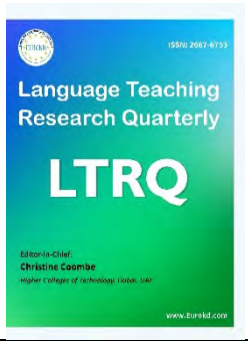

Language Teaching Research Quarterly

2022, Vol. 31, 19–40

Where Does Language Aptitude Come From? Redux

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Received *20 June 2022* ***Accepted*** *10 September 2022*

Abstract

This paper examines evidence for relationships among individual differences (IDs) in L1 achievement, L2 aptitude, and L2 achievement. It begins by providing an overview of my academic journey from L1 educator to L2 researcher and explains the development of the Linguistic Coding Differences Hypothesis (LCDH). Next, I review Peter Skehan's influential research on language aptitude and L1-L2 relationships and summarizes research showing that IDs in L1 achievement (and L1 ability) are universal, can be identified early, and are stable over time. Then, I review research on L1-L2 relationships and IDs in L2 learning, focusing on the longitudinal studies and reporting two new studies that examine the relationship between L1 achievement and L2 aptitude on the MLAT. Overall, I argue that the development of L1 literacy leads to growth in metalinguistic awareness, which enhances L1 literacy skills, and that L1 literacy and metalinguistic awareness provide the foundation for L2 aptitude, the ability to use and understand "decontextualized" material. I conclude the paper by proposing an answer to the title.

Keywords: *Language Aptitude, L1 Achievement, Metalinguistic Awareness, L2 Achievement, Individual Differences*

Introduction

This special issue honoring my work in language research and individual differences (IDs) in language learning is a tremendous distinction. I want to thank Dr. Mohebbi for devoting this issue of the journal to the topic of language aptitude and inviting me to contribute. I also thank my colleague, Dr. Edward Wen, for his encouragement to pursue my recent projects and collaborate as co-editor on three aptitude volumes.

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doi:10.32038/ltrq.2022.31.03

My paper for this issue will examine the evidence for relationships among L1 achievement, L2 aptitude, and L2 achievement. Specifically, I propose that L1 ability and achievement are the origin for L2 aptitude and ultimate L2 achievement, and that language aptitude is relevant for formal learning situations and acquisition. First, I provide an overview of my journey from L1 to L2 research and the genesis of the Linguistic Coding Differences Hypothesis (LCDH). Second, I review Peter Skehan's seminal research on L1-L2 relationships from which the title of the paper is drawn. Third, I summarize research showing that IDs in L1 ability and achievement are universal, can be identified early, and are stable over time. Fourth, I review my group's research on L1-L2 connections over 30+ years, focusing on our longitudinal studies and report two new studies examining the relationship between L1 achievement and L2 aptitude on the MLAT. Lastly, I conclude with an answer to the question posed by paper's title.

L1 Background and Development of the LCDH

My study of L2s in the U.S. was serendipitous. I am a L1 educator who is neither fluent nor literate in a foreign language (L2). I was a classroom teacher and tutor for students with learning problems, specifically reading disabilities (dyslexia) and learning disabilities. While earning my doctorate in special education and educational psychology, I was a graduate assistant and consultant at a children's hospital where I learned to conduct psychoeducational assessments of individuals with cognitive and learning problems. After graduation, I accepted a full-time position as a university professor and opened a private practice as an educational consultant, both of which I maintained for 35 and 40 years, respectively. At the university, I taught courses in learning disabilities, reading and reading disabilities, educational assessment, and research. My private work included performing psychoeducational evaluations of children, adolescents, and adults referred for learning and reading disabilities and consulting with school districts, professional agencies, and medical and law licensing boards.

My journey into L2s began in 1985-86 with the assessment of university students who experienced L2 learning problems. The referrals came from Dr. Leonore Ganschow, a LD and reading specialist, who would become my colleague and collaborator for 20 years. Though we lacked L2 backgrounds, Leonore and I speculated that there would be connections between the students' L2 learning difficulties and their L1 learning skills, an intuition that was validated when the university students I evaluated were found to have subtle language learning problems. Two important advantages of our L1 backgrounds were our extensive knowledge of the research base for L1 language and literacy development and our many years of experience with students who exhibited language learning problems. For example, L1 researchers have found that there are large and extensive differences in L1 ability that can be identified by preschool age (Bates et al., 1995; Kidd & Donnelly, 2020, Kidd et al., 2018), and that these IDs in oral language are related to L1 literacy development years later (Kendeou et al., 2009). We reasoned that since L2 learning is the learning of *language*, IDs in L1 achievement would be found to be related to IDs in L2 learning. Our speculation resulted in the development of the LCDH (Sparks et al., 1989) and further clarification of the hypothesis in subsequent years (Sparks, 1995; Sparks & Ganschow, 1991, 1993a, 1995).

Briefly, the LCDH makes the following claims: 1) L1 and L2 learning have a common underlying foundation, i.e., language ability, 2) L2 aptitude and L2 achievement run along a continuum of very strong to very weak learners, 3) L2 learning problems are, first and foremost, *language* learning problems, 4) like L1 ability, L2 aptitude is componential, and 5) L2 aptitude and L2 achievement will be constrained by L1 achievement. The LCDH is similar to Cummins' (1979) Linguistic Interdependence Hypothesis (L1 and L2 have a common underlying foundation) and Linguistic Threshold Hypothesis (L2 proficiency is moderated by L1 attainment). Later, we studied the L2 anxiety hypothesis and found that IDs in L1 achievement and L2 aptitude are confounding variables in studies related to anxiety.

Though our hypothesis made sense to us, Ganschow and I found that little research had been conducted to investigate L1-L2 connections. Later, we learned that while SLA/L2 researchers recognized IDs in language skills, these IDs were rarely studied and largely ignored (Dabrowska, 2016). We also learned that IDs in language skills had been ignored, in part, because "…linguists are uncomfortable with the claim of significant differences in native language ability" (Gass & Selinker, 1994, pp. 232-233). Fortunately, we found John Carroll's work on language aptitude and the MLAT (Carroll, 1962; Carroll & Sapon, 1959, 2000), Peter Skehan's (1986) research on the origins of language aptitude and his follow-up study from the Bristol Language Project (Skehan & Ducroquet, 1988), and Cummins' research cited earlier, and were pleased that our hypothesis was consistent with their research. Even so, we were puzzled that although L2 researchers recognized IDs in L2 achievement, they had failed to conduct studies that measured students' L1 achievement and L2 aptitude, followed them over time in naturalistic or instructed settings, and determined whether they would also display IDs in L2 aptitude and L2 achievement. For example, L2 researchers had not yet answered the most basic question about IDs in language: would students who display significantly lower L2 achievement also exhibit significantly lower L1 achievement and L2 aptitude when compared to those with stronger L2 achievement?

The lack of studies on L1-L2 relationships played positively into another advantage of our L1 backgrounds: the availability of and our expertise in using the large number of individually-administered, standardized tests in the U.S. to measure L1 (English) oral and written language skills and cognitive processing abilities. Standardized tests are used to compare individuals of the same age (grade) along a common scale, determine their standing in a group, track their progress over several years, and provide insights into both inter- and intra-individual differences that cannot be easily distinguished by group-administered tests, course grades, and qualitative measures. We assumed that other countries had developed similar measures, but found we were largely mistaken. We also assumed that L2 educators in the U.S. and elsewhere had developed individually administered, standardized measures of second-language achievement, but learned this was not the case. At the time (in the early 90s), Ganschow and I reasoned that the lack of research investigating L1-L2 relationships was, in part, due to the focus on similarities, not differences, in L1 ability; the lack of interest in IDs generally; and L2 researchers' unfamiliarity with individually administered, standardized instruments to measure L1 achievement. Later, we

learned that the U.S. is unique in developing a wide range of standardized tests that are used to measure L1 achievement and cognitive processing skills.

Next, I review Peter Skehan's seminal work on connections between students' early L1 ability and achievement and their later L2 aptitude and L2 achievement as an important "prelude" for our studies.

IDs in L1 Development, L2 Aptitude, and L2 Achievement

In a pioneering project, researchers in the Bristol Language Project (Wells, 1985) studied the language development of children born in Bristol, UK and followed two cohorts over several years. The results of the studies revealed wide variation in the speed at which children acquire their native language. For example, some children reached a point in language development well in advance of others by 3-4 years of age, and the children whose language development was the slowest took several years to reach the level of language development attained by the more advanced children several years earlier.

In his seminal work on language aptitude, Skehan (1986) followed students from the Bristol Project to the time they entered L2 classes at 13-16 years of age, which allowed him to study connections between the students' L1 development and their subsequent L2 aptitude and L2 achievement, i.e., Skehan's (1989) "triangle of relationships." Skehan and a colleague found that the children's L1 development and attainment prior to age 5 were strongly correlated with their L2 aptitude and L2 achievement several years later in secondary school (Skehan & Ducroquet, 1988). The results also revealed that while L2 aptitude test scores in secondary school were predicted reasonably well by L1 measures, L2 aptitude scores predicted the bulk of the success for L2 achievement. Even so, prediction of L2 achievement by the L2 aptitude tests was supplemented by specific L1 achievement measures, notably vocabulary growth and language comprehension. Skehan and Ducroquet noted that the L2 aptitude tests "captured the useful predictive variance of many of the first language indices…and so preempt them…" for predicting L2 achievement (p. 102).

Skehan's findings suggested that L2 aptitude tests are predictive of L2 achievement because their items "…partly measure an underlying language learning capacity which is similar in first and foreign language learning." He further hypothesized that aptitude tests' "…main emphasis is probably to function as a measure of the ability to learn from decontextualized material" (p. 34). In other words, the skills and capacities measured by aptitude tests are different than, or go beyond, those presented to an individual in "real life" L1 settings. For example, the items on aptitude tests demand that students must be able to use their language analytic abilities to "think" about how language works rather than to simply use their language.

In sum, not only was Skehan's study a seminal event but his insights for relationships among early L1 ability and later L2 achievement and L2 aptitude were prescient. His findings suggested that L2 aptitude tests measure skills similar to those mastered in a student's L1, e.g., sound-symbol relationships, knowledge of grammar, L1 vocabulary, but that L2 aptitude tests predict L2 achievement better than L1 measures because of their capacity to measure material that has been isolated, or removed, from a context. In the next section, I review research on IDs in L1

development and attainment conducted after the Bristol Language Project and Skehan's groundbreaking research.

Individual Differences in L1 Development and Attainment

IDs in the development of oral language skills in L1 have been well-known for many years. Bloom and Lahey (1978) presented evidence indicating that developmental variation in children's language is a "fact that can be taken pretty much for granted" (p. 165), and described how child language research in the 1960's and 70's shifted from large, cross-sectional studies to intensive, longitudinal studies with small numbers of children (Bloom, 1970). Researchers investigating vocabulary and grammar development contributed to the growing literature on IDs in language acquisition. For example, Bates et al. (1988) reviewed investigations showing that while there are regularities in childhood language development, there are also important differences among children (inter-individual differences) and also within a child (intra-individual differences) in most aspects of language development. Bates et al. (1995) found that language researchers had focused primarily on similarities but ignored the variation in development of children's language. They summarized studies which documented variation in the language development of normal children that were both substantial and stable in skills such as word comprehension, first stages of grammar, and word production. They also found "enormous individual differences in onset time and rate of growth in each of these components" (p. 1) showing the wide variability in the rate of language development from first words to grammar; the variations are stable and cannot be explained by a single causal factor; and that language comprehension and production may be dissociated in both normal and abnormal populations. Bates et al. (1995) concluded with regard to language development, "The Average Child is a fiction…" (p. 26).

Although most children learn to communicate in their L1, i.e., talk and listen effectively in everyday contexts, more recent research conducted with larger and more representative samples, has consistently found normal variation in the communication and the rate of acquisition of these skills across all components of the language system (Gilkerson et al., 2017; Hoff, 2006, 2013; Huttenlocher et al., 2010). IDs in L1 achievement are large and stable across development (Bornstein & Putnick, 2012) and these IDs are strongly related to subsequent acquisition of L1 literacy skills (Kendeou et al., 2009; Seidenberg, 2017). Kidd et al. (2018) reviewed a large body of evidence and characterized IDs in language acquisition and processing as an "inconvenient truth: their presence is undeniable but our theories and experimental methods overwhelmingly downplay their importance" (p. 154). Kidd & Donnelly (2020) cited evidence showing that IDs in language proficiency are not only a pervasive feature of language development but also the "norm rather than the exception." These differences can also be observed across all domains of language development. Moreover, the "downstream effects" of IDs in early language development are apparent in children's vocabulary and grammar development, IDs do not disappear after childhood, and IDs are observed among typically developing adults in their ultimate ability.

Like the findings from the Bristol Language Project (Wells, 1985), converging evidence has found that there are IDs, i.e., normal variation, across all components of language development. IDs in language ability are both large and stable over time, and early IDs in language skills predict later language and literacy outcomes.

Studies on L1-L2 Relationships and the LCDH

Over 30+ years, our group has investigated a number of different topics related to language learning and L1-L2 relationships with secondary and postsecondary learners in the U.S. Our publications since 1991 have covered roughly four stages of development: a) early studies in L1-L2 relationships (1991-1998); b) a two-year longitudinal study (1995-1997); c) a 10-year longitudinal study with three cohorts (1992-2004); and d) a three-year longitudinal study (2014-2017). The studies have investigated a number of topics relevant for L2 researchers, but my review will be limited to our studies investigating relationships among L1 achievement, L2 aptitude, and L2 achievement, and to studies examining the L2 anxiety hypothesis. My studies on other topics such as L2 and learning disabilities (LD) and L1-L2 reading have been summarized elsewhere (e.g., see Sparks, 2016, 2021).

Early Studies on L1-L2 Relationships. After reporting case studies of low-achieving learners in L2 classes who displayed weak L1 achievement, especially in L1 literacy (Sparks & Ganschow, 1986; Sparks et al., 1989), we conducted a series of studies with high and low-achieving groups of L2 learners and hypothesized that there would be significant differences in the groups' L1 achievement and L2 aptitude (on the MLAT). The results of these studies revealed significant between-group differences in most L1 skills, especially L1 literacy, and on the MLAT favoring the high-achieving group (Ganschow et al., 1991; Sparks et al., 1992; Sparks, Artzer et al., 1998; Sparks, Ganschow et al., 1998). Group differences ranging from .67-1.30 *SD* in L1 skills, mostly in L1 literacy and grammar, and up to 1.50 *SD* on the MLAT were found. We also published a paper using composite cases from our studies in which we illustrated IDs in language abilities and showed that there is variation--often substantial variation--between the L1 skills (achievement) of students (inter-individual differences), and also intra-individual differences in a student's L1 achievement across multiple skills (Sparks & Ganschow, 1993b; see also, Sparks, 2022).

During this period, we also tested our hypothesis that L2 learners with differences in L2 anxiety would exhibit significant differences in L1 achievement, L2 aptitude, and L2 achievement. When college L2 learners with no differences in IQ or college entrance exam scores were divided into high, average, and low anxiety groups by their scores on Horwitz's Foreign Language Classroom Anxiety Scale (FLCAS; Horwitz et al., 1986), results showed significant differences in their L1 oral language and L1 literacy (word decoding, reading comprehension) skills and L2 aptitude on the MLAT (Ganschow et al., 1994) favoring the low anxiety group. In another study using the FLCAS with secondary level L2 learners, the results showed significant differences among the three anxiety groups on most L1 measures, 8th grade English grade, the MLAT, and end-of-year L2 grades (Ganschow & Sparks, 1996) favoring the low anxiety group. A follow-up study revealed that the students who scored lower on the L1

measures and the MLAT were rated by their L2 teachers as having less positive affective characteristics, i.e., lower motivation, higher anxiety (Sparks & Ganschow, 1996).

Two-Year Longitudinal Study. In this new study, we followed two groups of secondary L2 learners at one private school and one public school through two years of L2 instruction. We administered extensive test batteries that included measures of L1 achievement, the MLAT, and the FLCAS, and also collected students' 8th grade English course grades and L2 grades. At the conclusion of the second-year L2 courses, the students were administered L2 achievement measures that were designed by L2 educators in our group according to ACTFL Proficiency Guidelines (ACTFL, 1989). We conducted several types of investigations with these groups including prediction, comparison, and factor analyses studies.

In the first prediction study, we found that the best predictors of students' first-year L2 course grades for both groups were 8th grade English grade, MLAT scores, and L1 spelling skills (Sparks et al., 1995). We followed the students through their second-year L2 courses and results showed the best predictors of students' second-year L2 achievement were their L2 word decoding and L1 vocabulary skills (Sparks et al., 1997).

In comparison studies, the students were divided into high, average, and low L2 proficiency groups according to their scores on the overall L2 proficiency measure (Sparks et al., 1998). We found significant differences between the high vs. low proficiency groups favoring the high proficiency group on *all* L1 measures, 8th grade English grade, the MLAT, and L2 course grades. In an investigation with the private school group, students were divided using their FLCAS score into high, average, and low anxiety groups and compared on the L2 oral and written achievement measures (Sparks et al., 1997). Results showed overall differences among the three groups and significant differences between the high and low anxiety groups on all of the L2 proficiency tests favoring the low anxiety group.

In a factor analysis study of the test battery administered to the two groups, the results found that the L1 phonological measures (word decoding, spelling, phonological awareness) loaded onto the same factor as the MLAT subtests that measured phonological skills (Phonetic Coding, Spelling Clues). Likewise, the L1 measures of language comprehension and grammar loaded onto the same factor as the MLAT Words in Sentences (grammar) subtest (Sparks et al., 1998). These findings supported the claim that L2 aptitude is componential.

10-Year Longitudinal Study. Our 10-year longitudinal study began in 1992 when we chose to follow three cohorts of students from 1st grade through two years of L2 courses in high school. (In the U.S., most students do not study a L2, and those who do enroll in only two years of L2 courses.) The students' L1 oral and literacy skills were tested at five time intervals from 1st - 5th grades. Their L2 aptitude was measured in 9th grade, and their L2 achievement was tested at the end of the 10th grade after two years of L2 courses. In high school, we also administered measures of L2 anxiety (FLCAS) and L1 print exposure, and collected students' L1 reading comprehension and language scores from their 10th grade achievement tests. Through prediction, comparison, factor analysis, print exposure, and anxiety investigations, this longitudinal study provided a wealth of evidence demonstrating that L1 achievement in early elementary school,

particularly L1 literacy, is intimately connected to students' levels of L2 aptitude and L2 achievement many years later.

In the first prediction study, we found that the L1 literacy measures in elementary school were strong predictors of L2 aptitude and L2 proficiency. For example, L1 literacy and L1 vocabulary from 1st to 5th grade predicted from 58% to 73% of the variance in L2 aptitude on MLAT in 9th grade, and from 25%-43% of the variance in L2 proficiency in 10th grade (Sparks et al., 2006). In a second prediction study in which L1 achievement and the MLAT were used as predictors of L2 proficiency, the MLAT was found to be the best single predictor (Sparks et al., 2009) of most L2 skills, except for L2 word decoding. To explain these findings, we proposed that the MLAT may pre-empt ("cut out") the variance for prediction of L2 achievement explained by L1 achievement because although the MLAT is comprised of basic language tasks similar to L1, the MLAT taps into students' metalinguistic ability, i.e., the ability to "….focus on and manipulate language form, as well as to treat language as an object of introspection, reflection, and analysis" (Roehr-Brackin & Tellier, 2019, p. 1115), a topic to which I will turn later. The relationships between L1 and L2 word decoding and spelling skills were examined in a third prediction study. We found that early L1 word decoding in elementary school was the best single predictor of L2 word decoding (52% of variance) and early L1 spelling and phoneme awareness were the best predictors of L2 spelling (54% of variance) in high school (Sparks et al., 2008).

We also investigated the notion of cross-linguistic transfer of skills from L1 to L2 by dividing the students into high, average, and low L2 proficiency groups and comparing them on the L1 achievement measures administered from 1st - 5th grades and the MLAT administered in 9th grade (Sparks et al., 2009). The results revealed significant overall differences among the L2 achievement groups on the L1 measures from 2nd to 5th grades, many years prior to L2 exposure, and on the MLAT. In all cases, the high L2 proficiency group exhibited stronger language skills than the low and average groups. These findings showed that the L1 achievement differences of high, average, and low proficiency L2 learners emerged early in school and were related to L2 aptitude and L2 achievement many years later.

Another important study on L1-L2 relationships was our factor analysis of the test battery administered to the participants in this 10-year study (Sparks et al., 2011). Like the factor analysis study described earlier, this study found that measures of L1 language comprehension, vocabulary, and grammar loaded on the same factor with similar measures from the MLAT, e.g., the Words in Sentences subtest. Likewise, L1 phonetic coding measures (spelling, word decoding) loaded on the same factor with the similar measures from the MLAT, e.g., Phonetic Coding, Spelling Clues. The findings provided additional support for our speculation that language aptitude is componential.

In L1 research, an environmental variable, print exposure (reading volume), has been found to explain significant portions of the variance in students' vocabulary, general knowledge, and overall language ability even after controlling for their cognitive ability (see Stanovich, 2000, Part V). In two studies, we investigated whether L1 reading volume over time would have an overall effect on the development of L2 achievement in high school. In one study, findings showed that L1 print exposure made significant and unique contributions to L2 reading

comprehension, word decoding, writing, listening comprehension, and speaking ability even after controlling for the effects of L1 literacy and verbal ability in elementary school, L1 cognitive ability, L2 aptitude, and 10th grade L1 reading achievement (Sparks et al., 2012a). In another study, we divided the students into high, average, and low print groups based on their scores on the L1 print exposure measures and compared them on the L1 achievement, L2 aptitude, and L2 achievement tests (Sparks et al., 2012b). We found significant differences between the high and low print groups on all L1 measures as early as 1st grade, the MLAT, the L2 proficiency tests, and L2 course grades favoring the high print group. The findings from these studies suggested that early success in L1 literacy and subsequent reading volume prior to L2 study are related to differences in L2 aptitude and L2 proficiency several years later and highlighted the importance of L1 literacy for L2 learning.

This longitudinal study over 10 years offered a unique opportunity to examine our hypothesis that students' language achievement is a confounding variable in studies involving L2 anxiety and led to two seminal investigations on this topic. In the first investigation, students were divided into high, average, and low anxiety groups according to their FLCAS scores in 9th grade, and then compared on the L1 skill measures from 1st - 5th grades, the MLAT in 9th grade, and L2 achievement in 10th grade (Sparks & Ganschow, 2007). The findings showed that there were significant overall differences among the three groups, and between-group differences showing that the high anxiety group achieved significantly lower scores on all L1 measures as early as the 2nd grade, several years *prior to* L2 study in high school. Negative correlations were also found between the FLCAS and all L1 achievement measures starting in 1st grade. We suggested that there was no *a priori* reason to expect that students' L1 achievement in elementary school would be negatively correlated with L2 anxiety in high school, many years *before* they enrolled in L2 courses. In the second study, we conducted hierarchical regression analyses and a path analysis, which showed that the FLCAS in high school accounted for significant unique variance in L1 achievement in elementary school, many years *before* the students enrolled in L2 courses, and significant unique variance on the MLAT (Sparks & Patton, 2013). The hierarchical regressions showed that the FLCAS in 9th grade predicted growth in several L1 skills from 1st to 5th grades and in L1 reading (literacy) from 5th to 10th grades. We proposed a common sense explanation for these findings, that is, the FLCAS is not measuring anxiety for L2 learning. We reasoned that an anxiety measure administered in 10th grade should *not* predict unique variance in students' L1 achievement skills several years *prior to* beginning L2 study, nor should the measure predict unique variance in L2 aptitude measured prior to enrollment in L2 courses *before* students had an opportunity, or reason, to become anxious about L2 learning. Our findings suggested that the FLCAS is measuring a construct that incorporates students' levels of language and literacy achievement developed years earlier, prior to L2 study. Based on these results, we have maintained that the FLCAS is more likely to be serving as a proxy for students' L1 achievement, their (accurate) self-perceptions of their language ability, or both.

The completion of the aforementioned longitudinal studies also allowed us to conduct a retrospective study using a cluster analysis technique to determine whether distinct cognitive and

achievement profiles of more and less successful L2 learners could be identified (Sparks et al., 2012). The results revealed three profiles: high, average, and low-achieving students. On all L1 achievement tests administered prior to L2 exposure as well as on the MLAT and L2 achievement measures, the high-achieving group scored in the above average range, the average-achieving group scored in the average range, and the low-achieving group scored in the low to below average range. These findings provided additional evidence that students' L1 achievement skills developed *prior to* L2 exposure are consistent with and strongly related to their L2 aptitude and L2 achievement, L2 achievement is moderated by L1 attainment, and L2 learning runs along a continuum of stronger to weaker learners.

Three-Year Longitudinal Study. Our three-year study began in 2014 when we randomly chose 307 students beginning Spanish I courses from four different high schools in one school district and followed the students through Spanish courses over three years. At the beginning of 1st year Spanish, the students were administered several measures of L1 achievement and the MLAT. At the conclusion of 1st year Spanish, they were administered measures of working memory and phonological short-term memory, metalinguistic knowledge, and L2 anxiety. For this study the participants were administered a different anxiety survey, the Foreign Language Reading Anxiety Scale (FLRAS; Saito et al., 1999). At the end of each year, we administered a standardized measure of Spanish achievement to assess their L2 reading, writing, vocabulary, and listening comprehension skills. In addition to the studies described here, this investigation yielded several papers on U.S. students' Spanish achievement (Sparks et al., 2017) and on the development of L2 reading in alphabetic orthographies described elsewhere (see Sparks, 2019, 2021; Sparks & Luebbers, 2018; Sparks et al., 2018a).

In one study investigating cross-linguistic transfer, we divided the students into high, average, and low-achieving L2 groups according to their score on the Spanish (L2) measure at the end of each year and compared them on the L1 measures and the MLAT (Sparks et al., 2019a). The results showed substantial differences among all three groups (high, average, low L2 achievement) on all L1 measures and the MLAT at the end of both 1st and 2nd year Spanish favoring the high L2 achievement group. A discriminant analysis procedure found that measures of L1 literacy (word decoding, reading comprehension), working memory, and the MLAT best discriminated between the students who chose to complete three years of Spanish vs. those completing two years of required Spanish, suggesting that students who continue in upper-level language courses display stronger L1 achievement and L2 aptitude. The results supported longstanding claims that IDs in L2 skills reflect IDs in L1 achievement and provided support for cross-linguistic transfer of L1 to L2 skills.

In another study, we performed a factor analysis on the test battery administered to the 307 students (Sparks et al., 2019b). The analysis yielded two factors similar to those in our previous analysis. One factor was comprised of L1 phonological measures and also included the two L1 memory measures. Another factor was comprised of L1 grammar and language comprehension measures and also included the L1 metalinguistic knowledge measure. However, the third factor was comprised solely of the five MLAT subtests. This finding was different from our previous factor analyses, but we noted that our test batteries in those studies did not include L1 measures

of working and phonological memory or metacognitive knowledge. Evidence cited by Roehr-Brackin (2018) shows that language aptitude, working memory, and metacognitive knowledge are distinguishable constructs (p. 107). Our findings supported the idea that although L1 skill measures and MLAT subtests measure similar skills, L2 aptitude itself may be a distinct construct in the presence of working memory and metacognitive knowledge measures.

This database has also been used to further explore the relationships among L1 achievement, L2 aptitude, L2 achievement, and L2 anxiety, in this case, the Foreign Language Reading Anxiety Scale (FLRAS; Saito et al., 1999). In one study, we divided the participants into high, average, and low anxiety groups by their FLRAS scores and compared them on the L1 measures, the MLAT, and L2 achievement tests at the end of each year (Sparks et al., 2018). The findings showed significant differences between the low vs. high anxiety groups on all L1 measures (except working memory), the MLAT, and L2 achievement favoring the low anxiety group, and significant differences between the high vs. average and average vs. low groups on several measures at the end of 1st and 2nd year L2 courses. In another study, the FLRAS explained significant unique variance in students' scores on all L1 measures as well as the MLAT (Sparks et al., 2018b). Moreover, hierarchical regressions revealed that IDs on the FLRAS explained growth in all L2 achievement skills from (1st to 2nd to 3rd year Spanish). Similar to our results with the FLCAS, we proposed the same common sense explanation for these findings with the FLRAS: the FLRAS is not measuring an anxiety for L2 reading. Instead, the FLRAS is measuring a construct that incorporates students' levels of literacy and language abilities. Here again, we reasoned that an anxiety measure should not predict unique variance in L1 skills or L2 aptitude measured *prior to* L2 exposure, that is, *before* learners have the opportunity to become anxious. We continued to maintain the position that L2 anxiety surveys are likely to be a proxy for students' L1 achievement, their (accurate) self-perceptions of their language skills, or both.

More recently, Abdullah Alamer and I have conducted studies with the FLCAS and FLRAS applying structural equation modeling (SEM) to examine pathways by which L1 achievement skills are associated with L2 anxiety via several language-based mediators. In a study with the FLCAS, we examined the model across six age ranges (from 1st to 5th grade, and 5th to 10th grade) and found that the effect of L1 achievement on L2 anxiety was indirect through L2 aptitude (MLAT) and L2 achievement, indicating that the impact of L1 on L2 anxiety is better understood through these two language-based mediators (Sparks & Alamer, 2022). In another study with the FLRAS, the results showed that the effects of L1 achievement on L2 reading anxiety was indirect through the MLAT, L2 achievement, and L1 metacognitive knowledge, while the effects of L2 achievement and L1 metalinguistic knowledge on L2 reading anxiety were direct (Sparks & Alamer, submitted). The findings of these studies suggest that anxiety may not be a cause of subsequent achievement in L2, but is likely to be the other way around.

*The MLAT and its Relationship to L1 Achievement***.** In two new studies, Philip Dale and I examined the growing evidence for relationships among L1 achievement and L2 aptitude with the participants who had been followed over three years of Spanish. In the first study, we conducted a series of hierarchical regressions with a fixed order of entry in which all L1

achievement skills were entered first, then followed by the MLAT, to predict L2 reading, L2 writing, and L2 listening comprehension and vocabulary (Sparks & Dale, submitted). Our results showed that L1 achievement explained from 21%-50% of the variance in L2 achievement, and that the variance explained by L1 increased from 1st to 2nd to 3rd year Spanish. IDs in L1 literacy, i.e., L1 word decoding, reading comprehension, writing, vocabulary, print exposure, were the best predictors of all L2 written (reading, writing) and oral (listening comprehension, oral proficiency) achievement. The MLAT explained an additional 2-14% of variance in L2 achievement, which suggested that the MLAT may be measuring important aspects of language ability not tapped by the L1 measures used in the study.

To further investigate this question, we examined the relationship between L1 achievement and the MLAT more closely with the aforementioned group of participants by using a combination of mediation and regression analyses (Sparks & Dale, submitted). The results showed that each of the six L1 measures of language and literacy skills (word decoding, reading comprehension, writing, vocabulary, language analysis, working memory) individually predicted all L2 achievement scores (r = .17 - .63) and also MLAT scores (r = .22 - .44); b) the L1 measures collectively significantly predicted MLAT scores (R^2 = .26); and c) MLAT is a significant, but moderate, mediator of predictions from L1 achievement to L2 achievement scores (indirect mediation effects ranged from 15% - 86% of total effects). Most relevant for our question about the relationship between L1 achievement and the MLAT was that the prediction from MLAT to L2 achievement was significantly and substantially (59% - 87%) due to variance in L1 abilities captured by the MLAT. We concluded that the prediction from MLAT to L2 is primarily, but not exclusively, due to its functioning as a measure of L1 abilities. Nonetheless, a proportion of L1 variance which predicts L2 achievement is not captured by the MLAT.

Summary. The results of our studies have provided strong support for the premises of the LCDH by showing that L1 and L2 learning have a common underlying foundation; L2 aptitude and L2 achievement run along a continuum of very strong to very weak learners; L2 achievement is constrained by L1 achievement; L2 learning problems are, first and foremost, related to L1 learning problems; like L1 achievement, L2 learning is componential; L1 achievement is predictive of L2 aptitude; and L1 achievement and L2 aptitude are confounding variables for claims about L2 anxiety. Our studies have supported the hypothesis that there are strong relationships among L1 achievement, L2 aptitude, and L2 achievement, i.e., Skehan's triangle, and shed light on the answer to Skehan's question, where does language aptitude come from?

A Path from L1 Ability to L2 Aptitude

Although the evidence over 30 years has supported the premises of the LCDH, I have thought for some time that there was a missing link (or two) in our plausible, but simple, theory for explaining the large body of research showing strong relationships between L1 achievement skills and L2 aptitude. The primary reason for my concern has been the findings from our two longitudinal prediction studies described earlier. In one investigation, results showed that L1 achievement in elementary school, especially in L1 literacy, accounted for 58%-73% of variance

in L2 aptitude on the MLAT (Sparks et al., 2006). However, in another investigation with the same participants, the MLAT was used as a predictor variable and found to be the strongest single predictor of L2 achievement (Sparks et al., 2009). At the time, we explained these findings by proposing that although the MLAT has been found to measure skills similar to those measured by L1 tests, the MLAT may preempt ("cut out") the variance explained by L1 because the MLAT measures an "underlying language learning capacity which is similar in first and second language learning settings" but unlike L1 tests, assesses the ability to learn from "decontextualized material", i.e., in isolation from the context (Skehan, 1989, p. 34). For example, a student may write a grammatically correct sentence without knowing the parts of speech in his/her L1, i.e., a meaningful context. However, the MLAT Words in Sentences subtest assesses whether s/he knows the part of speech by asking the grammatical function of a word in a sentence, i.e., a less meaningful or irrelevant context. In effect, we assumed the MLAT gained its value for predicting L2 achievement by tapping into students' metalinguistic ability, i.e., ability to think about, reflect on, and manipulate language (see Ranta, 2002). Our simple conjecture was that the L1 tests in our studies measured contextualized material and the MLAT largely measured decontextualized material.

Recently, a more complex explanation for relationships among L1 achievement, metalinguistic awareness, and L2 aptitude has emerged. Roehr-Brackin (2018) reviews research underscoring the link between the onset of literacy and the development of metalinguistic awareness (see also Bialystok, 2001; Gombert, 1992; Yelland et al., 1993). This research suggested that the global term, L1 achievement (L1 ability), we have used in our work, should be "subdivided" into two components, L1 oral language and L1 literacy. In retrospect as a L1 reading researcher, this should have been apparent to me. In L1 research, it is well-known that learning to read (literacy) itself is "parasitic" on speech (Kavanagh & Mattingly, 1972) and language development (Snowling & Hulme, 2012). Prior to literacy development, some metalinguistic awareness can be drawn from oral L1, e.g., rhyming (see Snow et al., 1998). However, it is the development of literacy that leads to enhanced metalinguistic awareness, which further enhances literacy skills. This may be one reason that in two different longitudinal studies over 10 years, L1 reading researchers have found that early success in reading (literacy) establishes a pattern in which children with strong early reading skills engage in more reading (print exposure) than their less-skilled peers and, over time, strengthen their reading-related and cognitive skills (Cunningham & Stanovich, 1997; Sparks et al., 2014).

But, if L1 literacy leads to the development of metalinguistic awareness, how can the relationship between metalinguistic awareness and L2 aptitude hypothesized by Ranta and others be explained? Skehan (1986; Skehan & Ducroquet, 1988) suggested that L2 aptitude tests measure the ability to learn from "decontextualized material" and that the tests derive their predictive value because the items, in part, measure an "underlying language learning capacity" similar in L1 and L2. If the development of metalinguistic awareness and the development of L1 literacy go hand in hand, is it possible that metalinguistic awareness and language aptitude have the same type of relationship? Some researchers have suggested that metalinguistic awareness

and language aptitude are partially overlapping constructs (Herdina & Jessner, 2002; Jessner, 2006). Other researchers have been more specific by focusing on language analytic ability, which is similar to metalinguistic ability, i.e., "…ability to handle language in a decontextualized manner" (Roehr-Brackin, 2018, p. 87). Ranta (2002) suggested that metalinguistic ability and language analytic ability may be "…two sides of the same coin" (p. 163) and proposed that the skills measured by L2 aptitude tests are those that affect development of metalinguistic skills that emerge over time.

If metalinguistic awareness and language analytic ability are similar, how can findings of strong relationships between learners' L1 achievement and L2 aptitude, in this case the MLAT, be explained? All of our studies since 1991 have found that students with stronger L2 aptitude display stronger L1 achievement, particularly in L1 literacy. Likewise, L1 literacy skills in elementary school (1st - 5th grade) were found to be strong predictors of L2 aptitude on the MLAT measured in high school. One explanation for the evidence showing strong L1 achievement-L2 aptitude relationships is that the MLAT itself is heavily dependent on literacy ability. In my recent studies on L1 achievement and the MLAT described earlier, hierarchical regression analyses found that L1 literacy skills alone (word decoding, reading comprehension, writing, print exposure, vocabulary) were strong predictors of oral and written L2 skills and that their predictive value increased over time from 1st year (21% of variance) to 3rd year (50% of variance) Spanish. When entered second in the analysis (after all L1 skills), the MLAT explained an additional 2%-14% of the variance in the L2 skills, suggesting that the MLAT may measure aspects of L2 achievement not assessed by the L1 measures. In a second study using mediation analysis, findings showed that the MLAT is much less efficient at extracting variance about L1 word decoding, writing, and vocabulary for predicting L2 achievement, suggesting that there may be considerable overlap in the skills assessed by the L1 literacy measures and the MLAT. These findings are not critical of the MLAT as a predictor of L2 achievement, but instead suggest that the prediction from MLAT to L2 attainment may be largely due to measurement of L1 achievement skills by the MLAT.

In hindsight, the missing links in our conceptualization of the path from L1 achievement (and L1 ability) to L2 achievement were: 1) separation of L1 oral language from L1 literacy, 2) inattention to metalinguistic awareness as a consequence of L1 literacy development, and, 3) neglect of metalinguistic awareness as a connection between L1 literacy and L2 aptitude. Figure 1 presents my version of the path from L1 achievement to L2 achievement that includes these links.[1] The path acknowledges that L2 aptitude may be the best single predictor of L2 achievement, but L2 aptitude has its roots in L1 oral language, L1 literacy, and metalinguistic awareness. The steps in the figure are interlinked, or cyclical, to show that the influences are always multi-directional, not unidirectional. For example, some metalinguistic awareness is derived from oral L1 development, which provides the foundation for L1 literacy. The development of literacy leads to more developed metalinguistic awareness, which further enhances L1 literacy skills. Both L1 literacy and metalinguistic awareness lead to stronger L2 aptitude, which in turn, leads to better L2 achievement. However, learning a second language can also heighten language awareness and lead to improvements in L1 (Murphy et al., 2015) and L2

aptitude, a point reviewed later in this section. This path, which now includes L1 literacy, may account for why L2 learners who had early success in reading in primary school and subsequent higher levels of print exposure in L1 achieved higher scores on the MLAT in 9th grade and stronger L2 proficiency in 10th grade (Sparks et al., 2012a), and explain why print exposure accounted for significant unique variance in L2 proficiency, even after controlling for the effects of L1 literacy and verbal ability, L1 cognitive ability, and L2 aptitude (MLAT) (Sparks et al., 2012b).

How does the path account for IDs in L2 achievement? The answer is straightforward: Research cited earlier has shown that there are IDs in L1 acquisition and processing that are large and stable across development, can be observed across all domains of language development, and do not disappear after childhood (e.g., see Kidd & Donnelly, 2020). IDs in L1 acquisition and processing mean there will be inter-individual differences in L1 literacy and metalinguistic awareness, all of which form a foundation for L2 aptitude and L2 achievement. These IDs in, e.g., L1 oral ability, L1 literacy, have been found to be related to differences in learners' L2 aptitude and L2 achievement.[2] Moreover, the conditions in which the L2 learning takes place will influence L2 achievement. For his Model of School Learning, John Carroll (1963) proposed five elements necessary for learning, three of which reside in the individual (aptitude, ability to understand instruction, perseverance) and two outside the individual (opportunity, quality of instruction). The bolded upward arrow in Figure 1 suggests that with favorable learning conditions, i.e., average or better L1 oral language, L1 literacy, metalinguistic awareness, and L2 aptitude; average or better perseverance and quality of instruction, a student has the potential to become a successful L2 learner. The fading upward arrow suggests a wide range of unfavorable conditions in which an individual would be a less successful, or an unsuccessful, L2 learner. For example, some students will have low or below average L1 oral language and literacy skills and are unlikely to develop adequate metalinguistic awareness or L2 aptitude. Others will have strong L1 achievement and metalinguistic awareness but little perseverance for L2 learning. Others may have average, or even strong, L1 achievement and L2 aptitude, but have little or no opportunity to learn a L2. For U.S. students, an example of unfavorable conditions is their largely monolingual socio-linguistic context that provides little or no opportunity to learn a L2. Our studies with monolingual English students have found that even those with above average L1 achievement, strong L2 aptitude, and average or better perseverance, did not develop even minimal fluency or literacy in a L2 after several years of classroom instruction (Sparks et al., 2017).

Does evidence suggest that L2 learning can improve L2 aptitude and L1 achievement, and perhaps indirectly, metalinguistic awareness (language analytic ability)? My early studies with L2 learners in a monolingual socio-linguistic context demonstrated that a type of teaching approach may have led to an increase in students' scores on the MLAT. In the first study, high school L2 learners with average cognitive ability and low average L1 literacy skills were identified as "at risk" (low-achieving) L2 learners by their high school and placed in a separate section for beginning Spanish (Sparks & Ganschow, 1993c). In this class, the students were

instructed using an approach that explicitly taught the phonological (sound-symbol) and syntactic (grammatical) structure of Spanish and directly taught Spanish vocabulary, i.e., form-focused instruction. The course was taught in both Spanish and English so that comparisons of the two languages could be highlighted. The students were administered pre- and post-test measures of several L1 skills, including L1 literacy, as well as the MLAT at the beginning and end of the course. The results showed that the students' scores increased 1.07 *SD* (from *SS* = 88 to *SS* = 104) on the MLAT and significantly increased on three L1 word decoding and phonological processing measures. We followed the students through a second year of Spanish instruction and re-administered the MLAT at the end of the year, where we found that the students had maintained their initial gains. We replicated the study with another group of low-achieving L2 learners taught by the same method, and also included a comparison group of high-achieving (average and above average) L2 learners in traditional Spanish classes. The results revealed similar findings, i.e., the low-achieving students' scores increased 1.20 *SD* (from *SS* = 89 to *SS* = 107) on the MLAT. In this study, we also found that the high-achieving group's scores on the MLAT increased 1.07 *SD* (from *SS* = 104 to *SS* = 120) from the beginning to the end of Spanish I. Both groups also made small, but significant, gains on some of the L1 measures. These findings prompt several lines of speculation. In the case of the low-achieving learners, findings suggest that a type of form-focused instruction in L2 could improve their metalinguistic awareness (language analytic ability) and thus improve L2 aptitude. In the case of the average- and high-achieving learners, learning a L2 itself could improve their metalinguistic awareness and L2 aptitude.

Conclusion: Where Does Language Aptitude Come from? Redux

The simple answer to the question asking about the origin of a student's language aptitude is that it comes from his/her language ability: learning a L2 is the learning of *language*. My proposed path from L1 oral language to L2 achievement runs along a continuum of language abilities. In each of the steps from L1 oral language to L2 achievement, students can display inter- and intra-individual differences in their language abilities. The notion that IDs in language ability play an important role in learning L2s is not new. The reader will notice that I have included the word "redux" in the title of my paper. In Latin, *redux* (from the verb *reducere*) means "brought back" or "bringing back" and is used here in reference to Peter Skehan (1986, 1998, 2019), who has long maintained that "language is special" for theories of L2 aptitude. The results of my group's research brought us back time and time again to Dr. Skehan, whose research uncovered strong relationships among early L1 achievement, later L2 aptitude, and ensuing L2 achievement. Our work built upon his notion that "language is special" for L2 aptitude and L2 achievement. Likewise, the path from L1 oral language to L1 literacy through metalinguistic awareness to L2 aptitude and L2 achievement presented in my paper rests on Dr. Skehan's foundational work.

Initially, when invited to write a paper for this special issue, I thought that an interesting topic might be whether L2 educators and L2 researchers have seriously considered the impact of IDs in L1 achievement for the development of L2 aptitude and L2 achievement. As an L1 specialist,

it has always seemed odd when others questioned whether there were inter- and intra-individual differences in L1 achievement and whether language itself had any special role for L2 aptitude and L2 learning. Earlier, I noted that IDs in L1 achievement have been ignored by some SLA/L2 researchers (see Dabrowska, 2016), in part, because of their discomfort with differences in native language ability (see Gass & Selinker, 1994, pp. 232-233). In this paper, I have reviewed evidence showing that IDs in L1 oral language development and L1 literacy are both normal and expected, and that students' IDs in L1 are strongly related to IDs in their L2 aptitude and L2 achievement. In my view, there may also be other reasons that IDs in L1 achievement have not been studied extensively by SLA/L2 researchers. One reason may be researchers' discomfort with the idea that L2 achievement may be constrained by L1 achievement, which implies deterministic limitations, i.e., L2 development is bounded by L1. Another reason may be disagreement with the concept of L2 aptitude because aptitude is thought to undermine the notion of unlimited potential for L2 achievement. An additional reason may include the idea that if IDs in L1 achievement and L2 aptitude are minimized as explanations for more and less successful L2 achievement, then the search for explanations unrelated to language ability can be justified. L2 researchers should continue to investigate all potential explanations for IDs in L2 achievement. However, explanations for more and less successful L2 achievement will necessarily be limited by failure to acknowledge IDs in L1 development that are large and stable and persist into adulthood, and are also related to later language outcomes, including L2s.

When considering the conundrum of why IDs in L1 achievement skills and their relationship to L2 aptitude and achievement have been downplayed, I recalled a phrase often used by my Latin teacher when I failed to provide the answer that was "under my nose": *in sterquiliniis invenitur*, which she loosely translated as "that which you need most is found where you are least likely to look."[3]

Notes

1. Figure 1 is included here to explain how L2 achievement is influenced by L2 aptitude, how L2 aptitude is influenced by metalinguistic awareness, how metalinguistic awareness develops from L1 literacy, and so forth. *The figure is not intended to be a model of L2 aptitude*, i.e., how well, relative to other individuals, an individual can learn a second language in a given amount of time and under given conditions, or the cognitive abilities that predict rate of L2 learning or ultimate L2 ultimate attainment. Even so, in any model of L2 aptitude, language will be "special" (central) because language skills are *necessary* for learning another language. [For a recent review of L2 aptitude models, see Skehan (2019)].
2. My studies have focused on pedagogically conventional classroom-based L2 learning, rather than immersion or immigration-based learning. The L2 instruction is occurring after the development of L1 literacy, as opposed to early simultaneous bilingualism prior to literacy instruction in either language.
3. I thank the anonymous scholar who graciously consented to review portions of this manuscript.

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Appendix:

Figure 1

Path from L1 Oral Language to L2 Achievement

Acknowledgements
Not applicable.
Funding
Not applicable.
Ethics Declarations
Competing Interests
No, there are no conflicting interests.
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