A Review and Evaluation of Suzuki and Kormos' Investigation into the Link between Cognitive and Utterance Fluency: The Multidimensionality of Second Language Oral Fluency

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The analysis of fluency has taken many forms over the years, with initial research focusing primarily on fluency's subjective aspects (e.g., Lennon, 1990; Chambers, 1997). However, in recent years objective (and/or temporal) components have been identified, disentangled, and extricated from the concept of subjective fluency, allowing for broader, more nuanced fluency analysis (e.g., Cucchiarini, Strik, & Boves, 2002; Tavakoli & Uchihara, 2020). With a broader, more nuanced approach in mind, Foster (2020), in a recent paper, outlines five possible trajectories for future fluency research. These include i) investigating the "relationships that exist between perceived L2 fluency and idiomaticity of use" (p. 4); ii) investigating the "relationship between speakers' familiarity with the content of the speaking task, their utterance fluency, and their perceived fluency" (p. 6); iii) investigating what learners' "reflections on episodic disfluencies contribute to an understanding of their L2 speech processing" (p. 7); iv) investigating "the relationship between productive vocabulary size and fluency performance measures" (p. 8); and finally, v) investigating how to support "L2 fluency development … in the language classroom" (p. 10).

With this investigation, although slightly altered from Foster's (2020) initial proposition, Suzuki and Kormos address Foster's (2020) second suggestion to investigate the intersection of speaking tasks with utterance fluency. However, rather than employing perceived fluency measures, Suzuki and Kormos chose instead to include cognitive fluency measures and explore their linkages with utterance fluency. With this short review article, I examine their study that explores the relationships between cognitive fluency, utterance fluency, and speaking task.

A SUMMARY OF SUZUKI AND KORMOS (2022)

Overview

Suzuki and Kormos (2022) explore the multidimensionality of oral fluency among a group of 128 Japanese second-language (L2) learners of English. Their main intention with this study is to investigate the link between cognitive fluency (CF) and utterance fluency (UF) by elucidating their respective factor structures via an examination of "the moderator effects" (p. 6) of speaking tasks. They conduct their analysis using latent fluency variables by examining cognitive fluency in relation to utterance fluency, and they employ both confirmatory factor analysis and structural equation modeling. They use four speaking tasks which differ according to modality, to elicit as wide a range of spoken output as possible, and to examine whether output variation occurs according to task. They employ a broad range of widely recognized fluency measures to analyze participants' oral output based on three generally accepted sub-categories of fluency:

speed, breakdown, and repair fluency (Segalowitz, 2010). The results of the analysis were mixed, in that they confirmed that all four speaking tasks affected the relationships between cognitive and utterance fluency, with significant variation occurring for both speed and repair fluency, while highlighting that processing speed remained consistent across all tasks.

Theoretical Background

Suzuki and Kormos begin by examining the theoretical background of CF based on three substantive studies: Levelt's (1989, 1999) foundational speech production framework, followed by the oral production models for L2 speech proposed by Kormos (2006) and then updated and expanded upon by Segalowitz (2010). Cognitive fluency, or the internal system humans use for producing speech, as outlined in these studies, involves the three-step process of conceptualization, formulation, and articulation. Utterance fluency is referenced in Segalowitz (2010, 2016) as temporal features that are observable, and quantifiable. Some examples of these measurable features include lexical retrieval speed, articulation rate, and silent pause length. Segalowitz (2010, 2016) suggests with his framework that CF is the basis for all speech production and, thus, the foundation of UF in oral production. Segalowitz and Freed (2004), using a semantic classification task in conjunction with a repeat-and-shift task, had previously confirmed that cognitive ability played a fundamental role in L2 UF. Expanding on this foundation, de Jong et al. (2013) used a wide range of CF measures to examine the relationships that possibly existed with UF measures, and broadened our understanding of the CF-UF link.

Cognitive Fluency Measures, Utterance Fluency Measures

In their study, Suzuki and Kormos operationalize CF by employing nine measures that cover linguistic resources (productive vocabulary knowledge, morphology accuracy, syntax accuracy, and maze word accuracy (which examines the automaticity of syntactic processing, as employed in Suzuki and Sunada, 2018), processing speed (picture naming and maze word reaction time, and articulatory speed), and monitoring speed (morphology reaction time, and syntax reaction time). For UF, eleven measures were employed: speech rate, mean length of run, articulation rate, mid-clause pause duration, end-clause pause duration, end-clause pause ratio, filled pause ratio, false start ratio, self-repetition ratio, and self-correction ratio. Based on Schoonen's (2015) suggestion that a model's robustness is dependent on its level of parsimony, this combination of 20 measures potentially allowed for a robust investigation of a single-factor model, a two-factor model, and a three-factor model.

The Triad Model of Utterance Fluency and the CF-UF Link

Segalowitz (2010, 2016) developed a fluency framework whereby he suggests that a person's CF represents the foundation for that individual's UF. Segalowitz also proposed that UF is composed of three fluency sub-categories that make up the triad model, namely, speed fluency (e.g., articulation rate), breakdown fluency (e.g., silent pauses), and repair fluency (e.g., repetitions).

In a study that expanded on Segalowitz' framework, de Jong et al. (2013) investigated the relationships that exist between UF measures and a broad range of linguistic resources and processing measures. Their analysis found that the three aspects of UF (speed, breakdown, and repair fluency) related inconsistently to

the three employed CF measures (vocabulary knowledge, grammatical knowledge, and pronunciation knowledge). They also found that speaking task played a moderating role with regard to the link between CF and UF. In addition, a recent study by Kahng (2020) delved further into the link between CF and UF through the use of a narrative speaking task where, uniquely, both first language (L1) and L2 output were collected and then analyzed with the same set of UF measures as employed in de Jong et al. (2013). Kahng's examination highlighted three important findings. First, while both speed fluency (mean syllable duration) and breakdown fluency (mid-clause pause ratio) related to CF measures (lexical and syntactic), the regression models produced slightly different results. Mean syllable duration now related to two CF lexical measures (lexical retrieval speed and phrasal vocabulary size), and mid-clause pause ratio related to only syntactic processing speed. Based on these differing outcomes, she surmises that across UF dimensions, CF components may vary. Second, the regression models did not result in corresponding L1 UF measures. She suggested that perhaps mid-clause pauses and repair fluency might reflect certain aspects of L2 processing. Finally, Kahng found that mean pause duration and filled pause ratio were the strongest predictors for both the L1 and L2 in the regression models. She indicated that this finding suggests that these two measures are more aligned with general language processes than with any specific L2 CF factors.

The overall findings of these studies form the basis for a number of generalizations regarding the CF-UF link. As both CF and UF are componential in nature, certain features of CF relate to varying degrees (weak to strong correlations) with certain features of UF, while other features exhibit no measurable relationship. Furthermore, the strength of the CF-UF relationships appears to be speaking task-dependent.

Research Objectives

Based on their examination of the few previous studies that investigated the CF-UF link, Suzuki and Kormos aim to further elucidate the CF-UF link by addressing the gap in the research where a broad range of CF and UF fluency measures are elicited using a range of speaking tasks. The final aims of the study are encapsulated in the four research questions derived from their literature review:

1. What is the relationship between cognitive fluency measures of lexical, grammatical, and pronunciation knowledge?
2. What is the relationship between utterance fluency measures of speed, breakdown, and repair fluency?
3. To what extent do components of cognitive fluency contribute to different dimensions of utterance fluency?
4. To what extent is the cognitive-utterance fluency link moderated by speaking tasks?

They then addressed these questions with the following methodology that I discuss in the subsequent section.

Methodology

Suzuki and Kormos examined 9 CF measures and 11 UF measures based on the oral output from the following four speaking tasks: i) argumentative task, ii) picture narrative task, iii) reading-to-speaking task, and iv) reading-while-listening task. In order to ensure that the analysis achieved sufficient statistical power of at least 5 participant samples for every fluency measure, based on an overall measure count of 20 variables

combined, Suzuki and Kormos recruited 128 L1 Japanese L2 English learners. Although the participants' proficiency level was self-reported to be largely at the B1-B2 CEFR level (Common European Framework of Reference, Council of Europe, 2001), Suzuki and Kormos reported that "some of them seemed to have reached C1 level" (p. 6).

Speaking Task Design and its Moderating Effect

Specific to the speaking tasks with regard to the link between CF and UF, Suzuki and Kormos state that they intend to "examine the moderator effects of speaking task design" (p. 6). Thus, following the framework as presented in previous work by Skehan (2009) and Prefontaine and Kormos (2015), the tasks needed to access three specific components of speech processing, namely, content planning, preemptive activation of relevant lexical terms, and the required phonological details. They, therefore, chose the four previously outlined speaking tasks with consideration given to both "variety of task" and the potential to tap into the broadest range of productive vocabulary knowledge possible. Suzuki and Kormos chose these four tasks to ensure three specific contrasts. First, employing an argumentative task allows for a specific examination of the moderating effect of content planning. Second, contrasting a reading-to-speaking task and a reading-while-listening-to-speaking task with a picture narrative task allows for an examination of how activating linguistic items beforehand may affect the CF-UF relationship. Finally, by specifically contrasting the results of the reading-to-speaking task and the reading-while-listening-to-speaking task, it is possible to examine the CF-UF relationship relative to the phonological information.

Utterance Fluency Measures

Based on Tavakoli and Skehan (2005), Suzuki and Kormos employed the following UF measures: speed fluency (articulation rate), composite measures (speech rate and mean length of run), breakdown fluency (mid-clause ratio, end-clause ratio, filled pause ratio, mid-clause pause duration, and end-clause pause duration), and repair fluency (self-correction ratio, false start ratio, and self-repetition ratio).

Vocabulary Knowledge Measures

The Productive Vocabulary Levels Test (PVLT, Laufer & Nation, 1999) was used as a vocabulary size measure, and a picture-naming task based on de Jong et al. (2013) was employed for measuring lexical retrieval speed.

Grammatical Knowledge

Based on Suzuki and Sunada (2018), the maze task was used to measure syntactic encoding skills, while a timed grammaticality judgment test (Godfroid et al., 2015) was employed for measuring participants' grammatical monitoring processes.

Articulatory Skills

Suzuki and Kormos employed a 69-word long, controlled speech production task in order to measure the efficiency of pronunciation-related processes. Unlike previous studies that had employed single-word production tasks (e.g., de Jong et al., 2013), Suzuki and Kormos hoped to target syllabification, an essential

phonological encoding process (Levelt, 1999).

Procedure for Data Collection

Participants carried out the tasks over the course of two sessions. The tasks completed during the initial one-hour session were the PVLT, the maze task, and the grammaticality judgment test. During session two, which occurred one week later, participants completed the four speaking tasks, the speech production task, and the picture-naming task.

Analysis and Results

Suzuki and Kormos began by conducting confirmatory factor analysis (CFA) for both CF and UF. None of the proposed models resulted in a goodness of fit that was optimal for the given data based on the initially proposed groupings of measures. Following the initial CFA, Suzuki and Kormos used those results to devise a structural equation model (SEM) for predicting the three UF latent variables of speed, breakdown, and repair fluency from the two CF latent variables, namely, linguistic resource and processing speed. Although their SEM analysis indicated that the final model offered acceptable goodness of fit (SRMR < .08), neither were the SEM pathways verifiable according to available theoretical frameworks nor were the paths consistent for all of the speaking tasks. These mixed results indicate that while certain measures might predict certain outcomes for one speaking task, given a different speaking task, these relationships may or may not continue to be present.

Conclusions of Suzuki and Kormos

Suzuki and Kormos' use of SEM to investigate the CF-UF link reinforced the widely accepted notion that fluency is a multifaceted construct, and the relationship between CF and UF is elaborate, depends on the fluency and lexical measures being explored, and varies according to the speaking task being employed. For CF specifically, they state that it is 'dimensional' in nature and is perhaps best investigated by measuring and analyzing specific CF components. Regarding the dimensionality of UF, through the explicit inclusion of articulation rate, a speed fluency variable, in the analysis, Suzuki and Kormos were able to expand on Tavakoli and Skehan's (2005) latent variable framework and statistically confirm that a distinction does exist between breakdown fluency and speed fluency. The CF-UF link was shown both to be multidimensional and vary depending on which speaking task was employed for elicitation.

Interestingly, the measured processing speed for L2 oral production was found to relate, at least to some degree, to all the investigated UF facets regardless of speaking tasks. Conversely, measured lexical resource output was found to differ slightly according to each speaking task for both speed and repair fluency. Suzuki and Kormos suggest that their findings offer general but useful insights into the CF-UF link, and which measures might be most appropriate for use in future fluency research. Furthermore, the results offer insights for instructors and L2 learners alike. Such insights may prove helpful when attempting to determine which outcomes to prioritize when considering the L2 fluency developmental trajectory.

A CRITIQUE OF SUZUKI AND KORMOS (2022) AND POTENTIAL SHORTCOMINGS

This study represents a welcome investigation into the CF-UF link. It describes a novel approach to examining this link using an SEM analysis of a wide range of fluency and lexical measures elicited with four different speaking tasks. Although the study succeeds in elucidating an under-investigated area of fluency, there are several deficiencies that I would now like to discuss.

Cognitive Fluency as a Single Category

The use of CF as a single category is potentially problematic due to its extremely multifaceted nature (Segalowitz, 2010). As noted in the SEM analysis, CF may encompass subconstructs ranging from lexical resource knowledge to morphology and syntax to speed of articulation. Suzuki and Kormos also call into question the notion of CF as a "unitary construct" (p. 12) when they suggest that either a two-factor model or a three-factor model might be more appropriate when analyzing the UF-CF link. This is a critical commentary on their part because it calls into question whether CF, as defined by Segalowitz (2010), should be considered an appropriate analysis construct when, by virtue of their second and third model options, Suzuki and Kormos appear to indicate that CF needs to be separated into various component parts in order to effectively carry out an analysis.

Use of Structural Equation Modeling

A common criticism of analyses that have employed SEM revolves around degrees of freedom (df) and whether there are enough variables available for each of the factors they intend to include. In an SEM analysis, in order to achieve 1 df, usually, four variables should be employed. For example, in Suzuki and Kormos' three-factor model, the third factor, monitoring speed, is only associated with 2 variables (GJT Morphology RT and GJT Syntax RT), which means that this part of the model has a df of 0, and necessarily a perfect fit. This df of 0 implies that the overall model probably has a better fit than it should.

Additionally, Suzuki and Kormos' use of SEM appears to offer results that are of limited use. The results highlight "a complex interplay between the multidimensionality of CF and UF and speaking task types" (p. 1). Are these results too general? One can accept this result as confirmation that speaking performance is extraordinarily complex, and in order to successfully examine linguistic components and usefully elucidate aspects of fluency that offer learners, instructors, and researchers the greatest degree of utility, perhaps one should employ a combination of general and more granular analysis. Can these findings be operationalized and implemented by language instructors or language learners? Or are these findings and their potential utility limited to the world of research?

Choice of Speaking Tasks

The results of Suzuki and Kormos' analysis indicate that relationships vary according to the speaking task employed. Therefore, this raises the question of which speaking task should be used for which circumstance. Did they choose the correct speaking task for their intended analysis? Moreover, as different speaking tasks appear to tap into different lexical knowledge, and elicit oral fluency differently from task to task, we can surmise that the nature of speaking tasks requires more thorough investigations. Future studies are needed that more clearly elucidate which speaking tasks should be employed in order to achieve

maximum appropriateness and effectiveness for the intended analysis.

Silent Pausing and Filled Pausing

Upon reading and analyzing Suzuki and Kormos' paper, a number of questions were raised regarding pauses: i) what is an appropriate cut-off threshold for silent pauses; ii) should silent pauses be examined and analyzed holistically as one group, or should they be divided into 'between clause' and 'within clause' sub-categories; iii) should filled pauses be categorized as a component of breakdown fluency or repair fluency, or considered separately; iv) should filled pauses also be subdivided into two categories, 'between clause' and 'within clause' as per silent pauses, or should researchers continue to analyze them holistically; and v) do filled pauses and silent pauses function similarly as a linguistic mechanism for learners of varying levels of proficiency. These questions are worthy of future investigation.

Another issue is the operationalization of silent pauses using the 250ms threshold. This is problematic for two reasons. First of all, Suzuki and Kormos, despite using Japanese L1 participants, chose this threshold based on Dutch and Turkish L1-speaking learners of English (de Jong & Bosker, 2013). This raises the question of whether or not a threshold established using an L1 that is considerably linguistically distant from Japanese L1 is appropriate. It has been noted that Japanese speakers' use of silent pauses tends to be both more frequent and longer on average than that of the two L1 language groups referenced in de Jong and Bosker (2013). Furthermore, de Jong (2012) has also employed a slightly longer threshold of 350ms for another study that involved L2 learners of Dutch who represented 43 different L1 backgrounds. From an L1 Japanese participant perspective, I point to a study by Onoda (2014) that appeared in the book *Exploring EFL Fluency in Asia* (p. 123), where she operationalized the silent pause threshold at 1000ms (or, 1 full second). Furthermore, Saito et al. (2015), in a study that investigated the influence of listener judgments on L2 comprehensibility and accentedness by considering linguistic dimensions that were operationalized as 18 different speech and lexical measures, employed 400ms as the silent pause cut-off threshold. The participants in this study were 40 L1 French speakers of English. Therefore, a critical aspect of fluency studies that remains unresolved is the appropriate threshold cut-off when considering silent pauses for participants from different L1 backgrounds. Should silent pause threshold length be L1 dependent? Are pausing analysis results derived from one L1 cohort applicable to an L1 cohort from a different linguistic background? Is there a point at which generalizations of fluency measures such as silent pause length become untenable?

Proficiency Level

Finally, Suzuki and Kormos do not consider a range of proficiency levels. A common weakness among fluency investigations, regardless of cohort size, pertains to all participants being at roughly the same proficiency level. Although a common proficiency level possibly allows for a generalization of findings at that particular level, it does not necessarily allow for a wider extrapolation across varying proficiency levels. Thus, future studies employing a similar analysis structure would be advised to enroll participant cohorts from a range of proficiency levels in order to determine if the results are consistent across the fluency developmental trajectory.

CONCLUSION

Suzuki and Kormos are the first researchers to examine in a broad manner the link between CF and UF using a combination of confirmatory factor analysis followed by an SEM analysis. Despite the previously mentioned shortcomings, their study is critical for the wider field of research because it opens the door for future studies that employ SEM to investigate the CF-UF construct at varying levels of proficiency, and whether CF should be considered holistically, or perhaps sub-divided into smaller, more precise categories.

Although employing factor analysis and SEM is impractical for most typical language teaching environments, the results of studies such as these are not. Research of this nature informs teaching practice by allowing language instructors of all educational levels to better evaluate the most appropriate speaking task for their classroom needs, and builds on our ever-expanding understanding of the specific utility of speaking tasks, and which tasks should be employed for which learning intentions. Particular considerations are proficiency levels, targeted output, and both time and resource constraints. Some of the possible targeted output might include recall ability, elicitation accuracy, productive vocabulary comparison, grammatical structure comparison, etc. Therefore, given practical considerations, this kind of fluency research offers intriguing implications for supporting L2 fluency development in the classroom, specifically, utterance fluency (UF).

Furthermore, UF consists of arguably the most readily measured aspects of fluency, and thus, investigations of this nature that isolate and examine discrete components of UF in relation to speaking tasks represent a practical, classroom-friendly approach for both language instructors and learners. For example, Suzuki and Kormos' results highlight the importance of speed fluency (e.g., articulation rate – syllables produced over time, excluding pauses). As the automatization of speech analysis with software programs such as PRAAT (Boersma & Weenink, 2012) has become ever more accessible, the door has now been opened for real-time, in-class, fluency assessment in such a manner that has not heretofore existed. Employing this type of in-class analysis allows for the introduction of both general and specific speaking tasks that target aspects of fluency, relevant to both the group at large and individual learners.

Finally, while the most common limiting factor for researchers tends to be access to enough participants and the resources to analyze their output, the limiting factor that usually besets instructors and learners alike, is time. Therefore, the ability to quickly assess fluency in an objective manner, perhaps even allowing students the opportunity to conduct a fluency analysis of their own speech production, represents an invaluable step forward in classroom assessment. Studies such as this one by Suzuki and Kormos bring this assessment approach closer to concrete actualization.

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ABSTRACT

A Review and Evaluation of Suzuki and Kormos' Investigation into the Link Between Cognitive and Utterance fluency: The Multidimensionality of Second Language Oral Fluency

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With this article, I investigate a 2022 study by Suzuki and Kormos that explores the multidimensionality of oral fluency among a group of 128 Japanese second-language learners of English. This study intends to use "speaking task design" to elucidate the relationships between cognitive fluency (CF) and utterance fluency (UF), and more clearly delineate which linguistic aspects contribute most significantly to CF and UF.

Suzuki and Kormos undertake this analysis by employing four different speaking tasks (argumentative, picture narrative, reading-to-speaking, reading-while-listening-to-speaking) and a broad range of linguistic knowledge and fluency measures (vocabulary size, lexical retrieval speed, sentence construction skills, grammaticality judgments, articulatory speed). Through their use of structural equation modeling (SEM), Suzuki and Kormos' main finding highlights the "complex interplay between the multidimensionality of CF and UF and speaking task types." Although the contribution of processing speed for UF was found to be consistent regardless of speaking task, significant variation across tasks was found for speed and repair fluency.

This review article begins with a short overview of the Suzuki and Kormos (2022) study, followed by an outline of the critical findings. Consideration is then given to the study's most robust results, followed by commentary on the weaker aspects of the research. I then close with a short discussion on the role of such a study within the broader field of fluency research and suggestions on how this study may be improved upon, and present various pedagogical implications of the research.

要　約

認知的流暢性と発話的流暢性の関連性に関する鈴木と Kormos の調査のレビューと評価 ― 第二言語口頭流暢性の多次元性 ―

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本稿では，日本人英語第二言語学習者128名を対象に，流暢性の多次元性を検討した Suzuki & Kormos (2022) の研究成果を紹介する。本研究では，「スピーキング課題デザイン」を用いて，認知的流暢性（CF）と発話流暢性（UF）の関係を明らかにし，どの言語的側面が CF と UF に最も大きく寄与しているかをより明確にすることを意図している。

彼らは，4つの異なるスピーキング課題（i. 論証，ii. 絵物語，iii. 読み聞かせ，iv. 読み聞かせ）と，幅広い言語知識と流暢さの測定（i. 語彙量，ii. 語彙検索速度，iii. 文構成能力，iv. 文法性判断，v. 調音速度）を用いてこの分析を行っている。Suzuki & Kormos (2022) は，構造方程式モデリング（SEM）を用いて，「CF と UF の多次元性と発話課題のタイプとの間の複雑な相互作用」を明らかにした。UF に対する処理速度の寄与は発話課題によらず一貫していることがわかったが，速度と修復流暢性については課題間で有意なばらつきが見られた。

本総説では，まず，Suzuki & Kormos (2022) の研究概要を簡単に説明し，次に重要な知見を概説する。次に，この研究の最も強固な結果について考察し，その後，研究の弱い側面について解説を行う。最後に，流暢性研究の広い分野でのこのような研究の役割について短い議論を行い，この研究がどのように改善され得るかについての提案を行い，この研究の様々な教育的含意を提示することで終わる。