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The relative contributions of L1 fluency, L2 proficiency, and extraversion to L2 fluency

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Résumé

La corrélation positive entre l'extraversion et le débit parolier en langue seconde (L2 ; Dewaele et Furnham, 2000) suggère que la personnalité contribue à la variabilité inter-apprenant observée quant à la fluidité de la parole L2 (fluidité L2). Ceci peut être dû au fait que les introvertis aient des taux de base de dopamine supérieurs à la moyenne. Ce taux augmente davantage dans des contextes à haute stimulation – notamment, lors de l'élocution en L2 – engendrant ainsi une inhibition de leurs processus attentionnels et de leur mémoire de travail (Lieberman et Rosenthal, 2001). Cependant, les recherches antérieures n'ont pas tenu compte de la fluidité en langue première (L1) ni de la compétence L2, deux facteurs pouvant influencer la fluidité L2 (p. ex., Hilton, 2008 ; de Jong et al., 2015). De surcroît, peu d'études ont comparé les contributions relatives des nombreuses variables pouvant prédire la variabilité de la fluidité L2. Notre étude a donc cherché à examiner combien de la variabilité observée au niveau de la fluidité L2 pouvait résulter de l'extraversion, et ce, après avoir tenu compte de la compétence lexicale L2 et de la fluidité L1 chez 47 anglophones apprenants du français. Les résultats d'une analyse à régression multiple ont révélé que, bien que la compétence lexicale L2 et la fluidité L1 aient été des prédicteurs significatifs (expliquant 25 % et 23 % de la variabilité quant au débit de la parole L2, et 15 % et 31 % de la variabilité quant au débit parolier L2 taillée [angl. *Pruned L2*

speech rate]), l'extraversion ne constituait pas un facteur indépendant pouvant expliquer la variabilité de la fluidité L2.

Mots-clés : la fluidité L2 - la fluidité L1 - la personnalité - l'extraversion - la compétence lexicale L2

Abstract

A previously documented, positive correlation between extraversion and second language (L2) speech rate (Dewaele and Furnham, 2000) suggests that personality may contribute to inter-learner variability in L2 fluency. This is likely because introverts have higher base-levels of dopamine, and experience impaired attentional and working-memory processes (Lieberman and Rosenthal, 2001) especially in high-stimulation contexts such as L2 speech production, where more of this neurotransmitter is released. However, previous research has not controlled for L1 fluency and L2 proficiency, both of which have since been shown to affect L2 fluency (e.g., Hilton, 2008; de Jong et al., 2015). Additionally, there is a lack of research comparing the relative contributions of the multiple variables that predict variance in L2 fluency. Accordingly, we addressed the following question: after taking account of L2 lexical proficiency and L1 English fluency, how much fluency variance observed in the productions of 47 learners of L2 French can be explained by extraversion? Results from a sequential regression analysis revealed that while both L2 lexical proficiency and L1 fluency were significant predictors (explaining 25% and 23% of variance in L2 speech rate and 15% and 31% of variance in L2 pruned speech rate), extraversion as an independently factor id not explain variance in L2 fluency.

Keywords: L2 fluency - L1 fluency – personality – extraversion - L2 lexical proficiency

1. Introduction

Second language (L2) speakers vary widely in their degree of oral fluency. Understanding how various factors promote fluency is particularly important for L2 researchers, teachers, and learners, given that its absence can lead to various negative consequences (e.g., frustration, embarrassment [Ożańska-Ponikwia, 2018], loss of interlocutors' attention [Lennon, 2000]). The importance of this phenomenon, coupled with the high degree of inter-learner variation observed, make it a significant topic of research with studies having demonstrated correlations with many factors including working memory (e.g., Georgiadou and Roehr-Brackin, 2017), linguistic processing skills (e.g., Segalowitz and Freed, 2004), linguistic knowledge (e.g., de Jong et al., 2013), L2 immersion (e.g., Trenchs-Parera, 2009), and first language (L1) fluency (e.g., de Jong et al., 2015). One personality trait, extraversion, has also been shown to correlate with L2 fluency (Dewaele, 1998; Dewaele and Furnham, 2000).

Several physiological and behavioral characteristics tied to extraversion might explain this relationship (see Dewaele, 2002). For example, introverts, who have higher base-levels of dopamine, experience impaired attentional and working-memory processes (Lieberman and Rosenthal, 2001) when more of this neurotransmitter is released in high-stimulation situations like L2 speech production. Processes involved in speech production may be slowed down, leading to less fluent speech by introverts. Moreover, if extraverts, who are sociable, talkative, and gregarious (Dörnyei, 2005) are more active inside and outside the classroom, they may be exposed to higher quantities of rich L2 input and have more frequent opportunities to produce meaningful language, or output.[1] Since the 1980s, both input (e.g., Krashen, 1985; Flege and Liu, 2001; Flege, 2009) and output (Swain, 1985, 1993) have been emphasized for successful acquisition as they result in gains in L2

[1] It should be noted that the effect of extraversion on increased input and output outside the classroom may be restricted in learner populations where access to the L2 outside the classroom is unavailable.

knowledge, and increased automatization of existing knowledge, both of which benefit L2 fluency.

While previous research on the extraversion-L2 fluency link is well motivated, three limitations exist. First, studies that found significant correlations between L2 fluency and extraversion (Dewaele, 1998; Dewaele and Furnham, 2000) have not controlled for proficiency, which since then has been shown to play an integral role in the production of fluent speech (e.g., Hilton, 2008). For example, in Dewaele and Furnham (2000), while a positive correlation between extraversion and L2 fluency was found in learners recruited from one language classroom, without an independent measure of proficiency, we cannot be certain as to whether the relationship is explained by extraversion or equally/rather by proficiency. Second, research is beginning to show that temporal characteristics (e.g., speech rate, mean length of pause) in the L1 predict these same characteristics in the L2 (e.g., de Jong et al., 2015). It is therefore essential that L1 fluency is studied to control for the possibility that fluency is stable cross-linguistically. Third, few studies have compared the contributions of multiple independent variables to L2 fluency. Comparing the amount of variance explained by different predictors would shed light on their relative importance for fluency development.

These gaps in the investigation of the effect of extraversion on L2 fluency warrant a study that: (1) investigates the extent to which the personality trait predicts L2 fluency after controlling for L1 fluency and L2 proficiency; and (2) compares the relative contributions of these variables to L2 fluency. To accomplish these objectives, we answer the following question: After accounting for L2 lexical proficiency and L1 fluency, how much of the variance observed in learners' L2 fluency is explained by extraversion? We respond to this by using multiple regression, an underused statistical technique in multivariate L2 research (Plonsky and Oswald, 2016), to compare the effects of extraversion, lexical, and L1 fluency proficiency (see §3.2 for details regarding measures of independent variables) on the L2 fluency of 47 Anglophone learners of French. Fluency measures (speech rate and

pruned speech rate) were taken from speech samples obtained using a picture description task (see §3.2.1 for a detailed description).

2. Literature review

2.1 L2 fluency

According to Segalowitz (2010), there are three ways to consider oral fluency. *Cognitive fluency* is the smoothness of the underlying psychological processes involved in production. *Utterance fluency* is the observable and measurable temporal fluency of audible speech. *Perceived fluency* is the subjective evaluation on the part of a listener based on features observed in utterance fluency. In the present study, utterance fluency alone is examined since it is objective and can be easily operationalized for quantitative research. This type of fluency is determined by measures of three generally accepted aspects, distinguishable in terms of how they are measured (Tavakoli and Skehan, 2005: 254). Breakdown fluency (Skehan, 2003) involves partial interruptions in the flow of speech. Common measures include length and number of unfilled pauses (silent pauses typically longer than 400 milliseconds; e.g., Freed, 2000), filled pauses (non-lexical filled pauses, e.g., "um"; e.g., Grantham O-Brien, 2014) and total amount of silence. Speed fluency refers to how quickly speech is produced and is commonly measured by articulation rate (total n of syllables / total phonation time [excluding both filled and unfilled pauses] expressed in syllables / second; e.g., Préfontaine et al., 2015) and mean length of run (MLR; total n of syllables / n of utterances between pauses 250 milliseconds or longer; Préfontaine et al., 2015). Repair fluency (Skehan, 2003), is the frequency at which speakers self-correct as measured by the number of reformulations, repetitions and/or false starts within a given speech sample. Although some measures tap into specific aspects of fluency, other more global measures (e.g., speech rate [SR], pruned SR [e.g., Derwing et al., 2009]) incorporate multiple fluency aspects.

To better understand inter-learner variation in L2 fluency, theoretical models have tried to describe the complex processing mechanisms that are important when speaking an L2. Studies on L2 speech production consistently refer to Levelt's (1989, revised 1999) model and de Bot's (1992) subsequent adaptation for bilinguals. While intended to describe normal spontaneous speech production in adult monolinguals, Levelt's static model is largely accepted in L2 research since it serves as the basis for de Bot's bilingual model. It formalizes the generally accepted perspective on linguistic, psycholinguistic, and cognitive processes that occur during speech production (Segalowitz, 2010) and consists of several processing components and two knowledge stores (one containing encyclopaedic knowledge, the other storing lexical items). While highly useful as a theoretical description of monolingual speech processes, Levelt's model fails to explain various L2 speech phenomena (e.g., slower speech of non-native speakers). de Bot (1992) addressed this in his modified model for second and subsequent language speech. In monolinguals, the processing components function autonomously, but in parallel. The system is efficient, automatic, does not require conscious attention of the speaker, and draws upon sufficient grammatical and lexical knowledge. Degree of automatization, and amount of linguistic knowledge are the two main variables differentiating L1 and L2 speech.

L2 learners must have sufficient linguistic knowledge for L2 production, but they must also possess the necessary skills to process language in real time. As these processing skills become more automatic, fluency improves. In learners with less L2 production and communication experience, the functioning of these processes requires time, effort, concentration, and monitoring (Lennon, 2000: 27) leading to fluency breakdowns. In contrast, for experienced learners, speech production processes (e.g., articulation and sometimes lexical access) are automatized, leading to more native-like speech (Lennon, 2000: 27). It is important to note that linguistic knowledge, and automatization are intertwined, but distinct. As explained by Thomson (2015: 209), some L2 learners with low levels of linguistic knowledge may be able to access it easily and quickly, resulting in oral speech that is basic, but

nevertheless fluent. While operationalizing lexical and grammatical knowledge for experimental research is more straightforward, tapping into automatization serves as a methodological challenge since it is not possible to directly measure cognitive processes. For this reason, in addition to time restrictions of the experimental session, we focus solely on L2 proficiency, L1 fluency, and extraversion in this study while acknowledging that degree of automatization is another important factor in L2 fluency.

2.2 L2 proficiency

It is easy to observe that without adequate linguistic knowledge, L2 speech is slow, labored, and fraught with hesitations. However, despite the fact that the importance of lexical and morphosyntactic knowledge is clearly underlined in theoretical models of L2 production (De Bot, 1996; Kormos, 2006), empirical studies examining the link between vocabulary and grammar and L2 speech are limited. Two notable exceptions are Hilton (2008) and de Jong et al. (2013).

To investigate the role of lexical and grammatical knowledge in L2 fluency, Hilton (2008) analyzed speech from 56 L2 speakers of English, Italian, and French (various L1s). Speech data were elicited using two video description tasks and grammar and vocabulary were assessed using computerized DIALANG (dialang.org) tests designed according to the Common European Framework. Significant correlations were found between both vocabulary (r = -.39 to -.66) and grammar (r = -.47 to -.73) and all fluency measures (words per minute, percentage of time speaking spent in hesitation, mean length of hesitation, rate of hesitation per 1000 words, and rate of retracing [number of repetitions, reformulations, and restarts per 1000 words]). Overall, the study confirmed the somewhat intuitive relationship between linguistic knowledge and spoken L2 fluency.

De Jong et al. (2013) collected speech data from 179 learners of L2 Dutch (various L1s) by assigning eight computer-administered monologue speaking tasks

contrasted on three dimensions: complexity (complex vs. simple), formality (informal vs. formal), and discourse type (descriptive vs. persuasive). Six fluency measures tapping into all three aspects of L2 utterance fluency were employed: breakdown fluency (number of silent and filled pauses, mean duration of silent pauses), speed fluency (inverse articulation rate [mean duration of syllables or speaking time / total n of syllables]), repair fluency (number of corrections and repetitions). To evaluate L2 linguistic knowledge, vocabulary (paper and pencil productive test) and grammar (142-item task assessing a range of features via fill in the blank, multiple choice and reordering of constituents task types) tests were administered. Grammar knowledge was significantly correlated with four fluency measures (number of silent pauses, number of filled pauses, number of corrections, mean syllable duration; r = .20 to -.47, p < .05). Lexical knowledge was significantly related to the four previously mentioned fluency measures as well as number of repetitions (r = -.24 to -.58, p <. 05). We see that utterance fluency measures vary in the strength of their relationships with linguistic knowledge. While L2 proficiency may be more important for explaining differences in speed fluency (measured as mean syllable duration in this study), for measures of breakdown fluency like mean silent pause duration, factors such as personal speaking style may matter more (de Jong et al., 2013: 913).

2.3 L1 fluency

Until recently, fluency researchers had ignored L1 temporal measures in L2 speech analyses, assuming that L1 and L2 fluency were separate, language-specific constructs. However, given variation in L1 fluency, researchers began considering the possibility that fluency is a stable characteristic that is "specific to an individual" (Derwing et al., 2009).

Riazantseva (2001) first stumbled upon the L1-L2 link when examining speech samples obtained from L1 Russian speaking learners of English using topic narrative and cartoon description tasks. She found that while 16 advanced learners

made significantly shorter, more target-like pauses in L2 English than in L1 Russian, 14 intermediate learners did not adjust their pausing in a target-like way, continuing to make longer L1-like pauses in L2 English. Results suggested that L2 fluency differences may be due to cross-linguistic influence that weakens with increased L2 proficiency.

In Towell and Dewaele's (2005) study designed to disentangle the influences of psycholinguistic factors related to L2 fluency, L1 and L2 speech samples were obtained from 12 Anglophone learners of L2 French using a cartoon film retelling task completed both before and after six months of study abroad. Positive Spearman Rank correlations between L1 and L2 SR were slightly higher at time 1 ($r_s = 0.81$, $p < .002$) than at time 2 ($r_s = .73$, $p < .007$), suggesting again that L1 influence decreases with L2 development.

Derwing et al. (2009) were first to examine the L1-L2 fluency link in depth. Their longitudinal study related measures for 16 L1 Slavic and 16 Mandarin speakers of L2 English three times over two years (time 2 after two months, time 6 after one year, and time 7 after two years). Fluency was determined based on L1 and L2 speech from a narrative task, rated by trained judges and temporal measures (SR, pauses per second, pause length, and pruned SR). Although significant correlations between judges' L1 and L2 ratings were found (Slavic: $r = .620$; Mandarin: $r = .527$, $p < .05$) at time 2, at times 6 and 7 there were no significant relationships. In terms of temporal measures, at time 2, there were significant correlations between all L1 and L2 fluency measures for both language groups. At times 6 and 7, significant L1-L2 correlations were found for the Slavic group only (except not with pruned SR at time 7). We observe here that the L1-L2 fluency relationship is strongest at the initial stages of L2 exposure and that its strength may depend on typological similarities.

Most recently, de Jong et al. (2015) used the same eight monologue speaking tasks used in de Jong et al. (2013; see §2.2) to elicit L1 and L2 speech samples from participants. L2 lexical proficiency was measured as in de Jong et al. (2013) and used to represent overall L2 proficiency. Fluency measures were obtained in the L2 Dutch

of intermediate-advanced L1 Turkish (n = 24) and English (n = 29) speakers. The following measures were taken: speed fluency (mean syllable duration), breakdown fluency (mean length of silent pauses within and between analysis of speech units [ASU], number of silent pauses per second of speaking time, and number of non-lexical filled pauses per second speaking time), and repair fluency (number of repetitions per second speaking time, number of corrections per second speaking time). All L2 fluency measures could be predicted by the L1 fluency measures with amount of explained variance ranging from 21% for syllable duration to 57% for mean length of pauses between ASU. Measures evidently varied in terms of how much they reflected speakers' general speaking styles. Results support the hypotheses of de Jong et al. (2013), who found that speed fluency was most influenced by lexical knowledge and suggested that repair and breakdown fluency may be more closely related to personal speaking style, than L2 knowledge.

Huensch and Tracy-Ventura (2017) examined the changing influence of L1 fluency, L2 proficiency, and cross-linguistic differences on L2 fluency over time. L1 English learners of L2 Spanish (n = 24) and French (n = 25) participated in two testing sessions before and after studying abroad (SA). By testing both L2 Spanish and L2 French, the researchers were able to investigate the effects of cross-linguistic differences on fluency development. L1 and L2 speech samples were gathered using a picture description task, and fluency was operationalized according to various measures of speed (mean syllable duration), breakdown (mean silent pause duration within ASU and between ASU, number of silent pauses/second, filled pauses/second), and repair (repetitions/second, corrections/second) fluency. Overall proficiency was measured using an Elicited Imitation Test (EIT) that required learners to listen to and repeat stimuli aloud. Before SA, only three standard regression models of L2 fluency (mean syllable duration, mean silent pause duration within ASU, and silent pauses per second) were significant, explaining 19-34% of variance. L1 fluency significantly predicted mean syllable duration and silent pauses per second, L2 proficiency predicted mean syllable duration and mean silent pause

duration, and target language predicted mean silent pause duration within ASU. After five months of exchange, all models of L2 fluency measures were significant, explaining 13-47% of variance. In all models, L1 fluency was a significant predictor and proficiency was not. Target language contributed significantly to L2 fluency in four models. Contrary to findings from previous studies (Riazantseva, 2001; Towell and Dewaele, 2005; Derwing et al., 2009) where the role of L1 fluency weakened with increased L2 experience, L1 fluency became more important after five months of SA. The researchers suggested one possible explanation for this: before SA, when learners' processing is slower and less automatic, differences in processing explain most variation in L2 fluency. However, when learners' automaticity improves, fluency differences may be more related to personal speaking style (L1 fluency; Huensch & Tracy-Ventura, 2017: 780). It is possible that at this level of study, proficiency in all participants was high enough that it did not lead to fluency variation.

In addition to highlighting the fact that the relationships between the various predictors of fluency are highly complex and constantly changing, the studies summarized here strongly suggest that a large proportion of L2 fluency measures may reflect not only linguistic knowledge and automatization, but also the way in which an individual speaks, regardless of the activated language. These findings underline the necessity for researchers to obtain L1 fluency measures in L2 speech research, and suggest that in previous research, L1 fluency may have provided "an unwanted source of noise that may have masked important L2 fluency phenomena" (Segalowitz, 2010: 35).

Next, we discuss a less thoroughly studied fluency predictor, extraversion.

2.4 Extraversion

Personality predicts "…happiness, physical and psychological health, spirituality, and identity…the quality of relationships with peers, family, and romantic others at an interpersonal level…occupational choice, satisfaction, and performance…community involvement...political ideology" (Ozer and Benet-Martínez, 2006: 401). It is thus somewhat surprising that research investigating personality's effect on L2 acquisition has been limited compared to that on most other individual differences (e.g., motivation), especially when we consider the fact that personality is a principal theme in psychology, constituting the object of its own active field of research (Dörnyei, 2005: 14). According to the dominant model used in current personality research, the Big Five model (e.g., McCrae and Costa, 2003), an individual's personality consists of five bi-polar continuous traits: extraversion, neuroticism, conscientiousness, agreeableness, and openness to experience. Born out of the hypothesis that factor analysis could determine broad universal dimensions based on an exhaustive list of thousands of personality adjectives, the five traits have been found to be effective descriptors of individuals' behavior, and remain stable throughout life (Costa and McCrae, 1997) and across cultures (McCrae and Costa, 2003).

In comparison to the four other traits, L2 studies have almost exclusively examined the effect of extraversion on language ability (e.g., Busch, 1982; Dewaele, 1998; Dewaele and Furnham, 2000). Extraverts demonstrate warmth, gregariousness, assertiveness, activity, excitement-seeking, and positive emotions. On the other hand, introverts are passive, quiet, reserved, withdrawn, sober, aloof, restrained, and less talkative (Dörnyei, 2005). One can immediately understand then why an initial interest in extraversion emerged in applied linguistics in the 1970s. This fascination led to a number of studies examining its effect on language use (Furnham, 1990), the hypothesis being that extraverts should be more successful in their L2 learning since they are likely more active outside of the classroom, giving rise to a greater amount of input (Krashen, 1985) and output (Swain, 1985, 1993), both of which are crucial

for L2 development. Unfortunately, this early work (e.g., Smart et al., 1970; Naiman et al., 1978; Ehrman and Oxford, 1995; Carell et al., 1996), which operationalized L2 ability using written measures, revealed unexpected results: no systematic or significant relationship (Dewaele and Furnham, 1999). As a result, applied linguists largely accepted the fact that extraversion was not important in language learning, dubbing it the "unloved variable in applied linguistics research" (Dewaele and Furnham, 1999). However, Dewaele and Furnham (1999) believed that its reputation was undeserved, and re-addressed the unanticipated findings, expecting that theoretical and methodological flaws were to blame. They argued that the exclusive use of written measures of L2 ability might have concealed important effects of extraversion on other L2 modalities, proposing that while extraversion may not influence overall success, it should minimally play a role in L2 speech production.

As previously mentioned, Dewaele and Furnham (1999, 2000) postulated that a relationship between extraversion and L2 fluency might be expected because of physiological and behavioural characteristics of extraverts. In terms of the former, extraverts have: (1) lower base-levels of dopamine and thus more stress resistance; (2) superior working memory; and (3) lower levels of anxiety. Introverts' higher base-levels of dopamine and norepinephrine (Dewaele, 2002) cause them to experience impaired attentional and short-term memory processes when more of this neurotransmitter is released in high-stimulation contexts (Lieberman and Rosenthal, 2001) like L2 speech production. The additional dopamine raises introverts' arousal level to a point exceeding their optimal degree of stimulation, effectively inhibiting automatic speech production processes (e.g., lexical retrieval). Rather than occurring automatically, processes slow down and function in a serial, controlled way. Extraverts' lower arousal level and insensitivity to punishment signals may be the cause of their better stress resistance, which aids in situations with time pressure and high influxes of information (i.e. L2 communication; Matthews and Dorn, 1995: 391). The second physiological advantage of extraverts is their superior short-term memory (Matthews, 1992) where they can store more information in their verbal

input registers (Matthews and Dorn, 1995: 383). Since L2 production is more demanding than in the L1, relying more heavily on memory, learners with limited short-term memories are disadvantaged (Paradis, 1997; Cook, 1997; as cited in Dewaele, 2002). Lastly, introverts are more socially anxious (Cheek and Buss, 1981), and high anxiety leads to reduced attentional capacity and increased attentional selectivity (e.g., Fremont et al., 1976; Eysenck, 1979). When speakers are focussed on feelings of anxiety, less attention is allocated to the language task, rendering performance less efficient (Eysenck, 1979).

These physiological characteristics of introverted learners can have behavioral consequences like avoidance of over-stimulating situations. For example, introverts are less willing to communicate in their L2 than extraverts (MacIntyre and Charos, 1996: 18). If extraverted learners are more active outside the classroom, the communicative practice could lead to increased automatization and/or increased L2 grammatical and lexical knowledge, both of which improve L2 fluency. One final behavioral difference proposed by Dewaele and Furnham (1999) is the speed-accuracy trade-off (MacKay, 1982). Cautious introverts might speak slower, favoring accuracy even if this costs them in fluency. Risk-taking extraverts on the other hand, might value speed more than accuracy. We now discuss how these characteristics manifest themselves in previous literature on extraversion in L2 fluency.

Busch (1982) studied extraversion's effect on L2 English fluency in 80 L1 Japanese learners, expecting that extraverts would practice the L2 outside of class, leading to better performance. All participants completed a standardized English test created for Japanese YMCAs (composed of a vocabulary and grammar test, cloze test, aural comprehension test, and dictation), and a personality questionnaire (Eysenck Personality Inventory [EPI]). 39 participants completed an additional oral interview rated for fluency by two evaluators. Correlations between extraversion and fluency were insignificant. We propose here that the puzzling lack of L2 fluency-extraversion relationship is due to the fact that while proficiency was measured via standardized tests, it was not controlled for in interpreting the oral interview results.

In fact, students came from two separate years of study. While descriptive data for the standardized test scores are not reported for just the 39 learners who did the oral interview, the total range for learners (n = 80) in overall standardized test scores was wide: 141–348 (maximum score = 400). Variability in the fluency ratings may therefore have been caused by differing levels of L2 knowledge, effectively burying any effect of extraversion.

Following this early project, Dewaele (1998) conducted a study on extraversion's effect on L2 fluency. 27 university students studying L2 French (L1 Flemish) participated in both formal (oral French exam) and informal (relaxed discussions of hobbies, studies, political opinions, and hopes for the future) interviews. Learners completed the EPI (Eysenck and Eysenck, 1964) and samples from their interviews (formal and informal) were selected and measured for SR. Significant Spearman Rank correlations were found between extraversion and SR in both informal (r_s = .50, p = .008) and formal (r_s = .46, p = .016) interviews.

Dewaele and Furnham (2000) expanded upon this work using the same methodology, but looking at extraversion's influence on fluency and several other variables (e.g., accuracy) in the L2 French of 25 Flemish learners. With regard to the two fluency measures obtained, there were significant Pearson correlations between extraversion and L2 SR in both situations (informal: r = .55; formal: r = .51, p < .01), and proportion of "er" (a non-lexical filled pause) in the formal situation (r = -.41, p < .05). Dewaele and Furnham (2000: 362–363) explained that the lack of fluency in the introverts could be caused by the fact that when they become stressed/aroused:

> "they slide back to controlled processing which overloads their working memory. This means their speech slows down, they hesitate more often, they tend to make more errors and they are unable to produce utterances of great length…Extraverts on the other hand, being better equipped to cope with interpersonal stress, are able to maintain most of their automatized processing."

A pattern of more fluent speech in extraverts has emerged in these three studies. However, caution is warranted in interpreting these results because of three major limitations: (1) previous work did not control for L1 fluency, as its importance in predicting L2 fluency was not documented until after their publication (see §2.3); (2) there has been insufficient control of L2 proficiency in previous studies on extraversion in L2 fluency because empirical research showing that L2 lexical and grammatical knowledge correlate with L2 fluency did not emerge until after they were written (see §2.2); (3) there is a need for more L2 fluency studies comparing the relative contributions of multiple variables to L2 fluency so we can better understand their importance for fluency development. Given these gaps in the literature, the objective of the current study is to eliminate potential confounding variables by examining the effects of extraversion on L2 fluency after accounting for both L1 fluency and L2 proficiency, all while comparing the relative contributions of each predictor variable. Compared to extraverts, introverts suffer from impaired attentional and working-memory processes in stressful situations, have more social and foreign language anxiety and are less willing to communicate in the L2, and may favor accuracy over speed. Because of these facts, we hypothesized that after accounting for L1 fluency and L2 proficiency, extraversion is a significant predictor of L2 fluency, but explains a small percentage of the variance relative to L1 fluency and L2 proficiency.

3. Experimental study

The experimental session was administered to participants individually via computer using Qualtrics (Qualtrics, Provo, UT), an online survey software, with the principal investigator present to supervise.

3.1 Learners

47 L1 English learners of L2 French (M_{age} = 19.9, *SD* = 2.41; 5 males, 42 females) were recruited from upper-intermediate to advanced French courses at a large Canadian English-speaking university. Recruitment was limited to these courses to ensure that participants had sufficient lexical and grammatical knowledge of French to complete the speech production task, which required them to describe cartoons (see §3.2.1). Since proficiency is one of the independent variables in the study, a test of vocabulary breadth was used as an objective measure of lexical proficiency (see §3.2.2). Biographical information regarding previous experience studying French, sex, age, L1, and mastered languages was gathered from learners using a linguistic background questionnaire which was completed by participants after they provided informed consent. All participants began learning French as a subject in school ($M_{age\ of\ onset\ of\ acquisition}$ = 7.9) and none had spent more than one month in a French-speaking environment. Their learning was therefore primarily classroom-based. To avoid French fluency being affected by fluency in other languages, participants spoke only English and French. Speech samples were obtained in both languages to control for L1-based variation in L2 fluency.

3.2 Instruments

To measure the dependent and independent variables of study, participants completed a speech production task (§3.2.1), a lexical proficiency test (§3.2.2), and a personality test (§3.2.3).

3.2.1 Speech production task

The picture description task, a method frequently used in L2 fluency research (e.g., Kormos and Dénes, 2004; Huensch & Tracy-Ventura, 2017), was employed since it

taps into general fluency by requiring learners to draw upon lexical and grammatical knowledge to develop the content of the message. An additional advantage was the lack of interlocutor speech to be cropped out. Following de Jong and Vercellotti (2016), learners were presented with a six-frame cartoon and given three minutes of preparation time. Learners were then encouraged to describe the cartoon while the computer audio and video recorded them. The task was completed first in English, and immediately afterwards in French using two separate cartoons[2] (Heaton, 1966) obtained from the IRIS repository (Marsden et al., 2016). De Jong and Vercellotti (2016) found no statistical differences in fluency (MLR, mean pause length, articulation rate, repetitions/100 words, reformulated words/100 words) in speech samples obtained from the two images, allowing us to ascertain that the images would not interfere with results.

3.2.2 Lexical proficiency test

Following the speech production task, participants completed a Vocabulary Levels Test (VLT) from the University of Toronto Test of French (in development by Jeffrey Steele and colleagues) to evaluate vocabulary breadth. Learners were presented with the instructions: "From the six choices on the left, choose the appropriate word for each definition on the right." The 45 items varied according to lexical frequency (based on words' frequency ranking bands; 0–1000; 1001–2000; 2001–3000; 3001–4000; or 4001–5000) and grammatical category (noun, verb, adjective). Each prompt included three simple definitions made up of words from the same or lower frequency bands as responses. The six words (three target responses and three distractors) belong to the same frequency band (see Example 1).

[2] Two separate cartoons for the L1 and L2 samples were used since using the same cartoon may have led to repetition effects, facilitating performance in the L2 samples.

Example 1. Nouns (Frequency band 1001-2000)

1. maison
2. guerre ___ période de l'année
3. fils ___ fin de la journée
4. coeur ___ endroit où on vit
5. nuit
6. été

Points were given for correct word-definition matched responses; no deductions were made for incorrect answers. Possible scores ranged from 0 to 45.

3.2.3 Personality test

Following standard practice in personality research, extraversion was assessed using a self-report questionnaire. The valid and reliable Big Five Aspect Scales (BFAS) test (De Young et al., 2007), consisting of 100 items (e.g., "Make friends easily.") rated on a Likert scale (strongly disagree [1] to strongly agree [5]), was chosen since it is quick and easy to administer online. Possible scores range from -25, demonstrating low levels of extraversion, to 25, revealing high levels of the personality trait.

3.3 Fluency analysis

All L1 and L2 speech samples were cropped and analyzed for fluency, which was operationalized via SR, and pruned SR. SR (n of syllables / total duration), a frequently used measure in L2 research (e.g., Derwing et al., 2004; Derwing et al., 2009), has often been found to predict fluency ratings among listeners (e.g., Cucchiarini et al., 2000; Rossiter, 2009) making it a good overall descriptor of utterance fluency. In addition to this, the measure encompasses both speed and breakdown fluency and ensures compatibility with Dewaele (1998) and Dewaele and

Furnham (2000). To obtain SR measures, a software script (Quené et al., 2011) in Praat (Boersma and Weenink, 2016) was used for calculations. Although Praat scripts are becoming more popular in recent literature (e.g., Préfontaine, 2013) as they provide quick and reliable fluency measures, they are not without limitations, one being the inability to tease apart real syllables from filled pauses, repetitions, restarts, and repairs. In relying solely on the script, we risk over-estimating the SRs of participants who frequently produced dysfluency markers. Consequently, measures of pruned SR (total n of syllables – filled pauses, repetitions, restarts, and repairs / speaking time) were also calculated manually.

4. Results

Table 1 presents the means and standard deviations for the dependent (L2 SR and L2 pruned SR) and independent variables (L1 SR, L1 pruned SR, VLT scores, and extraversion) studied here.

Variable	***M***	***SD***
L2 SR	2.78	.56
L2 pruned SR	2.38	.59
L1 SR	3.26	.45
L1 pruned SR	3.09	.48
VLT scores	31.90	6.33
Extraversion	8.29	4.56

Table 1: Descriptive statistics for participants' L1 fluency, L2 proficiency, extraversion, and L2 fluency

4.1 Correlational analyses

The relationships between L2 fluency and lexical proficiency, L1 fluency, and extraversion, were tested using Pearson Product Moment Correlations (2-tailed; probability level set at $p < .05$). Recall that two measures of fluency were used in the current study; SR to render results maximally comparable to Dewaele (1998) and Dewaele and Furnham (2000), and pruned SR to avoid over-estimating the fluency of participants who used frequent dysfluency markers. As shown in Table 1, L1 SR and VLT both correlate with L2 SR. Surprisingly, no correlation exists between extraversion and L2 SR. By looking at the other measure of the dependent variable, L2 pruned SR, we see parallel results. L2 pruned SR correlates with both L1 pruned SR and VLT, but not with extraversion.

L2 fluency	Independent variable	*r*	*p*
L2 SR	L1 SR	.55	.00
	VLT	.43	.00
	Extraversion	-.03	.43
L2 pruned SR	L1 pruned SR	.48	.00
	VLT	.57	.00
	Extraversion	-.09	.31

Table 2: Correlations between learners' L2 (pruned) SR and independent variables (n = 47)

4.2 Sequential regression analysis

To address our research question, we used a sequential regression to examine extraversion's unique effect on L2 fluency after accounting for L1 fluency and lexical proficiency. A sequential regression process, as opposed to a standard or stepwise process, was used because previous research has already established strong relationships between L2 fluency and lexical proficiency and L1 SR, suggesting that these variables would be significant factors in a standard regression. By entering

them first, we were able to see if extraversion would explain L2 fluency above and beyond these factors. By looking at the R^2 contribution of extraversion, we determine how much this variable contributes independently to L2 fluency. Two separate models were created: the first with L2 SR as the dependent variable, the second with L2 pruned SR as the outcome variable. In both models, L1 fluency was entered first, followed by VLT, and lastly extraversion. The significance level was again set to 0.05.

As seen in Table 2, L1 SR was found to be a significant predictor of L2 SR (p = .00) in the regression analysis predicting 31% of the variance. VLT was also a significant predictor of L2 SR (p = .00) accounting for 15% of variance. While the three-predictor model accounts for 47% of variance in L2 SR, extraversion did not have significant partial effects (p = .38). In the second regression analysis with L2 pruned SR as the dependent variable (see Table 3), a similar pattern emerged. Again, extraversion did not uniquely contribute to explaining variance in L2 fluency (p = .67). However, while both L1 pruned SR and VLT were significant predictors of L2 pruned SR (p = .00, and p = .00, respectively), in this regression analysis, VLT explained slightly more variance (25%) than L1 pruned SR (23%).

Model	Total R^2	ΔR^2	L1 SR β	VLT β	Extraversion β
1	.31*	.31*	.69* (.38, 1.01)		
2	.45*	.15*	.66* (.37, .94)	.03* (.01, .05)	
3	.47	.01	.70* (.40, .99)	.03* (.01, .05)	.01 (-.01, .04)

* $p < .05$

Table 3: Summary of regression analysis of independent variables predicting L2 SR

Model	Total R^2	ΔR^2	L1 pruned SR β	VLT β	Extraversion β
1	.23*	.23*	.58* (.16, 1.00)		
2	.48*	.25*	.47* (.12, .84)	.05* (.02, .08)	
3	.48	.00	.50* (.12, .87)	.05* (.02, .08)	.00 (-.03, .05)

* $p < .05$

Table 4: Summary of regression analysis of independent variables predicting L2 pruned SR

5. Discussion

While separate studies have examined the independent effects of L1 fluency, L2 proficiency, and extraversion on L2 fluency, previous research has not directly compared the relative contributions of these variables within one study. In two sequential regression models with SR and pruned SR as the dependent variables, extraversion was not a significant predictor, but L1 fluency and L2 lexical proficiency both contributed significantly. With L2 SR as the dependent variable, L1 fluency predicted more variance (31%) than lexical proficiency (15%), further emphasizing the fact that while lexical proficiency is clearly integral for fluency development, temporal characteristics transferred from the L1 are also important. The relative effects for L2 pruned SR were different with both variables explaining almost the same amount of variance (L1 fluency: 23%; L2 lexical proficiency: 25%). The differing contributions of the predictor variables for pruned SR and SR are consistent with previous studies showing that strength of relationship between L2 fluency and L1 fluency and L2 proficiency varies according to fluency measure. Specifically, de Jong et al. (2013) found that of the three aspects, speed fluency was influenced most

strongly by lexical knowledge and de Jong et al. (2015) found that L1 fluency explained more variance in measures of breakdown and repair fluency. As SR and pruned SR are global fluency measures, with SR incorporating speed and breakdown aspects and pruned SR involving all three aspects, we cannot make direct comparisons with previous work. Instead, we suggest that future research continue to compare how the importance of fluency predictors change according to the measured aspect.

Previous research found significant correlations between extraversion and L2 fluency (Dewaele, 1998; Dewaele and Furnham, 2000). As previously mentioned, this finding seems logical given the physiological and behavioural differences between introverts and extraverts that may facilitate L2 speech production. One limitation in this previous research however, was that it did not consider the influential roles of both L2 proficiency and L1 fluency, since their importance for L2 fluency was established after these studies were published. We expected to find a modest, but significant effect of extraversion on L2 fluency even after accounting for these variables. Surprisingly, results reveal no correlation between extraversion and L2 fluency, and no effect of extraversion in multiple regression analyses. There are two possible explanations for the lack of significant findings here.

First, L2 proficiency and L1 fluency may have acted as confounding variables in previous research. Given the small sample sizes in Dewaele (1998; n = 27) and Dewaele and Furnham (2000; n = 25), we cannot rule out the possibility that extraverts' greater L2 fluency was actually explained by their greater L1 fluency or L2 proficiency, which were not measured or controlled. Of the two potentially confounding variables, we expect that L2 proficiency is more likely to have played a role. As discussed, it has been hypothesized that extraverts may use the L2 more often, which could result in increased L2 proficiency. Since extraversion and proficiency may co-vary, it is important that studies tease apart the variables to ensure that extraverts' greater L2 proficiency is not the extraneous variable resulting in increased L2 fluency. We are interested in whether an extravert having the same

amount of linguistic knowledge as an introvert is more fluent as a result of differences related to personality (e.g., physiological advantages), not linguistic ability. It is imperative that future research distinguishes extraversion from L2 proficiency so as not to over-estimate a fluency advantage for extraverts.

Second, although results do not show any effect of extraversion in this group, this does not exclude the possibility that extremely high or low levels of extraversion affect L2 fluency. As personality traits are normally distributed, with the majority of individuals falling in the middle of the spectrum and fewer at the poles of the traits, most of our participants were not characterized by extreme levels of extraversion (see Table 1). In fact, our least extraverted learner scored -6 on a scale of -25 to 25. This may also reflect a sampling problem during recruitment since it is unlikely that an extreme introvert would voluntarily participate in a study. Since Dewaele (1998) and Dewaele and Furnham (2000) do not report learners' extraversion levels, we cannot make cross-study comparisons. To test the hypothesis that extraversion affects L2 fluency at extremely high and low levels, we compared two of our participants with identical VLT scores (38 out of 45), similar L1 SR (participant 1: 3.54; participant 2: 3.61), but very different extraversion scores (participant 1: 14.5; participant 2: -6). The participants' highly different L2 SR (participant 1: 3.84; participant 2: 2.68) might suggest that extraversion plays a role in determining L2 fluency in extreme cases. Since we are unable to make inferences from an analysis of just two learners, we conducted a Mann-Whitney U test to determine if the most extraverted (n = 10) and introverted (n = 10) learners differed in L2 SR. While no significant difference was found in the SR of the least (Mdn = 2.98) and most (Mdn = 3.27; U = 59.5, p = .48) extraverted learners, we were not able to account for L2 proficiency or L1 fluency in this type of test. Due to the self-selection issue in recruitment, we might encourage future researchers to address the question of whether or not extreme levels of extraversion affect L2 fluency using more qualitative approaches.

If extraversion does affect L2 fluency in certain quantities, studies that address the causal path from extraversion to L2 fluency are warranted. While previous work

has proposed various causes behind the fluency-extraversion correlation found in Dewaele (1998) and Deweale and Furnham (2000), empirical research has not yet examined whether the relationship is caused by differences in cognitive processing (e.g., working memory, degree of automatization) or differences in amount of linguistic knowledge thought to have been obtained via additional L2 practice.

6. Conclusion

The current study further investigated the role of extraversion in L2 fluency while addressing gaps in existing literature on this topic including a lack of control of L1 fluency and L2 proficiency, and an absence of multivariate research comparing predictors of L2 fluency. We sought to test the hypothesis that in a sequential regression analysis, after accounting for L1 fluency and L2 proficiency, extraversion is an important predictor of L2 fluency (operationalized both as SR and pruned SR). In both SR and pruned SR, L1 fluency and lexical proficiency played important roles, explaining 23-31% and 15-25% of the variance, respectively. However, contrary to previous research that found a link between extraversion and L2 fluency, we found no significant relationship between the two variables in 47 L1 English learners of L2 French. We have argued that findings from the current study contradict previous findings on extraversion and L2 fluency since both L1 fluency and L2 proficiency were controlled here. It may be that in previous work, correlations between extraversion and L2 fluency were the result of a confounding variable, most likely proficiency. We propose that future research should further investigate the extraversion-fluency link in learners who are highly introverted and extraverted, to determine whether extraversion matters for L2 production in extreme cases. If extraversion does play a role in highly extraverted and introverted learners, researchers should consider how it interacts with other mediating variables (e.g., amount of linguistic knowledge, memory) to explain fluency. If extraversion does not affect L2 fluency even in extreme cases, the relationship between oral ability and

more specific, lower-level facets of extraversion may be of interest (see Ockey, 2011 who found that one of six facets of extraversion, assertiveness, predicted 3% of variance in L2 perceived oral fluency).

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