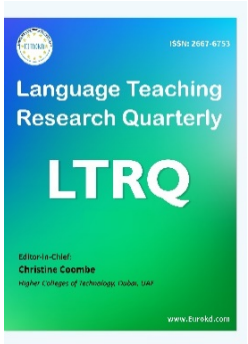


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# Fluency in Speaking as a Dynamic Construct

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**Abstract**

In current research into second language (L2) speaking, aspects of fluency are measured as static constructs. Averaged over a complete speaking performance, for instance, syllables per minute is calculated. Similarly, the number of pauses is calculated per minute, averaged over a complete speaking task. This paper argues, however, that we need to investigate fluency as a dynamic construct. Research into L1 speaking has shown that L1 fluency aspects may show cyclical temporal patterns (Roberts & Kirsner, 2000). In addition, research into the changes in perception of L2 comprehensibility during task performance has shown that L2 comprehensibility may show dynamic patterns, with implications for ratings on comprehensibility (Nagle et al., 2019). This paper, therefore, argues that L2 fluency should be investigated as a dynamic construct as well. The paper finishes by sketching pedagogical implications and directions for future research.

**Keywords:** *Dynamicity, Speaking, Fluency*

## Introduction

In today's global economy, most people, all over the world, need to use a second language (L2) in education or in their professional career at some stage in their life. Therefore, many people need to be able to communicate successfully not only in their native language (L1) but also in their L2.

L2 learners exhibit large individual differences with respect to success in learning to speak an L2. Therefore, an important aim of second language acquisition research has been to explain such individual differences. With respect to oral abilities, research has established that L2 speakers differ in the complexity, accuracy and fluency (CAF) with which the message is delivered (Housen & Kuiken, 2009) and that (skills in) these linguistic aspects of speech are related to L2 proficiency (De Jong et al., 2012; Koizumi et al., 2022; Jeon et al., 2022). The

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linguistic aspects of speech complexity, accuracy, and fluency are therefore seen as indicators of L2 proficiency, both in research on second language acquisition as well as in language testing practice.

According to Brown (1996), for communicative language learning, it is important to focus on content and fluency when teaching speaking. Consequently, in addition to CAF, the notion of Functional Adequacy (FA) has been added as an important indicator (De Jong et al., 2012; Kuiken & Vedder, 2018). Perhaps a learner is able to use complex language in speech, and do so relatively accurately and with fluency, but not on topic. In that case, the FA or overall communicative success of the speaking performance would be low. FA is the result of an overall successful communicative speech performance. Thus, if a learner is asked to respond to a prompt, or to describe a number of pictures, FA can only be established after hearing the full response, rendering FA a (mostly) static construct: per task, there is only one time to know to what extent the task as a whole has been fulfilled. Measures of CAF, on the other hand, are not static by nature. For instance, one utterance may include low-frequency words and be relatively long, whereas the next may be a short sentence with mostly high-frequency words. Similarly, one sentence may include a number of phonological and morphosyntactic mistakes, and the next may be without any such errors. Like the examples for complexity and accuracy, utterances throughout a speaking task may also be more or less fluent, fluctuating through time. As fluency is the most important aspect of communicative language teaching besides content or functional adequacy (Brown, 1996), I will focus on fluency in this paper and argue that it is a dynamic construct.

The current paper will first describe how fluency is currently usually operationalized, followed by a brief review of research into the dynamicity of L1 speaking fluency. Although L2 fluency has not been investigated dynamically thus far, there is recent research on the dynamicity of L2 comprehensibility, which is briefly described before implications and directions for future research are laid out.

*Current Definition and Operationalization of Fluency*

To define fluency, I first describe the extraordinary skill of speaking. Because before a speaker is able to articulate the appropriate sounds with a speed of around five syllables per second, a number of speech production processes have been carried out and have been carried out quickly. There are roughly three stages in speech production: conceptualising what to say, formulating how to say this in language, and finally articulating the appropriate sounds (e.g. Levelt et al., 1999). If at any stage of the speech production process, the speaker encounters a problem, the speaker will become disfluent, which may result in silent pauses, filled pauses (e.g. ‘uh’, ‘uhm’), or slowing down articulation speed. All the while, speakers monitor their speech to ascertain whether what they are about to say or are just saying matches what they intended to say in the first place. In dialogue, the accomplishment of speaking successfully becomes even more phenomenal, as speakers need to plan their upcoming utterance while listening to their interlocutor and predicting what their interlocutor will say and when their turn is likely to end (Levinson, 2016; Pickering & Garrod, 2013). Only when speakers are able to predict effectively in this way, they can – just in time – take and utter their turn.

When speaking in a second language (L2), the same stages and processes are needed to proceed from thoughts to articulated sounds (Kormos, 2006), often while engaged in conversation. However, the processes will be more demanding, because they are less automatised in the L2, especially those processes needed for linguistic formulation of the message (Segalowitz, 2010). Likewise, the prediction processes are more demanding while engaged in an L2 conversation (Pickering & Gambi, 2018). Moreover, the L2 linguistic knowledge that is needed for formulation purposes may at times be insufficient, causing disfluencies, for instance, when the speaker decides to reconceptualise, circumventing the need for specific L2 linguistic knowledge (Kormos, 2006). In short, disfluencies in speech are telling of speaking proficiency: only highly proficient L2 learners with highly developed L2 knowledge and skills, including predictive skills (De Jong, 2023), will be able to fluently express their thoughts, without undue hesitations.

The previous paragraph described what Segalowitz (2010) defined as 'cognitive fluency': the ability to smoothly and efficiently translate thoughts to sounds. Cognitive fluency will lead to noticeable fluency in speakers' utterances ('utterance fluency') which is subdivided into aspects of speed of speaking, breakdowns (pauses), and repairs (Tavakoli & Skehan, 2005). Finally, the third notion in the triad by Segalowitz (2010) is 'perceived fluency': listeners' impressions of speakers' cognitive fluency, based on what the listeners perceive of the utterance fluency. Perceived fluency can be operationalized by having judges rate fluency; utterance fluency can be operationalized by measuring specific aspects of speech in recorded sound files.

Both perceived fluency and utterance fluency are currently operationalized as static constructs. For perceived fluency, a rater judges fluency based on the whole performance of a task by a speaker. Similarly, based on the whole performance of a task by a speaker, are aspects of utterance fluency calculated for research and assessment practice. For speed fluency, the total number of syllables divided by the total speaking time (syllables per second) is calculated, or the average syllable length over the whole performance is calculated. For breakdown fluency, the total number of silent and filled ("uhm") pauses are counted and likewise normalized per total (speaking) time. More recently, for breakdown fluency, pauses between and within clauses are distinguished, as it is mainly pause use within clauses that separates more proficient from less proficient L2 speakers. Nevertheless, the measures for pauses within and between clauses are calculated over whole performances. The same holds for repair fluency: the total number of reformulations and restarts are counted, and then normalized per total time.

Cognitive fluency (the quintessential notion of fluency), must be a dynamic construct, however. Translating thoughts to sounds will be more or less strenuous, depending on the difficulty of conceptualization and formulation of the message that is planned. It is likely that this difficulty will not be constant throughout a speaking performance. Indeed, with respect to the formulation, research has shown that fluency goes down before syntactically more difficult sentences (Ferreira, 1991; Sadri Mirdamadi & De Jong, 2015), and before words that are more difficult (De Jong, 2016; Hartsuiker & Notebaert, 2010; Kircher et al., 2004). In addition to difficulties during the formulation of the message, fluctuations in difficulty in the

conceptualization of a message will also lead to fluctuations in fluency (Goldman-Eisler, 1968; Bortfeld et al., 2001; Merlo & Mansur, 2004; Felker et al., 2019).

*Research into Dynamicity of L1 Speaking Fluency*

Henderson et al. (1966) were among the first to investigate how conceptual planning may impact on fluency. They found that speakers alternated between fluent and disfluent passages during spontaneous speaking. The passages were indicated by determining the silence to speech ratio. The disfluent passages (with a large silence to speech ratio) were found to contain more filled pauses, more pauses within syntactic units, and more repetitions and false starts compared to the fluent passages. The alternation of fluent and disfluent passages were seen as evidence for temporal cycles in speech production, in which low-fluency passages were hypothesized to coincide with the conceptualization phase in speech production, followed by less cognitive-intensive formulation/articulation phases. The existence and duration of these temporal cycles has been investigated since, as briefly described below.

Henderson et al.'s (1966) subjective procedure was replicated a number of times (e.g., Goldman-Eisler et al., 1967; Butterworth, 1975; Beattie, 1980), indicating temporal cycles between 10 to 30 seconds. However, as pointed out in other studies, the subjective methods to indicate cycles are likely to be flawed. Jaffe and Feldstein (1970, cited in Roberts & Kirsner, 2000) and Warner (1979) first took up this issue, but the difficulty (time and costs) in objectively investigating temporal cycles in speaking may have led to the fact that research on this topic, as yet, is scarce.

Roberts and Kirsner (2000) also explicitly mentioned the time-intensive labor involved in the research as a reason why few researchers have taken up the issue. In their research, they measured fluency in 34 segments of discourse of at least 30 seconds. For each window of 200 ms, the duration of phonation (excluding filled pauses) was measured in ms and divided by 200, leading to a measure ranging from 0 to 1 for every 200 ms. From time series analyses, it was found that temporal cycles with alternating more fluent and less fluent periods in speech existed, and were around 17 seconds. Moreover, it was found that topic shifts were generally followed by periods of higher fluency, in line with the hypothesis that the temporal cycles reflect conceptual planning followed by executing (formulation and articulation) of these plans. Merlo and Barbosa (2010) used a similar approach to measure fluency in windows of 200 ms. They investigated twenty spoken productions of at least 20 seconds. In addition to coding silent and filled pauses as hesitations as in Roberst and Kirsner (2000), they also coded lengthenings, repetitions, and false starts as hesitations. As in Roberst and Kirsner (2000), for each window of 200 ms, the percentage of non-hesitant speech was calculated. The results again indicated periodic cycles, with a mean of 13 seconds. They also found that all time series, although showing the periodic alternation between more fluent and less fluent stretches of speech, were statistically stationary. This means that, apart from the periodic fluctuations, speech did not become more or less fluent during a speech sample.

Finally, Pakhomov et al. (2011) investigated the effects of age and dementia on temporal cycles in speech. Using similar approaches for measurement to those of Roberts and Kirsner (2000) and Merlo and Barbosa (2010), they replicated the presence of periodic cycles and

furthermore showed that both age and dementia were related to differences in aspects of the periodicity of speaking, potentially pointing towards difficulties in the more conscious, less automatic processes in speaking for older speakers and speakers with dementia.

This brief overview shows that there is indeed little research into the dynamics of speaking fluency in L1 speech, and it mainly involves the investigation of temporal cycles. A particularly noteworthy finding for the practice of measuring aspects of fluency in L2 speech, may be that the cycles in Merlo and Barbosa (2010) were static, not showing more or less fluency throughout a speaking performance. If this holds for L2 speech, it would mean that capturing the overall fluency measures statically, averaging over a whole performance, may not lead to different results from results when taking into account a dynamic perspective. The findings by Pakhomov et al. (2011), on the other hand, who suggested that cognitive resources needed for conscious processing may affect the cycles, lead to the hypothesis that the dynamicity of speech may be different for L1 and L2 speaking, and that proficiency will play a role. To the best of my knowledge, however, there is as yet, no research regarding the dynamicity of L2 fluency.

*Research on Dynamicity of L2 Comprehensibility*

Although dynamicity in aspects of speaking have not been investigated, there is research looking into changing perceptions by listeners in terms of comprehensibility. Comprehensibility is a notion that captures how linguistic, cognitive, and social variables are associated with how easily a listener may understand the message. As operationalized by Derwing and Munro (1997, p. 2), comprehensibility points to how easy or difficult it is to understand the message, thus referring to listeners' processing efforts. Comprehensibility has been linked to a broad range of linguistic aspects in the utterances (see, e.g., Isaacs & Trofimovich, 2012). Until recently, raters' judgments on comprehensibility have, like the linguistic aspects of CAF that partly underly these ratings, only been operationalized statically: judges evaluate the speaking performance once on comprehensibility, usually after listening to the full performance.

Nagle et al. (2019), however, argued that comprehensibility may fluctuate throughout a speaking performance and were the first to investigate precisely this issue. In their study, taking an idiodynamic approach to the perception of comprehensibility, raters were asked to evaluate comprehensibility through time with a procedure that allowed raters to change their evaluation of comprehensibility on a by-second basis (MacIntyre, 2012), by indicating whether speech was becoming more or less comprehensible. Raters pressed a button up or down, to indicate that their evaluation of the comprehensibility went up or down. If no button was pressed, the software would, once per second, stepwise return the rating to the baseline. After hearing all speaking performances, the raters heard the same performances again, and they were now asked to give their overall judgment on comprehensibility. Finally, the raters were invited in a stimulated recall, to comment on their reasons of up- or downgrading their evaluations through time. The results showed that although most raters were relatively static in their evaluations, the dynamic raters explained the changes in their evaluations by categories known from earlier research (e.g., discourse organization, lexis and grammar, pronunciation, and fluency). Finally, using mixed-effects regression analyses, the overall ratings of comprehensibility were found

to be influenced by downgrading behavior: raters who gradually rated a speech performance as less comprehensible through time, tended to give lower overall ratings. Upgrading the evaluation through time, on the other hand, was not associated with higher overall ratings.

Also taking a dynamic approach, but now for interaction, Trofimovich et al. (2020) had interlocutors rate each other during conversations, at approximately 2.5 minute intervals. This was done while performing three conversational tasks, approximately 17 minutes in total. The results showed that mutual comprehensibility ratings tended to be high at the start of the tasks, but then, affected by task complexity to drop, and ending higher towards the end of the task performances. Like Nagle et al. (2019) for monologues, this study showed that comprehensibility is not static, but changes through time.

*Implications and Future Dynamic Research*

In other words, the perception of L2 speaking performances is not static. However, there is, as yet, no research into the dynamicity of the L2 speech itself, investigating how measures of fluency develop over time. But, as argued above, it is likely that L2 speaking fluency is not a static construct. This calls for the need to investigate how L2 speaking fluency fluctuates during a performance.

For pedagogy and assessment, the current static operationalization of speaking fluency may overlook important aspects of the construct. For pedagogical purposes, it will be helpful for learners to realize that becoming fluent in speaking does not entail striving for constant, relatively high-speed articulation rates and constant, low use of pauses. Such insights may lead to more realistic and thus easier attainable learning goals. In the classroom, teachers can talk openly about fluency (Brown, 1996, 2003), and show how, even for native speakers, fluency is a relative notion, differing between speakers and even within speaker performances. For assessment purposes, we need to know whether the current static operationalization of fluency is valid. For instance, if in addition to cyclical patterns, changes in levels of fluency are found during task performance, we need to know how to account for this. Is the average level of fluency across the task performance the best way to capture a participant's fluency? It may be the case that raters are in fact relying on the last part of the performance, as was the case for comprehensibility judgements when comprehensibility went down during performance (Nagle et al., 2019).

In other words, we need to investigate fluency levels throughout task performances, taking a dynamic approach. Ultimately, to truly understand the fluctuations through time, future research also needs to relate the dynamicity of fluency to other linguistic, affective, social, and contextual factors such as task demands. In other words, we need to take time seriously, and then, through adopting a complex dynamic system approach, explain the fluctuations. A complex dynamic system view acknowledges the fact that the human social world is one in which everything counts and everything is connected (relational principle) and one in which everything changes (adaptive principle) (Hiver, 2022, p. 478). Because time matters, measures for second language learning and for differences between individuals cannot be researched exclusively in a static way.

A potential fruitful option for researching fluency as a related and changing aspect within the time-domain of a single task-performance is to adopt the idiodynamic method (MacIntyre, 2012). The purpose of this method is to uncover fluctuations over time including the possible reasons underlying them. Indeed, Nagle et al. (2019) already adopted the idiodynamic method to investigate the dynamicity of perceived comprehensibility. With respect to dynamicity of L2 fluency, Aubrey (2022) also used the idiodynamic method to relate measures of fluency to speakers' perceived levels of anxiety and enjoyment. To my knowledge, this is the only research thus far, measuring aspects of L2 fluency through time during task performance. Aubrey (2022) asked participants to rate their levels of enjoyment and anxiety using the same idiodynamic procedures as Nagle et al. (2019) and showed how pausing in speech is related to higher levels of anxiety and to lower levels of enjoyment. Although this research indeed could show how the non-static measures of fluency and affect are related, the factor 'time' itself was not investigated. The research, with four participants, did not show whether pausing for these participants was cyclical, static, or changing through time.

In addition, when adopting a small timescale within speaking performances, it will be possible to truly investigate Skehan's (1998) limited attentional resource model: the hypothesized trade-off effects must operate on a very small timescale, for instance, because searching for difficult words (lexical complexity) directly impedes fluency, measurable on a millisecond timescale. Such research will add to our current understanding from previous research adopting a dynamic approach on larger time scales. Yu and Lowie (2020), for instance, investigated trade-off effects with full performances as units of measurement and found complex interactions on a week-by-week basis.

To conclude, for valid assessment of speaking performances and for research on language development, research needs to add time as a factor to find out whether and how speaking fluency develops through time during L2 speaking tasks.

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