



How does first language achievement impact second language reading anxiety? Exploration of mediator variables

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Abstract

Although studies have consistently found negative correlations between second language (L2) anxiety and L2 achievement, the anxiety concept is criticized for the failure to consider confounding variables, particularly first language (L1) achievement, in the relationship between language anxiety and language achievement. Also, past studies tend to rely on cross-sectional data to conclude causality. To assess long-term causal relationships between L1 and L2 achievement, the study used structural equation modeling to examine pathways by which L1 achievement is associated with L2 reading anxiety after two years via several mediators: L1 working memory, L1 print exposure, and L1 metalinguistic knowledge; L2 aptitude (MLAT); and L2 reading, writing, and listening comprehension. Students ($n=293$) in a U.S. secondary school were administered these measures and followed through first-year Spanish. Findings showed the effect of L1 achievement on later L2 reading anxiety was direct and indirect through L2 aptitude, L2 achievement, and L1 metalinguistic knowledge. Effects of L2 achievement and L1 metalinguistic knowledge on L2 reading anxiety were direct. An out-of-sample analysis for model prediction power supported the external validity of the study results. We recommend that teachers and learners deal with L1/L2 skills, rather than anxiety per se, in order to reduce sense of L2 reading anxiety.

Keywords L2 anxiety · L2 achievement · L2 aptitude · L1 achievement · Structural equation modeling

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Introduction

The study of L2 anxiety has received substantial attention in the field of language learning. The field has been guided largely by use of the Foreign Language Classroom Anxiety Scale (FLCAS) (Horwitz et al., 1986) to explore the relationship between language anxiety and different language learning outcomes such as speaking, reading, writing, and listening comprehension. The FLCAS was designed to “assess the degree of anxiety [in a foreign language] as evidenced by negative performance expectations and social comparisons, psychophysiological symptoms, and avoidance behaviors” (Horwitz, 1986, p. 559). In subsequent research, Saito et al. (1999) introduced the Foreign Language Reading Anxiety Scale (FLRAS), a 20-item, self-report instrument thought to measure L2 reading anxiety.

Since the early 1990s, Sparks and his colleagues have challenged the claim that a unique anxiety for L2 learning impacts attainment of a language (Ganschow & Sparks, 1996; Ganschow et al., 1994; Sparks & Ganschow, 1991, 1993, 1995, 2007; Sparks & Patton, 2013; Sparks et al., 1997). They provided an alternative view by suggesting that students’ language achievement is a confounding variable when measuring language anxiety. To support this perspective, their studies have found that the FLCAS administered several years later in high school is associated with various aspects of L1 achievement in elementary school and L2 aptitude measured by the Modern Language Aptitude Test (MLAT; Carroll & Sapon, 1959, 2000). Sparks and his colleagues have also investigated the links between L2 reading anxiety on the FLRAS and L1 and L2 achievement measures that yielded similar results (Sparks, Luebbers et al., 2018; Sparks, Patton, & Luebbers, 2018a, 2018b). More recently, Sparks and Alamer (2022) investigated the mediating role of L2 achievement and language aptitude for the relationship between L1 achievement and the FLCAS and found support for the indirect effect of L1 achievement on language anxiety. Nonetheless, the field currently lacks substantial information about the mediational process through which L1 achievement is related to L2 reading anxiety through potential mediators.

In the present study, we examine the effect of L1 achievement on L2 reading anxiety and the role of several potential mediators with a group of students completing a 1st year, secondary level L2 course. In the literature review, we summarize the research on L2 anxiety with the FLCAS and FLRAS and review challenges to the L2 anxiety hypothesis.

Review of the literature

Language anxiety and FLRAS

It has been long believed that L2 anxiety negatively affects students’ learning of a L2. Scovel’s (1978) review of the anxiety literature revealed inconsistency in the

association between L2 anxiety and language learning by finding that the correlations could be positive, negative, or neutral between the two variables. The notion of L2 anxiety as a constraint in language learning has been examined by a number of researchers. A recent systematic review of the anxiety literature from 1960 to 2018 explored the negative relationship between language anxiety and L2 achievement and concluded that anxiety is responsible for lower scores in L2 proficiency (Oteir & Al-Otaibi, 2019). Based on cross-sectional correlation data, recent meta-analyses have suggested that L2 anxiety negatively impacts students' levels of L2 proficiency and recommended strategies to mitigate anxiety in the classroom (e.g., Botes et al., 2020a; Li, 2022; Teimouri et al., 2019; Zhang, 2019).

With regards to L2 reading anxiety, Saito et al. (1999) proposed an anxiety specific to L2 reading and introduced the Foreign Language Reading Anxiety Scale (FLRAS). The FLRAS is a 20-item survey that uses a Likert scale to elicit students' self-perceptions of anxiety about L2 reading difficulties compared to other L2 skills. In their pilot study, Saito et al. reported that the FLRAS and the FLCAS shared approximately 41% of the variance, i.e., $r=0.64$. Because 59% of the variance was not shared by the instruments, they hypothesized that general anxiety about L2 learning was related to, but distinct from, L2 reading anxiety.

The FLRAS has been administered in several studies. For example, in a study with university students enrolled in Spanish, Brantmeier (2005) found that students at advanced stages of language instruction felt less anxious about reading the target language than they did about speaking and writing the language. In an investigation with elementary and intermediate level English-speaking university students studying Chinese, Zhao et al. (2013) showed that L2 reading performance was negatively correlated with L2 reading anxiety among elementary level and intermediate level English-speaking university students learning Chinese as a foreign language in the U.S. and that unfamiliar scripts, unfamiliar topics, and worry about comprehension were identified as the major sources of the students' L2 reading anxiety. In another study with university L2 Spanish students, Sellers (2000) found that low anxiety students recalled more passage reading content than students who reported higher levels of anxiety. In a study using the FLRAS with U.S. learners of Chinese as a foreign language, Zhou (2017) found that worries relating to comprehension, unfamiliar topics, pronunciation, and discomfort reading aloud were sources of reading anxiety. In a study with Saudi students learning English, Bensalem (2020) found that background variables (experience abroad, knowledge of a third language) and self-perceived proficiency in English reading played a significant role in predicting levels of reading anxiety on the FLRAS. In a study with ESL students, Zhang (2000) reported that male and female students exhibited differing levels of anxiety on the FLRAS and suggested that language anxiety in both genders may result from low language proficiency and other cultural factors. In another study, Zhang (2001) found that ESL students' language anxiety in a study abroad program could be attributable to age, learning experiences, and socioeconomic factors. In most studies with the FLRAS internationally and the U.S., results have revealed varying levels of overlap between the FLRAS and the FLCAS as well as negative correlations between the FLRAS and L2 reading achievement (e.g., see Hadidi & Barzegar, 2015; Matsuda & Gobel, 2004; Matsumara, 2001; Zhao, et al. 2013).

Critique of the language anxiety hypothesis

In this section, challenges to the L2 anxiety hypothesis are assessed by examining studies conducted with the FLCAS and FLRAS.

Studies with the FLCAS

Since the 90s, Sparks and Ganschow have hypothesized that students' L1 achievement and their L2 aptitude measured by MLAT are confounding variables when investigating the relationship between anxiety and L2 learning. They posited that students with lower levels of language learning achievement would exhibit higher levels of anxiety. In their analysis of the FLCAS (Sparks & Ganschow, 1991), they found that the 33 items were related to students' verbal memory, oral language expression and comprehension skills, and speed of language processing rather than anxiety. Sparks and Ganschow also critiqued Horwitz et al. (1986) for failing to use comparison groups and control for participant's level of L1 achievement and/or L2 aptitude. They also contended that students' responses on the FLCAS would likely be a "proxy" for students' levels of language achievement, their self-perceptions of their language learning skills, or both.

In the 90s, Sparks et al. conducted a series of studies with secondary and postsecondary learners in which they administered the FLCAS and measures of L1 achievement, L2 aptitude (MLAT), and L2 achievement (Ganschow & Sparks, 1996; Ganschow et al., 1994; Sparks & Ganschow, 1996; Sparks et al., 1997). These investigations found that students who reported high levels of anxiety on the FLCAS displayed significantly weaker L1 achievement, lower L2 aptitude on the MLAT, and significantly lower L2 achievement than students with low L2 anxiety. Two studies using an author-designed instrument administered to L2 classroom teachers that included items surveying their students' L2 achievement and affective characteristics showed that students with weaker L1 and L2 achievement and lower MLAT scores were rated by the teachers as having less positive affective characteristics, including higher levels of anxiety, than students with stronger L1 and L2 achievement and higher L2 aptitude on MLAT (Sparks & Ganschow, 1996; Sparks et al., 2004).

Sparks et al. conducted a longitudinal study in which they followed 54 students over 10 years, from 1st to 10th grades. In this study, participants were administered the following measures: (a) L1 achievement from 1st to 5th grades; (b) the MLAT and FLCAS in 9th grade; (c) L1 reading comprehension and language measures in 10th grade; and (d) L2 reading, writing, spelling, listening comprehension, and speaking proficiency tests at end of 10th grade after two years of L2 courses. In one investigation, Sparks and Ganschow (2007) divided the students into high, average, and low anxiety groups based on their FLCAS score and compared the groups on all L1 and L2 measures. Between-group comparisons showed that the low anxious group scored significantly higher than the high anxious group on all L1 measures from 2nd to 5th grades, the L1 reading and language measures in 10th grade, MLAT in 9th grade, and the L2 proficiency tests. The FLCAS was negatively correlated with all L1 measures as early as 1st grade, several years *before* the students began L2 courses. In another investigation with these participants, Sparks and Patton (2013)

found that the FLCAS explained significant unique variance in L1 achievement from 1st to 5th grades as well as significant unique variance in students' MLAT scores and L1 reading comprehension and language achievement in 10th grade. Analyses using hierarchical regressions showed that the FLCAS also explained unique variance in the growth of L1 reading, spelling, and language achievement from 1st to 5th grades, and in L1 reading comprehension from 5th to 10th grades.

Given the aforementioned findings, Sparks et al. contended that if the FLCAS were measuring anxiety for L2 learning in high school, there would be no viable explanations for: (a) individual differences (IDs) in L1 achievement among the three anxiety groups when they were in elementary school; (b) negative correlations between the FLCAS and measures of L1 achievement as early as 1st grade, several years *before* they were exposed to L2 in high school; (c) why the FLCAS would predict significant unique variance in L1 achievement or L2 aptitude measured by MLAT; and (d) why the FLCAS would predict growth in L1 achievement over several years in elementary school. Other researchers have also reported that students' scores on the FLCAS are related to their L2 achievement (e.g., see Argaman & Abu-Rabia, 2002; Chen & Chang, 2004).

Studies with the FLRAS

Like the FLCAS, Sparks, et al. (2000) critiqued the FLRAS because 18 of the 20 items asked specifically about students' L2 reading skills, leading to uncertainty about whether anxiety or reading is being measured. For example, the survey included the following items: *I get upset when I'm not sure whether I understand what I'm reading in Spanish*; *It bothers me to encounter words I can't pronounce when reading Spanish*; and *The hardest part of Spanish is learning to read*. Sparks et al. speculated that the outcome of studies with the FLRAS would be similar to those with the FLCAS, that is, students with higher levels of reading anxiety would exhibit lower levels of language ability, and vice versa. In response, Horwitz (2000) defended the FLRAS and suggested that "...to deny the reality of foreign language anxiety is illogical as well as insensitive to the experiences and needs of many language teachers learners" (p. 258). Horwitz has published several reviews of the language anxiety literature in which language anxiety is hypothesized to be a causal factor of poor L2 achievement (e.g., see Horwitz, 2001, 2010). However, none of the publications in these reviews have cited empirical evidence contradicting Sparks et al.'s claim that students' L1 achievement and L2 aptitude are confounding variables in the relationship between L2 achievement and L2 anxiety.

Recently, Sparks et al. were presented with the opportunity to test their claim about the FLRAS and language achievement by conducting a longitudinal study over three years with U.S. high school L2 learners. In their first study, Sparks et al. administered measures of L1 achievement (reading, writing, vocabulary, language analysis), L1 cognitive processing (working memory, metacognitive knowledge), L1 reading-related skills (print exposure), L2 aptitude (MLAT), written and oral L2 achievement (Spanish), and the FLRAS to U.S. secondary L2 learners. These students were followed through 2–3 years of L2 courses (Sparks, Luebbers et al., 2018). Participants were divided into three anxiety groups—high, average, and

low-based on their FLRAS scores and compared on all L1 and L2 measures at the end of 1st, 2nd, and 3rd year Spanish courses. Findings showed that the low anxiety group scored significantly higher than the high anxiety group on all L1 and L2 measures, and significantly higher than the average anxiety group on most L1 and L2 measures at the end of 1st and 2nd year Spanish. Students who completed 3rd year Spanish exhibited stronger L1 achievement and higher MLAT scores than students completing only two years of Spanish, and displayed either low or average anxiety on the FLRAS. The results suggested the FLRAS is likely to be measuring IDs in students' L1 achievement and L2 aptitude on the MLAT, rather than their anxiety about L2 reading.

In another study with these participants, Sparks, Patton, and Luebbers (2018) administered the FLRAS and the aforementioned L1 and L2 measures to determine whether the FLRAS would explain unique variance in their L1 achievement and L1 cognitive processing skills; explain unique variance in L2 aptitude on the MLAT; and predict growth in L2 achievement over the three years of L2 courses. A path analysis procedure showed that the FLRAS explained unique variance in L1 achievement and L2 aptitude (MLAT) scores. A series of hierarchical regression analyses found that the FLRAS predicted significant unique growth in L2 reading, spelling, writing, vocabulary, and listening comprehension over time from the end of 1st to 2nd to 3rd year Spanish courses.

In a recent study, Hamada and Takaki (2022) applied a latent rank model to identify Japanese learners of English who were struggling or successful in L2 classrooms according to their L2 reading anxiety symptoms on the FLRAS. Their findings showed that the FLRAS classified students into three ranked groups: low L2 reading anxiety, high anxiety about unfamiliar grammar knowledge in L2 reading, and even higher anxiety about L2 vocabulary and L2 grammar knowledge deficits. The authors suggested that the FLRAS is able to categorize students into groups according to their reading anxiety symptoms and that language anxiety scales (like the FLRAS) can function as basic diagnostic tests of L2 reading skills. Their results are consistent with the idea that lower levels on L2 achievement increase the degree of L2 anxiety. Hamada and Takaki concluded that a primary solution to reducing students' L2 anxiety is likely to be teaching L2 reading skills.

In sum, findings have shown that the FLCAS and FLRAS are likely to be measuring broad constructs that comprise IDs in students' L1 and L2 achievement and their L2 aptitude on the MLAT developed *prior to* L2 coursework, and both surveys may be reporting IDs in students' L1 and L2 skills and MLAT scores, their self-perceptions of their language learning skills, or both. The studies reviewed here have shown that students' language achievement and language aptitude are likely to be confounding variables for the proposed role of anxiety in L2 learning.

Directionality of the language anxiety and L2 achievement relationship

Recently, Alamer and Lee (2021) investigated the directional relationship between language anxiety and L2 achievement. They noted that proponents of the L2 anxiety hypothesis have approached their studies with the preconception that anxiety *affects* language learning. For example, although Zhang (2013) claimed to explore

the relationship between L2 listening anxiety and L2 listening performance, the structural model was confirmatory, not exploratory, and aligned with the L2 anxiety hypothesis. Moreover, Zhang (2013) indicated that the examined causal model “was constructed on the basis of the assumption that FL anxiety can deteriorate FL performance” (p. 170). In contrast, Alamer and Lee (2021) examined the relationship between L2 achievement and L2 anxiety longitudinally across three time points using a cross-lagged panel (CLP) analysis. CLP analysis is more suited to study the directionality between the variables in an exploratory manner (Alamer & Arabai, 2022; Kearney, 2017). Their results supported the directional effect from L2 achievement at Time 2 to L2 anxiety at Time 3, but did not support the claim that anxiety negatively affected future L2 achievement. Instead, the results showed that language achievement preceded language anxiety. The study highlighted the importance of going beyond cross-sectional data to substantiate cause-and-effect relationships between the variables. A recent study has also confirmed the directionality from proficiency to anxiety (Botes et al., 2020b). These results inform the present study and lead us to adopt the position that language achievement precedes language anxiety.

Purpose and research questions

Statistical concerns

Although Sparks et al. have published several studies on L2 anxiety, those studies did not use recently developed statistical tools to evaluate links among L1 achievement, L2 aptitude on the MLAT, L2 achievement, and the L2 anxiety construct. For example, associations among the aforementioned variables were established through bivariate correlations, multiple regression analyses, or PROCESS analysis. Appropriate quantitative approaches may lead to results showing stronger causal implications and more reliable results (Alamer & Arabai, 2022; Hair & Sarstedt, 2021). For example, applications of structural equation modeling (SEM) allow for the inclusion of constructs such as ‘L1 achievement’ that is constituted by its indicators (e.g., word decoding, vocabulary, working memory, etc.). In previous research, L1 achievement has been treated by its indicators separately, that is, the specification of the global construct *L1 achievement* was absent. Further, the use of second-generation statistical analysis (i.e., SEM) allows for the exploration of the association between the constructs more accurately and with more robust results (Alamer & Marsh, 2022; Alamer, 2022a).

One of the recent advancements of SEM has been the reintroduction of partial least squares structural equation modeling (PLS-SEM; Hair et al., 2022; Henseler, 2021). PLS-SEM is an alternative SEM method with the objective of evaluating composite models. PLS-SEM has several features that have already benefited L2 research (e.g., Alamer, 2022b, 2022c; Arabai & Alamer, 2022; Sparks & Alamer, 2022) and suit the objective of the present study. For example, it allows for the assessment of the out-of-sample prediction, which displays the accuracy of the estimated model in predicting scores that have not been used in the initial stage of the analysis, thus

providing an indication for the external validity of the results (Alamer et al., 2022; Hair & Alamer, 2022). More importantly, because PLS-SEM is a *composite-based* technique, it allows composite constructs to be easily specified and estimated. Composite constructs are those formed by their items/indicators. Items on a composite are unique in that they hold specific detail about the construct and are not interchangeable. For example, in our hypothesized model (Fig. 1), L1 achievement is made of more elementary parts (i.e., L1 word decoding, reading comprehension, vocabulary, L1 analysis, and L1 writing). Clearly, these items/indicators are distinct in meaning; however, they jointly form the overarching construct of L1 achievement. In this way, removing one item from the composite construct likely alters its conceptual meaning (Henseler, 2021). Consequently, when the construct follows this definition, it is called *composite* or *formative* (also referred to as an *emergent variable*). Hence, the relationship in the composite model goes from the items to the construct. We argue that modeling composites through PLS-SEM when they are present is an important methodological contribution to the L2 research (Alamer et al., 2022; Alrabai & Alamer, 2022).

Possible mediators

In a recent investigation, Sparks and Alamer (2022) followed students from elementary to high school to examine pathways by which L1 achievement skills are associated with L2 anxiety (FLCAS) via two mediators, L2 aptitude measured by MLAT and L2 achievement. The results showed that the effect of L1 achievement skills on L2 anxiety was indirect through the mediators, suggesting that

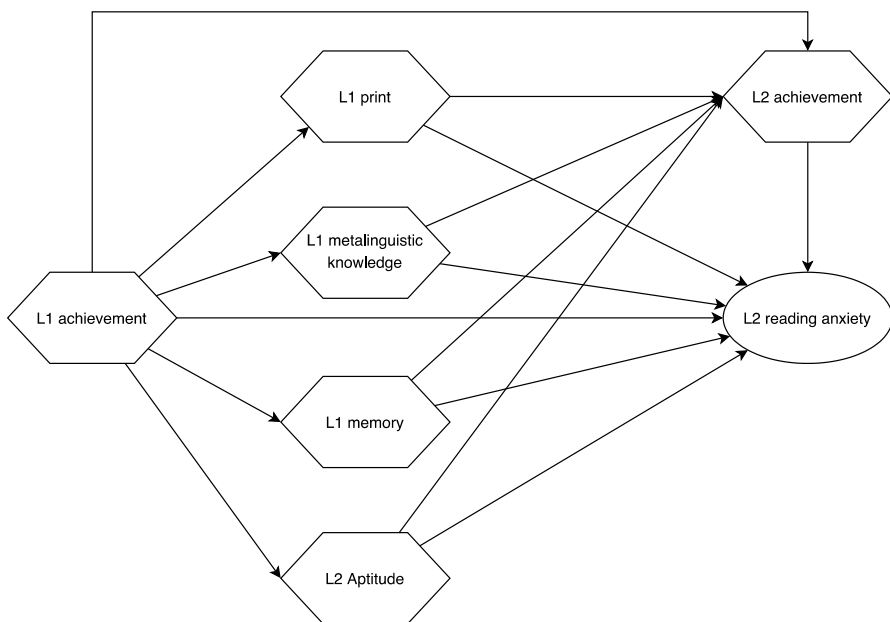


Fig. 1 The Conceptual Model Linking L1 Achievement to L2 Reading Anxiety

the impact of L1 achievement on L2 anxiety was better understood through the mediators. The present investigation seeks to replicate and extend that study by: (a) employing a larger group of L2 learners; (b) using a battery of tests that included not only L1 achievement, the MLAT, and L2 achievement measures but also measures of L1 working memory, metacognitive (literacy) ability, and print exposure (reading volume); and (c) a different L2 anxiety survey, the FLRAS.

The *L1 working memory* measures were chosen as mediators because students with high, average, and low anxiety on the FLRAS have been found to exhibit significant differences in working memory (Sparks et al., 2018a, 2018b); the FLRAS was found to explain unique variance in L1 working memory (Sparks, Patton, & Luebbers, 2018a, 2018b); and working memory has been found to play an important role in different aspects of L2 learning (Wen, 2019). The *L1 metalinguistic* measure was chosen as a mediator because students with high, average, and low anxiety on the FLRAS have been found to exhibit significant differences in L1 metalinguistic knowledge (Sparks et al., 2018a, 2018b) and the FLRAS has been found to explain unique variance in L2 learners' metalinguistic knowledge (Sparks, Patton, & Luebbers, 2018a, 2018b). *L2 aptitude (MLAT)* was chosen as a mediator because students with high, average, and low anxiety on the FLRAS have been found to exhibit significant differences in L2 aptitude (Sparks & Ganschow, 2007; Sparks et al., 2018a, 2018b) and the FLRAS explains unique variance in students' scores on the MLAT (Sparks, Patton, & Luebbers, 2018a, 2018b). [L1 working memory, metacognitive (literacy), and language aptitude (MLAT) have been found to be distinguishable constructs (Roehr-Brackin, 2018)]. The *L1 print exposure* measures were included as mediators because more and less anxious L2 learners have been found to exhibit significant differences in L1 print exposure (see Sparks et al., 2018a, 2018b), and L1 print exposure made unique contributions to L2 achievement even after adjusting for the effects of L1 achievement and cognitive ability in elementary school and L2 aptitude on the MLAT (Sparks et al., 2012b). The *L2 achievement* measures were included as mediators because students with high, average, and low anxiety on the FLRAS have been found to exhibit significant differences in L2 achievement (Sparks et al., 2018a, 2018b) and the FLRAS was found to explain growth in L2 achievement from first- to second- to third-year Spanish reading, writing, speaking, and listening comprehension (Sparks, Patton, & Luebbers, 2018a, 2018b).

Research question

The purpose of this study is to investigate the effects of L1 achievement on L2 reading anxiety with a larger dataset and with a more extensive battery of L1 measures. We have one comprehensive research question for the present investigation: Is the effect of L1 achievement on L2 reading anxiety (measured by FLRAS) mediated by L2 aptitude on the MLAT, L1 print exposure, L1 metacognitive (literacy) knowledge, L1 memory and L2 achievement? Figure 1 displays the hypothesized model in the present study.

Method

Participants

The study began with 307 participants chosen randomly from students enrolled in first-year Spanish courses at one of four high schools in a large suburban school district in the Midwestern area of the U.S. near a metropolitan city. There were 154 males and 153 females whose mean age was 15 years, 7 months (ages ranged from 13 years, 7 months to 17 years, 6 months, $SD = 8.7$ months) enrolled in 9th, 10th and 11th grades at the beginning of the study. Participants included 301 Caucasian, four African-American, and two East Asian students. Two hundred and ninety-three (148 females and 145 males) of the 307 students completed the first-year Spanish course. All participants were monolingual English speakers who had no prior experience with Spanish, were not routinely exposed to Spanish outside school, and spoke no language other than English.

The study was approved by the IRB Board at the first author's institution (approval number not provided by institution). Signed parental permission was obtained for each participant.

Testing instruments

L1 achievement

A description of each L1 measure is provided in Appendix S1. These standardized measures are not available for review as they are proprietary but can be accessed from the publisher.

L1 word decoding

The two measures of word decoding were the Woodcock Reading Mastery Test-Revised Basic Skills Cluster (Woodcock, 1998), and the Test of Word Reading Efficiency (Torgesen, Wagner, & Rashotte, 1999). The L1 Word Decoding score was obtained by averaging a student's standard scores ($M = 100$, $SD = 15$) on the Woodcock Cluster and TOWRE Composite.

L1 reading comprehension

The measure of L1 reading comprehension was the Stanford Achievement Test 10 (Pearson, 2007).

L1 vocabulary

The measure of L1 vocabulary was the Woodcock-Johnson-III/NU Picture Vocabulary subtest (Woodcock, McGrew, & Mather, 2001).

L1 language analysis

The measure of language analysis was the Test of Language Competence-Expanded Edition Figurative Language subtest (Wiig & Secord, 1989).

L1 writing

The measure of L1 writing was the On-Demand Writing assessment, a state-required outcomes assessment that is a timed, group-administered standardized measure of writing.

L1 working memory, L1 metalinguistic knowledge, and L1 print exposure measures

A description of these measures is provided in Appendix S1. The working memory measure is not available for review as it is proprietary but can be accessed from the publisher. Copies of the metalinguistic knowledge and print exposure measures are provided in Appendix S2 and S3, respectively.

L1 working memory

The measure of phonological short-term memory was the Comprehensive Test of Phonological Processing, Phonological Memory Composite (CTOPP) (Wagner, Torgesen, & Rashotte, 1999). The measure of working memory was the Woodcock-Johnson-III/NU Working Memory Cluster (Woodcock, Mather, McGrew, Schrank, & Johnson, 2007). The L1 Memory score was obtained by averaging a student's standard scores ($M = 100$, $SD = 15$) on the two tests.

L1 metalinguistic knowledge

Participants' metalinguistic knowledge was measured using a questionnaire designed by van Gelderen et al. (2007) consisting of statements about texts, reading, and writing (literacy) that are either correct or incorrect.

L1 print exposure

The instruments used to measure print exposure were the Author Recognition Test (ART) and the Magazine Recognition Test (MRT) (Acheson, Wells, &

McDonald, 2008), which were updated versions of the measures developed by Stanovich et al. (Stanovich & West, 1989; West & Stanovich, 1991).

L2 aptitude

The measure of L2 aptitude was the Modern Language Aptitude Test (MLAT) (Carroll & Sapon, 1959, 2001). This standardized test measures L2 aptitude with a simulated format to provide an indication of the probable degree of success in learning a L2. The test is described in Appendix S1. This standardized measure is not available for review as it is proprietary but can be accessed from the publisher.

L2 (Spanish) achievement

A standardized measure of Spanish achievement, the *Batería III Woodcock-Muñoz Pruebas de aprovechamiento* [Woodcock-Muñoz Achievement Tests] (Woodcock, Muñoz-Sandoval, McGrew, & Mather, 2004) designed for students whose native language is Spanish, was used to measure participants' Spanish achievement. The subtests are listed here and described in Appendix S1. This standardized measure is not available for review as it is proprietary but can be accessed from the publisher.

L2 reading

Participants were administered the *Identificación de letras y palabras* [Letter-Word Identification] subtest and the *Comprensión de textos* [Text Comprehension] subtest. The L2 Reading score was obtained by averaging a student's standard scores ($M = 100$, $SD = 15$) on the two subtests.

L2 writing

Participants were administered the *Ortografía* [Orthography or Spelling] subtest and the *Muestras de redacción* [Writing Samples] subtest. The L2 Writing score was obtained by averaging a student's standard scores ($M = 100$, $SD = 15$) on the two subtests.

L2 listening comprehension

Participants were administered the *Vocabulario sobre dibujos* [Picture Vocabulary] subtest and the *Comprensión Oral* [Oral (listening) comprehension] subtest. The L2 Listening Comprehension score was obtained by averaging a student's standard scores ($M = 100$, $SD = 15$) on the two subtests.

L2 reading anxiety

The Foreign Language Reading Anxiety Scale (FLRAS) (Saito, Horwitz, & Garza, 1999) was used to determine participants' anxiety for reading in a foreign (L2) language. According to a recent factor analysis study (Hamada & Takaki, 2021),

the FLRAS is better conceptualized as multidimensional and consists of three sub-factors. We follow this suggestion and model FLRAS as a higher-order factor with three lower-order factors. Because the lower-order factors were aggregated in our analysis, i.e., obtaining mean values of the three sub-factors, only the higher-order factor (i.e., FLRAS) is relevant for a reliability estimate. The reliability of the FLRAS was checked by calculating Cronbach's alpha, which was 0.73, and a composite reliability which was 0.85. The average variance extracted (AVE) was 0.65. These findings indicate that the factor is appropriately estimated. A list of items on the FLRAS is provided in Appendix S4.

Procedure

The testing instruments were administered to participants at different times over the course of the study. The MLAT was administered in groups of 25–30 students by the first author in the first 3–4 weeks of the 1st year Spanish course. The L1 measures were administered individually at the beginning of the Spanish course by the first author, a Spanish professor, and graduate students trained by them. The participants' scores on the L1 reading comprehension and L1 writing measures were obtained from school records. The measure of L2 reading anxiety, the FLRAS, was administered individually during the same time period.

The measures of Spanish achievement were administered individually to the participants at the end of the 1st year Spanish course by the first author, the L2 Spanish professor, and graduate students trained by them. Participants' raw scores for the six measures were transformed to standard scores ($M = 100$, $SD = 15$) using the *Woodcock-Johnson-III* Normative Update Compuscore and Profiles Program Version 3.1 (Skrank & Woodcock, 2008). Because the *Woodcock-Munoz* is a standardized, norm-referenced test calibrated to measure the skills of native Spanish-speaking test-takers, norms were available for a wide range of grade levels, i.e., participants' scores on the six subtests could be compared to native Spanish-speaking students in 1st–12th grades. For this study, participants' scores according to 9th grade native Spanish speaker norms were used.

Statistical analysis

Data screening and assumptions

Before analyzing the data through the PLS-SEM, a preliminary check evaluated the normality and outliers of the data. Normality was evaluated by checking the skewness and kurtosis and also graphically via Q-Q plots. The 2/-2 guideline for skewness and kurtosis was chosen and visual deviation from the line in the Q-Q plots was selected (Hair et al., 2022). Our analysis displayed some values that depart from normality, while outliers (found in L1 print exposure and L1 language analysis) were retained in the data because they represent real values that can occur in the population. The analyses were conducted with and without the

outliers to examine the differences between the analyses, and these results indicated trivial differences. The type of the statistical analyses we adopted are robust to the non-normality observed on some of the variables.

Validity and reliability of the constructs

The present paper adopted the PLS-SEM method to execute the SEM. PLS-SEM is an alternative analysis tool to the widely used covariance-based SEM (CB-SEM). The main objective of PLS-SEM is to test the predictive relevance of the composite model. PLS-SEM is a composite-based method; thus, the evaluation of reliability and validity differs from the commonly applied CB-SEM method. Reliability of the reflective constructs (i.e., factors) are examined using Cronbach's alpha (α) and composite reliability (CR), both of which should be above 0.70 for a reliable measure. However, in formative constructs (i.e., composites), these two indices are not used. Instead, formative constructs are assessed for their convergent validity by ensuring that: a) the items lack collinearity issues, and (b) the items show relative contribution on the formative construct. Collinearity is checked by the variance inflation factor (VIF) in which the value should be below 5 (and better, lower than 3) to indicate that the indicators are not highly interchangeable. Relative contribution is assessed by showing the significance (i.e., the p -value) of the indicator weights on the construct. Finally, recent research Henseler (2021) showed that reporting model fit indices (e.g., SRMR) in PLS-SEM can be useful to determine the adequacy of the model with values equal to or below 0.08 indicating acceptable to good fit.

Evaluating the structural model

The evaluation of PLS-SEM is based on four measures: (1) model collinearity through VIF (explained above), (2) the explanatory power, which is assessed via the coefficient of determination (the R^2 value), (3) the SRMR as one of the established fit indices in PLS-SEM for readers to determine the levels of fit of the structural model, and (4) the predictive power, which is assessed using the PLS_{predict} procedure (Shmueli et al., 2019). PLS_{predict} is one of the recent advancements in PLS-SEM that evaluates the extent to which the results of the model can predict out-of-sample data. It incorporates an initial training sample (randomly drawn) and then estimates the predictive capability of the model based on a second hold-out sample of data other than that used in initial training sample. If the error values in RMSE are lower in the PLS model than in the linear regression model (LM), the model can be said to have good predictive power (see Hair et al., 2022 for greater details). The effect sizes in the model coefficients are interpreted following Hair and Alamer (2022) guidelines such that beta (β) values between 0 and 0.10, between 0.10 and 0.30, between 0.30 and 0.50, and > 0.50 are indicative of weak, modest, moderate, and strong effect sizes, respectively.

Table 1 Descriptive Statistics, Means and Correlational Matrix (Spearman rho)

	1	2	3	4	5	6	7
1. L1 achievement	–						
2. L1 Metalinguistic	0.32***						
3. L1 Print Exposure	0.44***	0.26***					
4. L1 Memory	0.43***	0.33***	0.18**				
5. MLAT	0.47***	0.29***	0.32***	0.36***			
6. L2 achievement grade 9	0.53***	0.25***	0.37***	0.31***	0.49***	–	
7. FLRAS	–0.36***	–0.27***	–0.26***	–0.17**	–0.28***	–0.41***	58.78 (9.32)

Sum score and (SD) are in the diagonal. Formative constructs have no sum scores or SD

* $p < .05$, ** $p < .01$, *** $p < .001$.

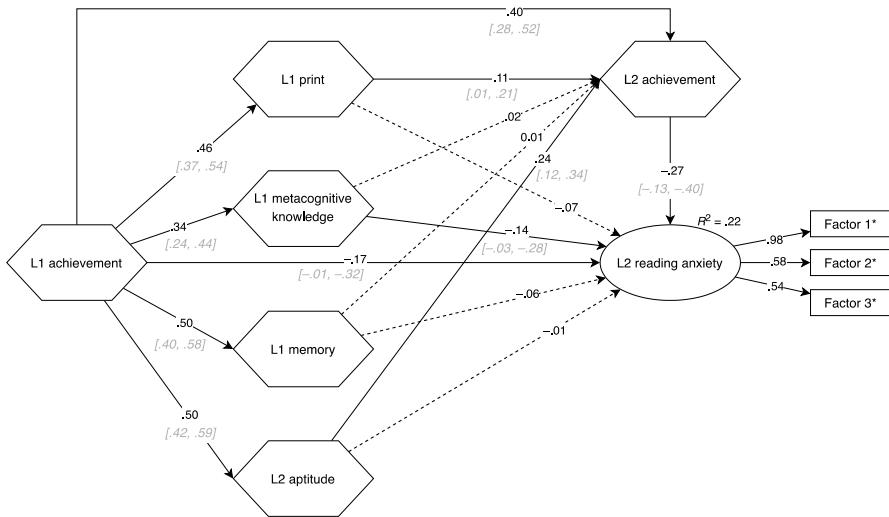


Fig. 2 Results of the Structural Model Linking L1 achievement to FLARS through Mediators. *Note.* Dashed lines indicate nonsignificant paths; values in brackets are bias-corrected confidence intervals (CI) 95%; * Hamada and Takaki (2021) suggested that the name of three factors should be *familiarity with vocabulary and grammar, reading confidence and enjoyment, and language distance* for factor 1, 2 and 3, respectively. However, we do not necessarily agree with these names because more thorough exploration is needed

Results

As indicated earlier, preliminary analysis on the data was conducted to check for normality and outliers. Table 1 shows the descriptive statistics and the correlational matrix for the variables involved in the model. The results of the structural model are presented in Fig. 2. Model indirect and total effects as well as predictive relevance

Table 2 Significant Standardized Indirect, Total Effects and Model Quality Measures

Paths	β	p
L1 achievement → L2 achievement → FLARS	-.11	< .001
L1 achievement → MLAT → L2 achievement → FLARS	-.03	.01
L1 achievement → Metalinguistic → FLARS	-.05	.05
L1 achievement → FLARS (total effect)	-.34	< .001
In-sample and out-of-sample prediction indices of FLARS		
R^2	.22	
RMSE	PLS model = 8.31	LM model = 8.35

measures are displayed in Table 2. First, our results showed that SRMR was 0.05 [SRMR Hi CI 95% = 0.04] indicating that the model showed good fitting to the data. We now explain the predictive capability of the structural model. The model showed that the variance explained by model variables was 0.22 (i.e., the R^2), indicating that the explanatory power was moderate. With regard to the out-of-sample predictive power, the results of the PLS_{predict} presented in Table 2 shows that the model has a strong predictive validity for scores on FLRAS that were unused in the training PLS model, i.e., the error on the PLS model (RMSE = 2.89) is slightly lower than in the linear regression model (LM) model (RMSE = 2.90). Following the PLS-SEM guidelines, if the PLS model outperformed the alternative LM model by showing lower prediction errors, then the model has good prediction for out-of-sample scores (Hair & Alamer, 2022).

With regard to the direct, indirect, and total effects of L1 achievement on L2 reading anxiety, the analysis revealed that the effect of L1 achievement on L2 reading anxiety was both direct and indirect (see Fig. 2). The effect of L1 achievement on L2 reading anxiety was indirect through three variables: L1 metalinguistic (literacy) knowledge, L2 aptitude and L2 achievement (see Table 2). No other indirect effects were observed in the structural model. The indirect effects in the models were negative and significant, -0.03 to -0.11 , with a total effect of -0.34 , suggesting moderate total effect size. The analysis identified the mediational pathways through which L1 achievement is linked to L2 reading anxiety.

Discussion

In this study, participants were administered measures of L1 achievement, L1 working memory, L1 metacognitive (literacy) knowledge, L1 print exposure, and L2 aptitude on the MLAT at the beginning of a first-year, high school Spanish course. They were administered L2 achievement measures and a L2 reading anxiety survey, the FLRAS, at similar time points in the Spanish course. The purpose was to investigate through structural equation modeling the pathway by which L1 achievement is associated with L2 reading anxiety via several hypothesized mediators.

Our research question asked whether the effects of L1 achievement on L2 reading anxiety would be mediated by L2 aptitude (MLAT), L2 achievement, or any of the working memory, print exposure, and metalinguistic (literacy) knowledge measures. The findings showed that there was a direct effect of L1 achievement on L2 anxiety. The analyses also confirmed the positive mediating effects of the two L2 variables, MLAT and L2 achievement, and one L1 variable, metacognitive (literacy) knowledge, and showed that the paths from L1 achievement passed through them, collectively. These findings demonstrated that L1 achievement skills were positively related to L2 aptitude (MLAT), L2 achievement, and L1 metacognitive (literacy) knowledge, and in turn, each of these variables was related to L2 reading anxiety. Numerous studies over 25 years have found that there are strong relationships among L2 learners' levels of anxiety on the FLCAS and FLRAS and their levels of L1 achievement, L2 aptitude on the MLAT, and L2 achievement. Students who report higher levels of anxiety on these measures display significantly weaker L1 and L2 achievement and lower MLAT scores (e.g., see Ganschow et al., 1994; Ganschow & Sparks, 1996; Sparks & Ganschow, 2007; Sparks et al., 1997; Sparks, Luebbbers et al., 2018; Sparks, Patton, & Luebbbers, 2018). Similarly, findings from the present study demonstrate that the impact of learners' achievement in L1 on their levels of L2 reading anxiety are mediated by language-based variables, i.e., language aptitude, language achievement, metalinguistic (literacy) knowledge.

The findings from this investigation suggest that the impact of L1 achievement developed *prior to* L2 instruction on students' L2 reading anxiety is both direct and indirect. From a direct effect perspective, this implies that L1 achievement developed *prior to* the study of a L2 has a unique, and pronounced, predictive effect on L2 reading anxiety over and above that explained by the indirect effects. This finding supports Sparks et al.'s studies which have found that IDs in early L1 skills developed *before* L2 instruction are related to IDs on L2 anxiety measures administered in high school and that students' levels of L2 anxiety in high school are negatively correlated with L1 achievement measures as early as 1st grade (see Sparks & Ganschow, 2007). Sparks et al. have contended for several years that if L2 anxiety measures such as the FLRAS (and FLCAS) were measuring a "special" anxiety for L2 learning, there will be no viable explanation for the findings of the present study and the long line of studies cited earlier. The findings reinforce Sparks et al.'s contention that L2 anxiety researchers should consider the idea that confounding variables will likely falsify the proposed causal relationship between anxiety and L2 achievement. As such, our results do not align with the classical view of the causal effect of anxiety on language learning, which have been firmly held for decades by L2 educators (Horwitz et al., 1986; Saito et al., 1999) and claimed in recent reports (Botes, et al., 2020a; Li, 2022; Oteir & Al-Otaibi, 2019; Teimouri, et al., 2019; Zhang, 2019).

From an indirect effect perspective, the effect of L1 achievement on L2 anxiety is explained by students' levels of L2 aptitude on the MLAT and their level of L2 achievement. In general, students' L1 achievement levels and their L2 aptitude, in this case MLAT, have not been considered by L2 educators to be a marker for their levels of anxiety for language learning. However, it is well-known that L2 aptitude, in this case the MLAT, is the strongest single predictor of L2 achievement (Li, 2019) and that students with weaker L1 achievement and lower MLAT scores display

higher levels of L2 anxiety, and vice versa (Sparks & Ganschow, 2007; Sparks, Luebbers et al., 2018; Sparks, Patton, & Luebbers, 2018). Given that prior research has established that students with higher levels of anxiety for language learning have significantly weaker L2 aptitude on the MLAT (and lower L1 achievement) and that language achievement precedes language anxiety (see Alamer & Lee, 2021), L2 educators would likely have a clearer picture for the source of their students' anxiety if they were provided with prior information about their students' language histories. For example, a study by Sparks et al. (1995) with U.S. high school students found that the best predictors of L2 achievement at the end of a first-year L2 course were the students' prior-year English grade and their score on the MLAT.

In a previous study with a different group of participants using the FLCAS, Sparks and Alamer (2022) also found that the effects of L1 achievement on L2 anxiety went through L2 aptitude (MLAT). In order to explain L2 aptitude measured by the MLAT as a mediator between L1 achievement and L2 anxiety, they cited Sparks et al. (2009) who proposed that L2 aptitude tests (such as MLAT) may pre-empt (cut out) the variance explained by L1 achievement skills for predicting L2 achievement. Like Skehan (1986, 1989), Sparks et al. speculated that L2 aptitude tests such as the MLAT measure students' ability to learn "decontextualized material" (Skehan, 1989, p. 34), i.e., language ability tasks not encountered in everyday life. For example, in L1, a student may be able to read a word correctly without being aware of the sound-symbol relationships or write a grammatically correct sentence without awareness of parts of speech. But on a L2 aptitude test (in this case, MLAT), the student must learn and retain a new sound-symbol system and recognize the grammatical function of a word to be successful. We propose that L2 aptitude (MLAT in this study) may be a mediator between L1 achievement and L2 reading anxiety (FLRAS in this study, but also the FLCAS) because language aptitude tests tap into students' capacity to use their knowledge about language, i.e., to *think* about language, rather than the ability to simply use language (see Bialystok, 2001). Thus, an L2 aptitude test may serve, in part, as a measure of metalinguistic ability or a surrogate for students' metalinguistic ability (see Ranta, 2002; Roehrer-Brackin, 2018).

The results of this study showed that the effects from L1 achievement to L2 reading anxiety were also mediated by L2 achievement. These findings replicate those of Sparks and Alamer (2022) in an investigation over several years in which they found that the effects of L1 achievement on L2 anxiety measured with the FLCAS were indirect through L2 achievement. These authors postulated a simple explanation for their findings: higher L2 anxiety has been found to be related to lower L2 achievement, which in turn, is linked to lower L2 aptitude on the MLAT and L1 achievement (e.g., see Sparks, Luebbers et al., 2018; Sparks, Patton, & Luebbers, 2018, 2019). They cited evidence showing that high, average, and low anxiety groups (based on FLCAS scores) exhibited significant overall differences on all L1 measures, the MLAT, and L2 achievement skills, and that the low anxious group scored significantly higher than the high anxious group on all L1 measures many years prior to L2 exposure (Sparks & Ganschow, 2007); the FLCAS is negatively correlated with all L1 measures as early as 1st grade (Sparks, et al., 2009); and the FLCAS administered in high school explains significant unique variance in primary school L1 achievement and L2 aptitude (MLAT) measured prior to L2 exposure

(Sparks & Patton, 2013). The aforementioned studies have consistently found that students with higher levels of anxiety on the FLRAS and FLCAS have fewer cognitive (language-based) resources in their L1 for use in L2 learning than students with lower levels of anxiety. In addition, findings support speculation that L2 aptitude on the MLAT, a measure of the ability to think about language, is itself a cognitive resource. Speculation about cognitive (language-based) resources is supported by Hamada and Takaki's (2022) findings, which showed that students who report higher anxiety (on the FLRAS) have weaker grammar and vocabulary knowledge in the L2 as well as lower L2 reading skills. The findings from the present investigation also lend additional support to Alamer and Lee's (2021) and Botes et al.'s (2020b) study which showed that language achievement precedes language anxiety in the L2 classroom.

A new finding from this study is that the path from L1 achievement to L2 anxiety was also mediated by a measure of students' metalinguistic knowledge about L1 reading, writing, and text structure, i.e., literacy knowledge. [See Appendix S3 for sample items.] The finding that this instrument is a mediator makes sense because it tapped into students' metalinguistic knowledge about *literacy* in L1 (English) and the FLRAS is a measure of *reading* anxiety. In L1 research, students' ability to think about more complex language structures has been linked to their reading volume (print exposure) over time (see Stanovich, 2000). In studies with L2 learners in high school, Sparks et al., (2012a, 2012b) found that: (a) high, average, and low reading volume groups displayed significant differences in L1 achievement, L2 aptitude (MLAT), and L2 achievement, (b) the differences in L1 achievement emerged as early as 1st grade, and (c) IDs in L1 reading volume made unique contributions to L2 achievement in high school. The results of the present study showing that metacognitive (literacy) knowledge is a mediator between L1 achievement and L2 anxiety and the aforementioned findings about reading volume and L2 aptitude/L2 achievement are plausible because students who read more are likely to have stronger literacy knowledge. The finding that the path from L1 achievement to L2 reading anxiety was mediated by L1 metalinguistic knowledge about literacy may be another indicator that students with higher levels of L2 anxiety, who have consistently been found to exhibit lower levels of language ability, will have fewer cognitive (language) resources for L2 learning than students with lower anxiety who have stronger language ability.

The use of SEM, particularly PLS-SEM, to analyze our longitudinal data has provided richer, clearer, and more complex explanations about the associations between L1 achievement and L2 reading anxiety that could not be obtained by first-generation analyses such as correlation or multiple regression. We applied PLS-SEM because it fits the predictive approach our study holds to achieve prediction with reasonable accuracy (Alamer, 2022b; Alrabai & Alamer, 2022; Hair & Alamer, 2022). Specifically, applying PLS_{predict} illustrated the extent to which the structural model predicts out-of-sample scores in L2 reading anxiety and the findings showed that our model was able to predict the omitted data successfully, thus supporting the external validity of the results from a new perspective (Shmueli et al., 2019, see also Alamer et al., 2022). Thus, our findings can be generalized to samples similar to the current

study. Our findings might also apply to different socio-educational settings pending empirical replication.

Also, we propose that modeling composite constructs such as L1 achievement and L2 achievement has resulted in more valid and reliable findings (Henseler, 2021). Combining this finding with previous conceptual and applied studies (e.g., Alamer & Lee, 2021; Sparks & Alamer, 2022; Sparks et al., 2012a, 2012b) as well as the fact that our data is longitudinal allowed us to reach a higher level of understanding about the causal relationship between the variables.

In sum, the findings from the present study support the notion that language skills including L1 achievement, L1 metalinguistic knowledge, and L2 aptitude are confounding variables in the relationship between language anxiety and L2 achievement, and also call into question the role of language anxiety as a causal factor in students' ultimate L2 achievement.

Limitations and conclusions

This type of study is rare in the L2 anxiety literature because it employed the full SEM technique to explore the effect of prior L1 achievement on later L2 anxiety through several L1 and L2 mediators. Moreover, the study tested hypotheses about the relationships among L1 achievement, L2 aptitude (MLAT), and L2 achievement using the richer, more advanced PLS-SEM method. Even though the study used several L1 and L2 mediators and employed these advanced techniques, one limitation is that other factors, e.g., motivation, previous educational experiences, were not included as potential mediators. Nonetheless, there are several important implications of our investigation for measurement, research, theory, and teaching related to language anxiety.

First, our results raise concerns about the *measurement* of language anxiety. Since 1991, Sparks et al. have maintained that L2 anxiety instruments are more likely to be surrogates for students' levels of language ability and language aptitude, their (usually accurate) self-perceptions of their language ability, or both. Sparks (1995) has contended that L2 anxiety scales like the FLRAS (and FLCAS) are likely to be contaminated by language achievement because the items ask students, directly and explicitly, about their language skills. The results of this study, which found that the relationship between L1 achievement and L2 anxiety is both direct and indirect as mediated by language variables [L2 aptitude on the MLAT, L2 achievement, L1 metalinguistic (literacy) knowledge], suggest that language educators and researchers should consider developing instruments that measure language anxiety uncontaminated by language ability and/or use language anxiety surveys as a proxy for students' language skills, i.e., higher anxiety and weaker language skills, and vice versa (see Hamada & Takaki, 2022). As noted by Hamada and Takaki (2021), the factorial structure of FLRAS differs from context to context and there is no strong agreement on the measurement model of the scale. Future research could examine this issue thoroughly by including advanced statistical tools such as exploratory structural equation modeling (ESEM; Alamer & Marsh, 2022; Alamer, 2022a).

Second, a related implication is the notion of confounding variables in language anxiety *research*. Sparks et al. have shown that L1 achievement and L2 aptitude measured by MLAT distinguish among students with high, average, and low levels of anxiety on the FLRAS and FLCAS, i.e., high anxiety and low language ability, and vice versa. Likewise, Alamer and Lee (2021) found that language achievement precedes language anxiety, and the present study showed that language variables have a direct effect and also mediate the relationship between L1 achievement and L2 anxiety. We suggest that proponents of anxiety as a potential causal mechanism for L2 learning confront this confounding variable problem if language anxiety is to remain a viable theory for more and less successful language learning.

Third, an implication related to *theory* is that language researchers shift their attention from IDs in anxiety to IDs in language skills to explain IDs in L2 achievement. SLA/L2 researchers have been engaged generally in the search for universal characteristics and processes of language development, not differences in language development (see Dabrowska, 2016). Although these views may be changing (see Andringa & Dabrowska, 2019), this perspective has ignored the evidence that there are early and extensive IDs in L1 achievement by preschool age (Kidd & Donnelly, 2020); language differences affect L1 school performance in oral language and literacy development (Kendeou et al., 2009); IDs in language skills extend into adulthood (Kidd et al., 2018); L2 learners display IDs in L1 achievement as early as primary school (see Sparks et al., 2006); and L2 learners with high levels of anxiety display lower levels of L1 achievement and L2 aptitude on the MLAT (Sparks & Ganschow, 2007). Recommendations for practice follow theory. Current theoretical assumptions maintain that IDs in anxiety can explain IDs in L2 performance. We suggest a different theoretical position: language achievement is the more important factor that explains IDs in language learning. Our theoretical position is consistent with the aforementioned research on language development, language differences, and language anxiety.

Fourth, language educators should focus on *teaching* the language skills necessary to become proficient in a L2. L2 anxiety proponents have suggested that teachers should find ways to mitigate feelings of anxiety among L2 students, e.g., making a relaxed classroom, asking students to reflect on their feelings, searching for underlying causes of anxiety. In making our recommendation, we do not imply that anxiety is unimportant, but rather suggest that in order to overcome negative feelings about language learning, teachers should focus more on teaching language skills to increase the amount of language “intake”, which can improve students’ performance in the language and reduce anxiety (see also Hamada & Takaki, 2022). This recommendation is in line with the evidence showing that IDs in language ability are detected as early as 1st grade and persist across time when students encounter a L2. Negative correlations between language anxiety and language achievement have been interpreted by L2 educators to mean that language anxiety may cause language achievement. However, Alamer and Lee’s (2021) study reversed this assumption, suggesting that L2 educators consider the possibility that improvements in the language skills necessary for L2 success will alleviate undue anxiety.

Lastly, we call for language researchers to investigate our theoretical assumptions about anxiety and to examine the questions raised here about measuring anxiety,

researching confounding variables, theorizing about the language-anxiety relationship, and teaching of language skills. Like other areas of study, our investigation requires replication by other researchers. For example, researchers could determine whether the results of the present study are similar across different socio-educational contexts, between genders, and across different target languages.

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Declarations

Conflict of interests The authors declare none.

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