# Fluency in Writing: A Multidimensional Perspective on Writing Fluency Applied to L1 and L2

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## Abstract

Some texts are easy to write, others are a real struggle. This article presents a brief review of how fluency has generally been measured in writing research. In addition to these 'traditional' measures, we define a wide range of complementary measures that might be diagnostic of fluency, by taking also more process-related characteristics into account. These complementary measures are derived from keystroke logging data, which were collected from an experiment among 68 students who wrote two descriptive texts, one in their mother tongue and the other in their second language. By using correlation and principal component analyses, we have reduced the set of variables and created a new multidimensional model to better address the complexity of fluency in writing. This model consists of four dimensions: (a) production, (b) process variation, (c) revision, and (d) pause behavior. These four components together create a multidimensional perspective on writing, which enables us to differentiate between fluent and less fluent writers.
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## 1. Introduction

Some texts hardly require any effort to write, whereas other texts—or even sentences—are the result of an intense struggle, with the blinking cursor and the backspace key as leading actors. Most of us also experience "writing fluency" in a foreign language as more problematic than writing in our first language. But, what exactly are the underlying concepts of writing fluency? Does it mean that some writers are able to finish a text of 500 words in a shorter period of time than others? That they produce more characters or words in a comparable amount of time? That they pause less during writing? Or that they do not need to revise or edit their first draft as intensively?

Fluency has been on the research agenda of language researchers for many years. Especially in speech and reading studies, the concept is quite clearly defined (e.g., Bosker, Pinget, Quené, Sanders, & de Jong, 2013; Segalowitz, 2010; Skehan, 2003, 2009). In writing, however, the definition of the concept is more vague. In contrast to spoken language, fluency in writing has no rhetoric function as such. If a person hesitates in phrasing a sentence in oral communication, or interrupts his or her discourse for a longer time, it will certainly be noticed by the listener and will probably influence the interaction. However, pausing during text production does not influence the reader-writer interaction, since a printed text normally does not (explicitly) reveal that the writer has paused at a certain instance in the text.

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In writing research, fluency has been the topic of a myriad of studies, which focus for instance on developmental writing (Berninger, Cartwright, Yates, Swanson, & Abbott, 1994; McCutchen, Covill, Hoyne, & Mildes, 1994), writing modes, juxtaposing oral and written modes or handwriting and typing (Olive, Favart, Beauvais, & Beauvais, 2009; Shanahan, 2006; Horenbeeck, Pauwaert, Van Waes, & Leijten, 2012), and especially L1 and L2 writing (Chenoweth & Hayes, 2001; Johnson, Mercado, & Acevedo, 2012; Kobayashi & Rinnert, 2013; Kormos, 2012; Latif, 2012; Lindgren, Sullivan, & Spelman Miller, 2008; Ong, 2014; Ong & Zhang, 2010; Snellings, Van Gelderen, & De Glopper, 2002; Tillema, 2012). In most of these studies, a distinction is made between two or more groups of participants (e.g., 5th graders vs. 9th graders, L1 vs. L2), or in a within participants design the kind of tasks (e.g., narrative vs. argumentative tasks) or writing modes (e.g., handwriting vs. keyboarding) are compared. The relation between fluency and quality is also a recurring topic, although no clear conclusions could be drawn so far (see, for instance, Snellings et al., 2002; Yan et al., 2012).

In this article, we aim at describing an integrated approach to fluency, combining various perspectives. The approach that we present in this article is based on keystroke logging observations in a writing study that addressed the difference in fluency between L1 and L2 using two writing tasks. Starting from existing fluency measures, we will bring together traditional process and product measures, both in isolation and in combination with each other. Moreover, we will introduce new perspectives at different levels, by focusing on writer characteristics (individual measures), writing tasks (specific genres) and writing contexts (use of tools and sources). In a first stage, we will explore a wide range of potential fluency indicators. This results in a list of about 200 variables. Subsequently, we will reduce the number of indicators using correlation and Principal Component Analyses (PCA) to finally reach a comprehensible set of ten fluency indicators, grouped in four underlying categories. Our main aim is to construct a manageable set of components and variables that enable us to describe and measure writing fluency from a multidimensional perspective. In our point of view, separate measures and sub-dimensions of fluency are needed to paint a more comprehensive and fine-grained picture of fluency performance in writing.

## 2. Fluency in speech and writing

Most language users experience and even get frustrated by the fact that they are less fluent in L2 than in L1, even if they master a foreign language at a high proficiency level. To get a better understanding of what this fluency gap underlies and how to overcome it, a large number of studies have been set up, both in oral and in written communication (see also, Segalowitz, 2010 for a comprehensive review).

In the development of measures to define fluency, writing researchers have largely built on insights from speech studies. Researchers in this research have long been concerned with identifying a large variety of critical features to adequately measure oral fluency (e.g., Goldman-Eisler, 1961; Lennon, 1990). Kormos (2006, p. 163), for instance, provides a summary of the most frequently used measures of fluency in oral studies and ends up with ten measures, which can be classified as follows: (a) Pauses (e.g., total pause time, silent and filled pauses per minute, length of pauses), (b) Disfluencies (i.e., breakdown of fluency, indicated by e.g., repetitions, repairs), (c) Rate (e.g., speech and articulation rate; length of runs), and (d) Pace and Stress (e.g., number and proportion of stress words) (see also Towell, Hawkins, & Bazergui (1996), Koponen and Riggenbach (2000) and Skehan (2003)). Iwashita, Brown, McNamara, & O'Hagan (2008) used a comparable set of variables as a starting point to better define the relationship between proficiency and fluency. Their analysis of more than 200 recordings of L2 speakers with different proficiency levels showed that total pause time, silent pause rate and speech rate correlate the highest with proficiency level.

The main findings on fluency in writing studies are very comparable. It is now commonly accepted that fluent writing processes are characterized by short pausing times, few revisions and a high production rate (MacArthur, Graham, & Fitzgerald, 2008). The use of the criterion last mentioned is particularly frequent in writing research. Kellogg's studies (1996, 2004) are typical examples of this approach to fluency. He demonstrated that initial planning leads to a decrease of cognitive effort in the transcription phase, positively influencing fluency. In his research, Kellogg refined the criterion of production rate by introducing two measures of production fluency: *Fluency I* refers to the mean number of words in the transcription phase (i.e., total time on task minus initial planning time); *Fluency II* is calculated on the basis of the gross time on task. This theme has inspired a lot of follow-up studies, and Kellogg's fluency measures have been widely adopted (Graham & Perin, 2007; Johnson et al., 2012; Leijten, Van Waes, & Ransdell, 2010; Snellings et al., 2002; Van Waes, Leijten, & Quinlan, 2010). In general, the Fluency II-approach has resulted in more comprehensible