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Unravelling the relationship between language anxiety and foreign language speech fluency in a monologue production

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ABSTRACT
This study investigated the interplay between language anxiety of advanced foreign language learners and their speech fluency measured with temporal indices. Language anxiety levels of 59 university level students of English were identified with the Input, Processing and Output Anxiety Scale (the IPOAS; MacIntyre & Gardner, 1994. The effects of induced anxiety on three stages of cognitive processing in computerized vocabulary learning.' *Studies in Second Language Acquisition* 16 (1): 1–17. doi:10.1017/S0272263100012560) and the Post-Session Survey on Anxiety. The former informed about the levels of anxiety experienced at three stages of linguistic processing, hence, input anxiety, internal processing anxiety, and output anxiety. The latter was applied to identify language anxiety levels exhibited during a monologue production, reported as task-specific language anxiety. Speech samples from the performance were analyzed for fluency breakdown (the number of filled and silent pauses), speed of speech (articulation rate), and composite measures (speech rate). The findings revealed that the advanced foreign language learners with higher levels of internal processing anxiety and output anxiety used filled pauses more frequently. Furthermore, the levels of output anxiety and task-specific language anxiety were inversely related to speech and articulation rate. The study also showed statistically significant differences in the production of filled pauses and speech rate between advanced foreign language learners with low and high levels of language anxiety as measured by the IPOAS.

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language anxiety; input-processing-output language anxiety; task-specific language anxiety; foreign language speech fluency

Introduction

The inspiration for the present study is reflected in the following quotation: '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' (De Jong, Pacilly, and Heeren 2021, 456). The problem mentioned above may be rooted in one of the affective factors that a second or foreign language (L2) learner experiences while using the target language, namely language anxiety (LA). This negative emotion has long been associated with cognitive processing difficulties (MacIntyre and Gardner 1994). Eysenck et al.'s (2007) Attentional Control Model and MacIntyre and Gardner's (1994) Information Processing Model explain the debilitative role of anxiety in cognitive processing and its efficiency, which ultimately resonates in speech performance (e.g. Hewitt and Stephenson 2012) and, thus, may be

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echoed in L2 speech fluency or disfluency. These models, along with Segalowitz's (2010) speech fluency framework and Levelt's (1989) speech production model, provide the theoretical framework for the present study.

Drawing on these models, the effects of LA, apparent in cognitive processing, may indirectly relate to L2 utterance fluency. More specifically, LA limits a speaker's efficiency of performing the underlying cognitive processes responsible for speech conceptualisation, formulation, and articulation (De Bot 1992; Kormos 2006; Levelt, 1989). High levels of LA may pose challenges to speech fluidity at all three stages of speech production and limit the efficient functioning of monitoring processes. All underlying cognitive processes in speech production determine, to some degree, L2 utterance fluency (Segalowitz 2010). Despite the fact that the debilitative role of high LA on L2 performance and some fluency measures has been acknowledged by several scholars (Aubrey 2022; Bielak 2022; Pérez Castillejo 2019), the results are inconsistent and fragmentary due to an array of contextual factors examined and measuring instruments applied for the constructs of LA and speech fluency. Therefore, more research needed to draft a more comprehensive picture of the complex relationship between LA and L2 speech fluency. To the best of our knowledge, none of the studies have so far used a combined set of tools measuring language learning specific, trait-like type of input, processing, and output LA, as well as more transient, situated task-specific LA and speech fluency temporal measures in a group of advanced L2 learners, performing a monologue task.

Therefore, the current study aims to add more insights to the body of research investigating the link between LA and L2 speech fluency. The study offers a novel perspective on investigating this interplay because LA is approached in a more calibrated manner, involving not only anxiety experienced while performing a task but also more solidified anxiety experienced at the input, internal processing, and output stages of processing whenever a learner is involved in L2 learning and use. This approach may reveal new and more nuanced patterns of the relationship between LA and speech fluency.

Literature review

Language anxiety

The understanding of LA has evolved along with different approaches to its research, addressed by MacIntyre (2017) as the Confounded Approach, the Specialised Approach, and the Dynamic Approach. Initially, the Confounded Approach applied broad definitions of anxiety, using instruments to measure trait anxiety and studying its impact on language learning. However, mixed results led to abandoning this approach. The subsequent Specialised Approach, inspired by the Confounding Approach, reoriented the conceptualisation of anxiety towards language learning situations. This change prompted the use of a more precise term, *situation-specific language anxiety*, distinct from other anxiety types. Within this approach, LA has been fine-tuned to the context of language learning, as reflected in the two classic definitions, viewing LA as 'a distinct complex of self-perceptions, beliefs, feelings, and behaviours related to classroom language learning and arising from the uniqueness of the language learning process' (Horwitz, Horwitz, and Cope 1986, 128), and 'the worry and negative emotional reaction aroused when learning or using a second language' (MacIntyre 1999, 27). LA, therefore, has been perceived as a negative emotion that arises only when learning or using a foreign language.

Generally, LA is typically differentiated from both trait anxiety and momentary transient state anxiety. However, MacIntyre and Wang (2022) acknowledge that there are certain elements of stability within LA, which originate from repetitive anxiety experiences during language learning and use. This understanding is further contributed to by MacIntyre and Gardner (1994), who introduced the Input, Processing, Output Anxiety scale (the IPOA). The IPOA measures LA at three stages of cognitive processing: *input language anxiety* (IA), which inhibits incoming messages, *processing language anxiety* (PA), which affects the internal processing stage associated with organising, storing, and assimilating information, and *output language anxiety* (OA), which impacts performance. The IPOA has been used in the current study, as it captures more solidified, trait-like LA levels of individuals who report their repeated affective states whenever they learn or use an L2 at different stages of cognitive processing, which is of particular interest in L2 speech fluency research (Segalowitz 2010).

Finally, the Dynamic Approach positions LA as an emerging state, fluctuating on a moment-to-moment basis, which is affected by several interacting factors, such as the task type or the setting. cently, the role of the dynamic interplay between emotions and task performance has been acknowledged in Task-based language teaching (TBLT) research (Almukhaild and King 2023; Lambert, Aubrey, and Bui 2023). Within the TBLT framework, tasks are understood as didactic tools that entail a focus on meaning, information gap, use of linguistic and non-linguistic resources, and communicative outcome (Lambert, Aubrey, and Bui 2023, 2). They place various cognitive demands on learners (Robinson 2005), and trigger various levels of affective states. More specifically, in line with Almukhaild and King (2023), emotional fluctuations may be associated with the elements of task design, such as content, level of challenge, degree of interactivity, and quality of input, as well as variables related to task performance, such as amount of planning time, possibility of repetition, and number of interlocutors. Following the Dynamic Approach, researchers can identify the experience of transient peaks of anxiety during task performance even in individuals who exhibit low levels of situation-specific LA (MacIntyre 2017, 24). In the present study, one instrument was applied to target the momentary state of LA, here referred to as a *task-specific language anxiety* (Task-specific LA).

Several theoretical models have been proposed to explain how anxiety interplays with cognitive processing, which is, in turn, related to speech fluency. For instance, Eysenck et al.'s (2007) Attentional Control Model explicates that when anxious individuals perceive a task as threatening, they divide their attention between task-relevant and task-irrelevant self-related thoughts, triggered by worry, which is a cognitive component of anxiety (Dewaele 2002). In line with Eysenck et al.'s (2007) model, cognitive efficiency is controlled by top-down and bottom-up processing mechanisms. The top-down system is responsible for focusing on goals and knowledge needed to perform a task, whereas the bottom-up system entails the appraisal of task-irrelevant stimuli. Cognitive efficiency is optimal when the two mechanisms operate in an equilibrium. However, high anxiety activates the bottom-up system, violating the attentional balance. An anxious L2 speaker, for instance, pays more attention to task-irrelevant stimuli than to task-relevant goals, which results in less efficient cognitive processing and, in consequence, less effective performance (Derakshan and Eysenck 2009). This is examined from the perspective of speech fluency in the present study. Moreover, according to Eysenck and Derakshan (2011), anxiety also debilitates inhibition and disrupts optimal shifts in the attentional control system. Therefore, anxious individuals are not only distracted by the bottom-up task-irrelevant thoughts, but they also have problems with directing their attention to the task-relevant processing.

These disruptions in cognitive processing caused by anxiety have been captured in MacIntyre and Gardner's (1994) information-processing model, which explicates the effects of LA at three stages of language processing. During task performance, anxious learners are distracted by task-irrelevant emotional arousal at the input stage when they are listening. High levels of IA can cause recursive concentration problems (Turula 2006) and impede attention, selective perception, and encoding abilities of the incoming linguistic information (Piechurska-Kuciel 2008). Consequently, such hindrances may contribute to lower comprehension. Next, at the internal-processing stage, L2 learners exhibiting high PA may experience difficulties in memorising, storing, conceptualising, and planning because their cognitive resources are partially redirected to distractible feelings of worry (Eysenck et al. 2007). These complications in cognitive efficiency continue at the output stage due to a high level of OA. Anxious L2 speakers, preoccupied with self-deprecating thoughts, experience, for instance, problems with retrieving linguistic chunks, which may result in disrupted and disfluent speech (MacIntyre and Serroul 2015). Furthermore, anxiety arising in earlier stages is cumulated and limits the capacity of the output stage (MacIntyre and Gardner 1989). Therefore, it is important to look into language anxiety levels at all three stages as is done in the present study. Moreover, we approach IA, PA and OA as affective states, solidified as a result of repetitive situations in L2 learning and use, rather than those related to a single communicative act. The trait-like LA that accumulates at the input, internal processing, and output stages of language processing is termed here as the total input-processing-output anxiety (Total IPOA).

L2 speaking is a particularly anxiety-provoking skill, even for advanced language learners (Tóth 2017), whose lower-level linguistic processing, for instance, regarding phonological articulation or lexical access, is highly automatised. In this group, more attentional resources can be shifted towards higher-level processing, such as conceptualisation of a message or discourse planning, making their L2 speech more fluent (Lennon 2000, 28). However, even at advanced L2 proficiency levels, variations in speech fluency are observable (Tavakoli, Nakatsuhara, and Hunter 2020). Language anxiety, with its effects on cognitive processing, might contribute to this variability. Elevated anxiety levels limit attentional shifts towards higher-level processing, affecting the smoothness and flow of speech. For advanced L2 speakers, disfluencies may stem from disruptions in cognitive control caused by anxiety-induced emotional arousal (Eysenck et al. 2007). These arguments make advanced L2 learners interesting targets in researching the interplay of LA and speech fluency. In contrast, at lower proficiency levels, disfluencies may arise from a blend of reduced automaticity (De Jong 2016) and LA.

L2 speech fluency and language anxiety research

Speech fluency is a complex phenomenon with multiple definitions, depending on various perspectives (for an overview, see Lintunen, Mutta, and Peltonen 2020). Following the four-level approach to defining L2 fluency, Tavakoli and Hunter (2018) link a very broad meaning of fluency with general language proficiency. Fluency in a broad sense is understood as an overall speaking proficiency (Wright and Tavakoli 2016). In a narrow sense, fluency is associated with the ease, flow, and continuity of L2 performance and is frequently approached as a component of oral proficiency, along with the complexity of linguistic forms and accuracy (De Jong 2018). However, the very narrow perspective conceptualising L2 fluency as the speed, breakdown (in terms of patterns of pausing), and repair features of L2 speech (Skehan 2009) offers greater opportunities for calibrated operationalisation in exploring the construct. In the classic narrow understanding, speech fluency is a 'rapid, smooth, accurate, lucid, and efficient translation of thought or communicative intention under the temporal constraints of on-line processing' (Lennon 2000, 26). This definition acknowledges the role of cognitive processes in fluent speech, included in Segalowitz's (2010) tri-partite fluency framework, which comprises cognitive, utterance, and perceived fluency.

Cognitive fluency refers to the speed and efficiency of underlying cognitive processes, the outcomes of which are manifested to a considerable extent in utterance fluency – 'the observable speech, fluidity and accuracy of the original performance' (Segalowitz 2010, 202), measurable through the speed, breakdown, and repair dimensions. Both cognitive and utterance fluency, in turn, contribute to how listeners perceive and interpret fluency features. This effect of listeners' inferences regarding a speaker's fluency has been termed as perceived fluency, and measured with fluency ratings. In this study, temporal aspects of utterance fluency are examined, in line with the assumption that they reflect, to a degree, the efficiency of underlying cognitive processes, which can be disrupted by emotional arousal triggered by LA.

Research into factors affecting L2 speech fluency confirms, among others, the role of language proficiency (e.g. Kormos and Dénes 2004), task type (e.g. Wright 2020), and instruction (e.g. Tavakoli 2018). Selected individual differences, particularly regarding L2 speakers' affective dimension, however, have been less extensively investigated (but see Park and Lee 2005; Tóth 2012). Nevertheless, only recently have some scholars attempted to initiate investigations, aiming to reveal the intricate relationship between affective factors and L2 speech fluency. However, the findings are inconclusive (Aubrey 2022; Bielak 2022; Kormos and Préfontaine 2017; Pérez Castillejo 2019; Trebits 2016).

In the studies following the Specialised Approach, the results regarding the relationship of L2 speech fluency and LA range from strong to non-significant. For instance, Park and Lee (2005) investigated the interplay of LA and oral performance. They measured LA with the Foreign Language Classroom Anxiety Scale (the FLCAS, Horwitz, Horwitz, and Cope 1986), and oral performance with perceived ease and fluency of speech. The results confirmed a weak negative relationship ($r = -.257$). Similarly, Tóth (2012) examined the role of LA in L2 performance by conducting semi-formal interviews with a native speaker. In his study, 16 L2 learners experiencing high and low levels of LA on the FLCAS differed significantly in the raters' scores for speech fluency, grammatical and lexical aspects, pronunciation, and in overall score for oral performance in the interviews.

More recently, Pérez Castillejo (2019) used the FLCAS to capture LA levels and investigate their connection with utterance fluency. Thirty-eight L2 learners of Spanish completed a narrative monologue task without visual cues, as part of an oral exam potentially inducing higher levels of LA. Fluency was measured with four breakdown indices: the number of filled and unfilled pauses at the syntactic units' boundary divided by the pruned number of syllables (end-ASP ratio), filled and unfilled pauses within syntactic units divided by the pruned number of syllables (mid-ASP ratio), duration of end-ASP, and duration of mid-ASP. Three additional measures were also selected for fluency examination: mean length of run (MLR), articulation rate (AR) and phonation-time ratio (PTR). The results revealed that LA was strongly negatively correlated with mid-ASP ($r = -.583$) and duration of end-ASP ($r = -.509$). MLR and PTR were positively correlated ($r^{MLR} = .633$ and $r^{PTR} = .593$) with LA. The researcher concluded that 'at a low-intermediate proficiency level, FLA [foreign language anxiety] interfered with speech processing by hindering formulation and encoding more than conceptualization of the message' (Pérez Castillejo 2019, 337). Our study complements these findings by focusing on advanced learners instead of the lower-intermediate level examined by Perez Castillejo.

Although the outcomes so far support the claim that relatively stable situation-specific LA interferes with the linguistic processing of L2 speech fluency, rarely has research examined this relationship from the perspective of anxiety experienced at different language processing stages, proposed by Maclntyre and Gardner (1994). To the best of our knowledge, only Trebits (2016) has pursued this line of enquiry, examining the impact of task complexity and input, processing, and output LA on L2 speech and writing. However, in the group of 44 upper-intermediate participants, no significant relationship was found between LA types and speech rate. Our study holds promise in elucidating these connections, as we use a broader set of fluency measures, offering a nuanced exploration of how LA at various processing stages may relate to advanced L2 speech fluency.

Following the Dynamic Approach, Kormos and Préfontaine (2017), Aubrey (2022), and Bielak (2022) aimed to capture transitory states of LA experienced while performing specific oral tasks and relate those to L2 speech fluency. These investigations yielded varied results. Kormos and Préfontaine (2017) explored the interrelationships between task types, affective appraisals of these tasks, as well as utterance and perceived fluency. The participants, 40 L2 learners of French, performed three monologue tasks, differing in cognitive demands. After each task, the participants completed a Task Appraisal Questionnaire, capturing, among other affective factors, their perceptions of task anxiety on a five-item scale. Native speaker raters evaluated the participants' speech against the L2 Fluency Assessment Grid, consisting of six 'can do' statements, selected from the Council of Europe's Common European Framework of Reference (CEFR) (2001). Finally, breakdown fluency was measured with pause frequency (PF), defined as the total number of silent pauses above .25 s divided by the total duration in seconds of the speech sample, and average pause time (APT), calculated by dividing the total duration of all pauses by the number of pauses in a given speech sample. Speed fluency was measured with AR, operationalised as the number of syllables divided by speaking time. While quantitative results did not reveal any significant correlations between LA and both utterance and perceived fluency, qualitative insights provided support for the claim that task type is associated with the appraisals of LA.

The idiodynamic methodology was followed in Aubrey's (2022) study, investigating the relationship between the affective states (language anxiety and enjoyment) and breakdown fluency, measured with the mean length of pauses per second. Four learners of English at B2/C1 CEFR levels performed a problem-solving monologue task, self-rated their second-by-second anxiety and enjoyment fluctuations, and were interviewed to clarify their emotional states during the task. The results revealed moderate to strong positive correlations between momentary LA changes and breakdown fluency for three out of four participants' performances.

Finally, Bielak (2022) measured task-specific LA after group decision-making (FLA-group) and individual monologue (FLA-mon) tasks among 43 mid- to high-intermediate learners. The results showed that higher levels of task-specific LA were experienced in the FLA-mon than in the FLA-group. Furthermore, FLA-group correlated with several L2 fluency measures: MLR ($r = -.50$), AR ($r = -.67$), end-AS ratio ($r = .59$), and mid-AS ratio ($r = .30$). However, FLA-mon was weakly negatively related only to MLR ($r = -.22$). Interestingly, these results identified complex relationships between affective factors, L2 speech fluency, and task type. The participants experiencing higher levels of anxiety during either a monologue or collaborative task produced shorter runs of speech between silent pauses (MLR).

To conclude, earlier studies with mixed results show a strong need for further research on the complex relationship between LA and L2 speech fluency, both moderated, among other factors, by language proficiency and task types. So far, little is known to what extent not only task-specific LA but also LA types experienced at different stages of linguistic processing interplay with speech fluency indices. The novelty of the present study is that it combines two perspectives on LA: more solidified trait-like type and more transient task-specific type, all while inspecting L2 speech fluency.

Research questions

This study aims to investigate the relationship between LA and utterance fluency among advanced L2 learners of English. The following research questions were formulated to address the gaps in previous research, as outlined above:

> RQ1: Which temporal aspects of (dis)fluency are related to levels of task-specific LA and anxiety experienced at the input (IA), internal processing (PA), and output (OA) stages of language processing?

> RQ2: To what extent do L2 learners with high and low levels of Total IPOA differ in temporal (dis)fluency aspects?

Method

Participants

The participants were 59 multilingual L1 Finnish university students of L2 English. They also reported having studied other languages, such as Swedish (100% of the participants), German (10%) and Spanish (3%). The group included 38 female, 17 male, and 4 participants of unspecified gender. The average age was 22.78 years. They declared to have been exposed to English for an average of more than 10 years prior to their enrolment at the university level. Their L2 English proficiency levels were measured using the Lexical Test for Advanced Learners of English (LexTALE), which is an empirically validated measure of overall English proficiency (Lemhöfer and Broersma 2012). The participants' LexTALE scores ranged between 63.75 and 98.75, which is equivalent to the B2 – C2 CEFR levels.

The participants were divided into low and high Total IPOA groups based on their cumulative scores from the Input, Processing, and Output Anxiety Scale (the IPOAS) described in Section *4.2.1*.

The mean value (M = 38.15) provided a cut-off point for classifying the participants into the low IPOA group: those scoring 38 and below, and the high IPOA group: those scoring above 38. The distribution of the data, verified by the Shapiro–Wilk test, was close to normal (W = .984, *p*-value = .605), and the low and high IPOA groups consisted of a balanced number of 29 and 30 participants, respectively.

Instruments and task description

Language anxiety measures

The trait-like type of LA was captured with the Input, Processing, and Output Anxiety Scale (the IPOAS) (Maclntyre and Gardner 1994), an instrument measuring anxiety experienced at three stages of linguistic processing: input, processing, and output anxiety. The scale consisted of 18 items, divided into three sub-scales, each comprising six statements, with the response values ranging from 6 to 30. The Input Anxiety (IA) scale contained such sample items as *I am not bothered by someone speaking quickly in English* and *I am anxious with English because, no matter how hard I try I have trouble understanding it.* The second was the Processing Anxiety Scale (PA), with items targeting feelings of anxiety at the processing stage, such as *I am anxious with English because, no matter how hard I try I have trouble understanding it.* The final sub-scale of the IPOAS aimed to capture output anxiety (OA), with the following sample item: *I never feel tense when I have to speak in English*. Three items in each sub-scale were key reversed. The participants responded on a 5-point Likert scale, from 1 – *I totally disagree* to 5 – *I totally agree*. The minimal score to be obtained on the IPOAS was 18 and the maximal 90. A high score indicated a high LA level. Cronbach alpha coefficients were calculated for each sub-scale and the whole IPOAS, reaching .62 for the IA scale, .60 for the PA scale, .79 for the OA scale and .84 for the IPOAS.

The more transient type of LA was approached with the Post-Session Survey on Anxiety (the PSSA) applied immediately after the monologue task performance to address task-specific LA. This instrument contained two closed-response questions: *How anxious were you while performing the monologue task in English?* and *How comfortable were you speaking English in the monologue task today?* (key reversed). The responses were marked on a 5-point Likert scale: 1 – *not at all*, 2 – *somewhat*, 3 – *quite so*, 4 – *very much so* and 5 – *extremely*. Both tools were translated into Finnish with minor adaptations to comply with the Finnish context. Additionally, a back-translation technique was administered to verify the validity of the instruments.

Utterance fluency measures

Out of an array of fluency indices (cf., Skehan 2009; Tavakoli and Skehan 2005), four measures belonging to speed, composite, and breakdown categories were selected: articulation rate, speech rate, frequency of silent pauses, frequency of filled pauses. The interplay of repair fluency (false starts, repetitions, reformulations, replacements) and LA has been investigated in a separate study (Peltonen et al. 2024). The choice was motivated by the acknowledged status of these measures in L2 utterance fluency research (Tavakoli and Wright 2020) and a high potential for comparability to the previous studies, involving affective factors (Bielak 2022; Kormos and Préfontaine 2017; Trebits 2016). Articulation rate (AR) as a fine-tuned measure of speed (De Jong 2016) and speech rate (SR) as a composite fluency measure (Tavakoli, Nakatsuhara, and Hunter 2020) were operationalised as the total number of syllables per minute of speaking time (excluding silent pauses), and the total number of syllables per minute of total time, respectively. These measures were considered in the current study, as they reflect different subtleties of speaking performance. AR is a pure measure of a speaker's speed, whereas SR reflects also individual speech behaviours, such as pausing habits or elongations (Tavakoli and Wright 2020), which could potentially be affected by feelings of anxiety. Moreover, AR and SR have been found to distinguish between more and less fluent L2 speakers (e.g. Kormos and Dénes 2004). These measures reflect the efficiency of underlying cognitive processes at all stages of speech production (Michel 2017).

They also reveal the flexibility of articulatory processes at the articulation stage (de Jong & Perfetti, 2011).

Additionally, breakdown fluency was measured with the frequency of silent pauses (SP), calculated as the total number of SPs lasting for more than .25 sec. (De Jong, Pacilly, and Heeren 2021) per minute of speaking time, and filled pauses (FP), operationalised as the total number of FP per minute of speaking time. The frequency of SP was selected for the purposes of this study, because it has long been acknowledged as a crucial indicator of fluency (Bosker et al. 2013). The choice of the second breakdown fluency measure, FP, was motivated by its potential to perform various communicative functions and signal hesitation or difficulties in recalling language (Götz, 2019). FP are 'verbal interruptions that do not relate to the content of the spoken statement' (Cossavella and Cevasco 2021, 173), and they are manifested with non-lexical fillers, such as 'er', 'um', 'uh', which may serve as strategies of hesitation or buying time while facing difficulties in retrieving information (Peltonen 2020).

Task choice and description

The task involved a description of a logically sequenced story, displayed in the form of a cartoon without captions, consisting of six frames. The purpose of the task was to elicit L2 narrative speech. In line with Robinson's (2005) description of the cognitive demands in a task, entailing resource-directing and resource-dispersing dimensions, the complexity of the task in the study could be described as low. In terms of resource-directing, the narrative involved here-and-now mode, low reasoning demands, particularly for advanced L2 learners, and few elements in the linearly developed story. Within the resource-dispersing dimension, the task did not require extensive prior knowledge, and two minutes of planning time before performance was provided to the participants.

L2 fluency research data have frequently been based on the performance from monologue tasks. Tavakoli (2016) enumerated two reasons for researchers' decisions behind this choice. First, the monologue task and the procedures introducing it are easy to be implemented and followed. Second, there is a reasonable degree of control of the incoming message. In other words, the elicited data are relatively comparable and predictable (Tavakoli 2016). An additional argument for the choice of the monologue task in the present research is associated with experiences of LA, which depend on, among others, the perception of the interlocutor (Szyszka 2017). To minimise the interpersonal factor while experiencing task-specific LA, monologue task performances were analyzed in the present study.

Procedure and analyses

The study data from 59 participants were collected on one day, with a short break in between. First, the informed consents were obtained, and the general information about the project was provided prior to speech sample recordings and questionnaire data collection. The participants were invited to perform the monologue task in the university language laboratory, where they were instructed to tell the story in their own words, following the cartoon prompt. The speech samples, with the mean length of 68.7 sec., were recorded and saved as MP3 files. Next, the participants reported their feelings of task-specific anxiety on the PSSA and provided their background information in an online questionnaire. Finally, they completed the LexTALE (Lemhöfer and Broersma 2012) and the IPOAS (Maclntyre and Gardner 1994).

The recorded samples were transcribed, annotated, and cross-checked manually by the project researchers and research assistants. Additionally, silent pauses of at least .25 s were identified with a script (De Jong and Wempe 2009) but adjusted manually in the software programme Praat (Boersma and Weenink 2007). Filled pauses were identified and calculated manually. Lennes's (2002) script was applied in Praat to extract the other temporal fluency measures. All fluency measures (AR, SR, SP, FP) were later standardised per minute of speaking time.

Descriptive statistics were calculated to provide the background information on the variables in the study. The normality of the data distribution was tested using the Shapiro–Wilk test. As the data distribution of IA (W = .928, $p = .002$), PA (W = .946, $p = .01$), and Task-specific LA (W = .906, $p = .001$) significantly deviated from normal, non-parametric Spearman's rho correlation coefficients were calculated for RQ1. The IPOAS data did not significantly deviate from the normal distribution (W = .984, $p = .605$). Therefore, a *t*-test was used to analyze the data for RQ2. Correlations with effect sizes of .25 for small, .4 for medium, and .6 for large effects, as well as *t*-tests with effect sizes of .4 for small, .7 for medium, and 1.0 for large effects, were interpreted following Plonsky and Oswald's (2014) guidelines.

Results

Before applying correlational and inferential statistical tests, descriptive statistics regarding LA types were calculated in the group of 59 participants (see Table 1). Of the three types of LA, not only did the participants score highest on average for OA, but the OA scores were also the most spread out. In line with other research (e.g. Szyszka 2017), the participants' levels of LA increased gradually at each stage of cognitive processing. The mean for Task-specific Language Anxiety (Task-specific LA) indicated relatively moderate levels of this type of LA in the group.

While addressing RQ1, non-parametric Spearman's rho correlation coefficients were calculated. The results of the correlations between various LA types and four fluency measures – frequency of SP, frequency of FP, SR, and AR – are visible in Table 2. Interestingly, no significant relationships were found between SP and any of the LA types. However, FPs were weakly positively related to PA ($rs = .266$, $p < .05$), OA ($rs = .385$, $p < .001$), and Total IPOA ($rs = .373$ at $p < .001$). In other words, higher levels of PA and OA were associated with a more frequent production of FPs. Negative correlation coefficients of small effect size were found between SR and OA ($rs = -.371$, $p < .001$), as well as SR and Task-specific LA ($rs = -.393$, $p < .001$). Similar negative correlations were calculated between AR and OA ($rs = -.366$, $p < .001$) as well as between AR and Task-specific LA ($rs = -.332$, $p < .05$). The higher SR and AR were identified in the spoken samples, the lower OA and Task-specific LA the participants exhibited. Finally, a weak negative relationship was found between SR and Total IPOA ($rs = -.295$, $p < .05$). Interestingly, IA did not correlate with any of the selected fluency measures, and Task-specific LA did not relate to any of the breakdown fluency indices.

Table 1. Descriptive statistics data (range, minimum and maximum values, means, and standard deviations) of language anxiety types – Input Anxiety (IA), Processing Anxiety (PA), Output Anxiety (OA), Total Input, Processing, Output Anxiety (Total IPOA), and Task-specific Language Anxiety (Task-specific LA).

Variable	Range	Min	Max	Mean	SD
IA	13	6	19	10.22	3.25
PA	12	7	19	11.49	2.95
OA	22	6	28	16.66	5.33
Total IPOA	41	21	62	38.38	9.45
Task-specific LA	6	2	8	3.90	1.61

Table 2. Spearman's rho correlation coefficients (R) between Input Anxiety (IA), Processing Anxiety (PA), and Output Anxiety (OA), Total Input, Processing, Output Anxiety (Total IPOA), Task-specific Language Anxiety (Task-specific LA) and number of Silent Pauses per speaking time per minute (SP), number of Filled Pauses per speaking time per minute (FP), Speech Rate per minute (SR), and Articulation Rate per minute (AR).

Variable	SP	FP	SR	AR
IA	.084	.214	−.185	−.016
PA	−.076	.266*	−.212	−.227
OA	.006	.385**	−.371**	−.366**
Total IPOA	.015	.373**	−.295*	−.246
Task-specific LA	.091	.165	−.393**	−.332*

Note: *$p < .05$, **$p < .001$.

Table 3. T-test results and Cohen's d effect sizes regarding filled pauses (FP), silent pauses (SP), speech rate (SR), and articulation rate (AR) in the groups low and high in input, processing, and output language anxiety (low IPOA and high IPOA respectively).

L2 fluency measures	Group	*N*	Mean	SD	*t*	*p*	Effect size (Cohen's d)
FP	Low IPOA	29	4.74	4.38	−2.157	.018	−.562
	High IPOA	30	7.28	4.66			
SP	Low IPOA	29	33.08	10.01	−.317	.376	−.083
	High IPOA	30	33.95	11.08			
SR	Low IPOA	29	165.39	25.87	2.478	.008	.645
	High IPOA	30	148.22	27.30			
AR	Low IPOA	29	231.57	27.85	1.750	.043	.456
	High IPOA	30	218.98	27.40			

The extent to which L2 learners with low and high Total IPOA differed in temporal (dis)fluency aspects (RQ2) was calculated using an independent samples *t*-test (see Table 3). Additionally, the False Discovery Rate (FDR) method was used to ensure control for potential Type I errors (Larson-Hall 2010, 251–252), as multiple fluency measures were applied for group comparisons. The low and high IPOA groups did not differ significantly in the frequency of SP ($t = -.317$, $p = .376$) and AR ($t = 1.750$, $p = 0.043$, the FDR method indicated this p value as false positive). However, they differed in the use of FP and SR. High IPOA participants applied more FP in their speech than their low IPOA counterparts ($t = -2.157$, $p = .018$), with a small effect size (Cohen's d = −.562). SR was significantly faster in the low IPOA group than in the high IPOA group, with a Cohen's d effect size of .645.

Discussion

The aim of the study was to explore the relationship between IA, PA, OA, Task-specific LA, and L2 speech fluency indices (RQ1). The results showed different degrees of connections between various LA types and speech fluency measures selected for the purposes of this investigation. First, LA experienced at the input stage of cognitive processing did not correlate with any L2 fluency measure. This outcome may be supported by the fact that the participants were exposed to linguistic input only at the stage of the task instruction, at which they were shortly guided how to approach the monologue task. Additionally, being provided in both L1 Finnish and L2 English, this type of input probably put a minimal cognitive strain on the advanced L2 users. Following the initial instruction, the participants performed a monologue without any further external linguistic input. For this reason, input anxiety might not have been activated in the course of the task performance. Another reason may be grounded in a relatively low level of IA with a mean value of 10.22 (SD = 3.25), as compared to previous research. For instance, Szyszka (2017) reported the average IA level of 13.95 (SD = 4.02) in a similar group of advanced L2 learners, whereas in Trebits' (2016) study of CEFR B2 level participants, the mean value of IA on a 5-point Likert scale was 2.71, which is the equivalent of 13.55 when the data from the IPOAS are calculated summatively. In the current study, therefore, the advanced individuals felt relatively at ease when exposed to L2. The role of IA might be more visible in interactions, where an interlocutor's input is important for a speaker's turn-taking, sustaining interactional fluency. This area, however, calls for further investigations.

Second, LA experienced at the processing stage was weakly positively related to the number of FP. Those participants who produced 'er', 'um', 'uh' more frequently, exhibited also higher levels of PA. The application of these types of disfluency features is hypothesised to serve as coping strategies for active information search (Cossavella and Cevasco 2021) and reflect problems in message planning and conceptualisation (Lambert, Aubrey, and Leeming 2021). These difficulties, in turn, might be explained by high levels of PA effects on attentional resources, which are shifted from higher-level processing of message conceptualisation and planning (Lennon 2000) towards task irrelevant thoughts (Derakshan and Eysenck 2009). Therefore, drawing on the results, it may be speculated that an advanced L2 learner distracted from the task by a relatively high level of PA produces fillers that buy time for speech production. Interestingly, the correlation coefficients between pausing frequency and all types of LA were insignificant, which is in line with Kormos and Préfontaine's (2017) outcomes where pause frequency was not related to affective appraisals of the tasks performed by the participants. Pausing, however, was related to LA when investigated from the perspective of location (Bielak 2022; Pérez Castillejo 2019) and duration (Aubrey 2022; Pérez Castillejo 2019). Therefore, perhaps, there are breakdown fluency indices, such as the number of filled pauses, pause location, and duration, which capture the relationship between breakdown fluency and affective states in a more precise manner. Apparently, as evidenced in the results of this study, the frequency of silent pauses does not belong to these measures. However, to support this claim, further investigations on the relationship between LA and breakdown fluency, measured from the perspective of silent pause location and duration, are needed.

Furthermore, OA and task-specific LA correlated moderately negatively with both composite and speed fluency measures, SR and AR, respectively. These measures pertain to the degree of automatisation and ease of retrieval of linguistic knowledge (Pérez Castillejo 2019). OA is associated with retrieval problems (Maclntyre and Gardner 1994). Therefore, the slower speech rate of anxious individuals may serve the same purposes as non-lexical fillers: it provides more time for retrieval, limited by anxiety. Interestingly, the values of coefficients indicating negative relationships were stronger for Task-specific LA than OA. As stated earlier, the former indicates a temporary anxiety level exhibited during task performance, whereas the latter pertains to a relatively stable anxiety experienced at the output stage of cognitive processing. Measuring this negative emotional state from a situation-specific perspective generated a stronger effect regarding speed of speech, which justifies this line of enquiry in further research.

Significant differences in SR and the frequency of FP between more and less anxious participants (RQ2) were confirmed in the study. The interpretation of these results is supported with theoretical considerations that explain the emotion–cognition connection from the perspective of an individual performing a task (Lambert, Aubrey, and Bui 2023). LA as a negative emotion encompasses several reactive dimensions that help an individual face the challenges of, for instance, L2 task performance. These include verbal or non-verbal expressive behaviour (Almukhaild and King 2023). In line with this theoretical framework, the more frequent use of filled pauses in task performance of an anxious individual may be interpreted as a reactive expressive behaviour. Additionally, the anxiety effect in cognitive processing can be explicated within Eysenck et al.'s (2007) Attentional Control Model. The optimal efficiency of cognitive operations, underlying speech performance, involves controlled and automatic mechanisms, operating in balance (Segalowitz 2010). When anxiety intervenes, it triggers task-irrelevant and worrisome thoughts, which steal controlled attentional resources, needed to execute effectively 'moment-to-moment decision making in transforming ideas […] represented as thought into speech' (Segalowitz 2000, 201). In other words, anxiety operates as a distractor, which lowers processing efficiency by disturbing the equilibrium between controlled and automatic processes. However, according to Eysenck et al. (2007), processing inefficiency may be compensated for by available coping strategies, for instance, stalling mechanisms (Dörnyei and Kormos 1998), such as an increased number of filled pauses or extended time for performance execution. The study results confirmed significantly more frequent application of both of these mechanisms in the high IPOA group than in the low IPOA group.

While the results of the study provide some valuable insights, there are also a number of limitations that need to be addressed. First, the reliability of some instruments may raise concerns. Cronbach's alpha values for the scales measuring IA and PA were relatively low. However, the IPOAS, in which the aggregated data from the IA, PA, and OA scales were analyzed, exhibited a satisfactory reliability value. This was the reason for including the whole scale in the study. Nevertheless, the results regarding IA and PA should be approached with caution. Moreover, the Post-Session Survey on Anxiety measuring Task-specific LA included only two items, which may also invoke deliberation on the tool's reliability. However, the intention was to elicit immediate and brief feedback on the emotions associated with the recorded task, without placing any additional strain on the participants. Additionally, the application of this scale was exploratory in its nature, as the methods are not equally well established for the task-specific LA, compared to the more stable LA. Therefore, the results from the use of this tool should be treated with caution. Finally, the sample size of 59 participants and the monologue task, which did not fully capture the complexity of real-life dialogic communication, may limit the generalizability of the results.

Conclusions

The study revealed several relationships of small strength (Plonsky and Oswald 2014) between four LA types (IA, PA, OA, and Task-specific LA) and four fluency indices: FP, SP, SR, and AR. The number of FPs produced in a monologue speech by advanced L2 learners was positively correlated with PA and OA, whereas AR and SR were negatively linked to OA and Task-specific LA levels. Pausing, measured as the frequency of SPs, was not connected with any type of LA under scrutiny. Additionally, significant differences, between small and medium in effect sizes, in the use of FPs and the speed of speech were found between the low and high IPOA groups. The speech of more anxious participants was significantly slower with more filled pauses than that of less anxious individuals. The study also draws attention to fluency indices, the choice of which may play a role in disclosing the nuanced interplay of LA and L2 speech fluency in future research. For instance, the location and duration of pausing may be more calibrated measurements than pause frequency. Moreover, it has been speculated that FPs and SR are manifestations of forms of coping with cognitive processing inefficiency, stemming from high levels of output and task-specific LA.

Generally, the study provides evidence upholding the claim that, even in the group of advanced L2 learners, whose linguistic processes are highly automatised and LA levels relatively low, the interplay between speech fluency and affective dimensions of individuals cannot be ignored. Therefore, the study bears important implications for future research, encouraging similar investigations at lower language proficiency and fluency levels, where LA levels may be more varied. Further investigations combining the Dynamic and Specialised approaches to LA with a range of speech fluency measures are encouraged, as they have the potential to unveil intricate complex connections between affective and linguistic dimensions of language learning. Last but not least, the results bear several implications for language teaching, assessment, and learning. Teachers' and assessors' awareness of the interplay of fluency and LA is crucial for calibration of their didactic and evaluative decisions. By recognising the signs of anxiety-related disfluencies, for instance, an excessive use of filled pauses, both teachers and assessors can support learners with constructive feedback that addresses issues of negative emotionality and empowers learners to communicate confidently and fluently. Moreover, teachers can create a safe classroom environment by implementing actions lowering L2 learners' anxiety while performing communicative tasks. One such action may involve careful design or selection of speaking tasks based on adequate content, cognitive demands, and level of interaction (Almukhaild and King 2023). Finally, to mitigate the impact of negative emotionality, teachers can provide ample time for planning and repetition prior to task performance.

The data supporting the results presented in the paper are stored at the University of Turku, Finland.

Ethics declaration: we have complied with the local ethical guidelines, according to which no IRB review was needed for our project.

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