluency.

Lastly, student 2 in Task 3 has an abnormally high Speech rate 2 measurement of 7.11. One explanation for this may be the excessive pausing that followed the participant getting flustered and tongue-tied. Given the short sample (89 seconds) and because Speech rate 2 is calculated without pauses, this figure is considerably inflated.

It should be duly noted that fluency research using the PRAAT script to detect pauses and syllables automatically is relatively new. The analysis in Table 5 presents a fair amount of overlap between levels but provides some reasons to account for discrepancies in the speech rate PRAAT script. Further analyses and validation procedures using this PRAAT script are required to narrow down and close existing gaps. However, the preliminary findings reveal that quantitative temporal variables of fluency can be related to overall criteria of the speaking rubric. This result supports the validity of using the rating scale and automatic speech rate procedures for language assessment purposes.

5.9 Summary of analyses for perceived fluency

Task difficulty and perceived fluency rating difficulty are related. Task difficulty affects rating difficulty. The lowest intra-reliability figure (74%) is associated with Task 2, the most difficult task.

Task difficulty and perceived ratings are related. Task difficulty affects speech perception. Tasks 1 and 3 are less cognitively demanding and have a higher amount of level 3 ratings. Task 2 is the most cognitively demanding and has the greatest amount of level 4 ratings.

Ranges of quantitative measurements as determined by PRAAT correspond to holistic perception rating levels across score levels and tasks. This finding highlights an underlying consistency between temporal measurement and perceived abilities.

The intra-rater reliability variation is 86% across tasks.

6. Conclusion

The present pilot study aimed to determine the extent to which analysis of perceived fluency and utterance fluency inform and provide support for the workability of three speech elicitation tasks designed to assess L2 fluency. The results reveal how task design and difficulty impact perceived fluency and utterance fluency differently, and thus influence overall speech production and perception. I argue that Task 2 and either Tasks 1 or 3 show distinguishing measurable features and are therefore workable for L2 fluency assessment. In sum, while all tasks trigger speech performance, the data reveals that Task 2 is the most difficult and prompts more speech output than Tasks 1 and 3. This observation may lend support to Robinson's (2001) cognitive processing model, which stipulates that cognitively demanding tasks provoke more speech production "by making additional functional demands and therefore increases lexical variety and grammatical accuracy" (p.39). This pilot study also provides some preliminary evidence indicating a link between temporal fluency measurements and intra-rater reliability, and rater interpretation of the fluency scale descriptors.

As explained in the literature review, fluency is a multi-dimensional construct. Clearly, the full extent of task variation cannot be validated at this stage given the small data set. Nor, when that data set is attained, will task variation be reduced to any one factor or dimension of fluency. However, I have attempted to make a case for depth and rigor in designing task types for language assessment. For data collection purposes, it is therefore essential to rigorously pilot test tasks to determine their fluency provoking properties before they are included on a test.

The pilot study has a number of limitations that should be acknowledged. Factors contributing to task difficulty, such as speaking anxiety and motivation are also related to the quality of performance. The research did not control for individual differences in processing. The research was solely focused on perceived fluency and utterance fluency. It did not account for the relatively unexplored construct of cognitive fluency, which is a speaker's ability to mobilize and efficiently coordinate mechanisms to produce speech. Lastly, the link between the findings and task models is missing.

There is a need for valid, precise, and reliable speech rate measurement procedures. Although the idea behind this pilot study is not orginal, it represents one of the first attempts to use automatic speech rate procedures to validate tasks designed for practical language assessment. Like any new software, new users should expect to devote a fair amount of time to learning PRAAT. The quantitative analyses of temporal variables presented in this paper were extracted based on version 1 of the automatic speech rate script by De Jong and Wempe (2009). Version 2, released in September 2010, greatly simplifies the procedures and calculations. Future L2 fluency research would benefit from further experimentation with the PRAAT speech analysis program. Learning to use this technology will provide new insights and opportunities for research in utterance fluency. However, in order to make future studies systematically comparable, settings in the PRAAT script will need to be standardized for optimal results.

Given the vague nature of fluency, the implications for pedagogical and language testing research are enormous. In many cases, the language learning environment does not always allow learners to capitalize on acquired vocabulary and grammatical structures by providing the sufficient oral practice critical to L2 skill development. The teaching of natural oral communication skills is paramount if learners are to be successful in achieving language goals and cope with real-life speaking needs of the spoken components of exams such as the TOEFL or the PTE. When the stakes are high, test scores have the power to grant access to an entirely new life. Since the use of these tests are not likely to diminish in the near future, research needs to look at ways to enhance, not hinder, L2 fluency performance on tests of spoken language.

7 References

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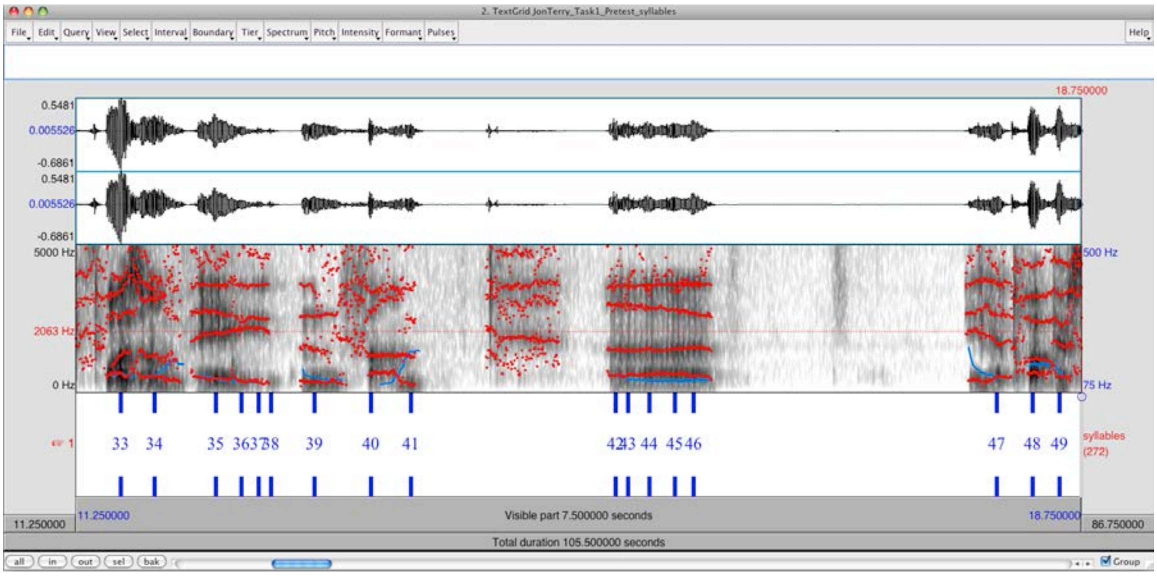
APPENDIX A: Automatic extraction by means of PRAAT



APPENDIX B: PRAAT settings used to calculate silences and syllable measurements