# 1 *Language Aptitude Research*
## From Testing to Theory and Practice

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## Introduction

Language aptitude refers to the set of cognitive abilities that allow us to *understand*, *explain*, *diagnose*, and *predict* why and how some individuals can learn a second/foreign language more effectively and efficiently than their peers, other things being equal (cf. Carroll, 1990; Doughty, 2019; Wen & Skehan, 2021). Since the modern inception of the concept in the 1950s in the USA (Spolsky, 1995), language aptitude research has undergone rollercoaster periods of developmental stages. The 1950s, 1960s, and 1970s, for example, were marked by interest and enthusiasm in the topic, but skepticism and marginalization about language aptitude developed during the 1980s and 1990s. Subsequently, language aptitude research regained momentum around the turn of the new millennium (Vuong & Wong, 2019), boosted by Robinson's edited volume (2002) on the topic twenty years ago. The last few years have witnessed an exponential growth of publications of journal papers, edited volumes, and journal special issues (e.g., Reiterer, 2018; Wen et al., 2019; Granena, 2020; Doughty & Mackey, 2021; Li & DeKeyser, 2021). As Doughty and Mackey have succinctly commented in their recent introduction to the 2021 issue of the *Annual Review of* Applied Linguistics *(ARAL)* dedicated to the theme, language aptitude has now become one of the most "important, intriguing, messy, and often controversial" topics in second language research (Doughty & Mackey, 2021, p. 1).

As indicated in the introduction to a recent volume (Wen et al., 2019), when language aptitude research in the past sixty years is put into the framework of Richard Snow's (1992) criteria for 'an aptitude theory', (i.e., construction of language aptitude tests, aptitude theory construction, application of language aptitude to practice), we can claim that significant achievements have been made in the first set of criteria concerning the construction of language aptitude tests. Most

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of these well-established aptitude test batteries, among which the seminal Modern Language Aptitude Test (MLAT; Carroll & Sapon, 1959) is the most representative, can be utilized to predict second language learning outcomes fairly reliably, with an overall correlation of around $R = 0.350 \sim 0.50$ (Li, 2015). Notwithstanding these commendable achievements in aptitude test construction and development, progress in aptitude theory construction has been less impressive. So far, a language aptitude theory with adequate explanatory power for foreign/second language learning is still lacking. Then, when it comes to the third criteria, namely, application of language aptitude to inform practice, progress has been rather slow (Wen et al., 2017).

To partially rectify this situation, the current volume has been developed to revisit and consolidate the achievements made in language aptitude testing so far. More importantly, it aims to further push developments in aptitude theory and practice. In this introductory chapter, we first provide a brief state-of-the-art review of language aptitude in the past six decades, summarizing the major research paradigms and methodologies and evaluating their achievements and limitations. Following these reviews, we discuss the background and rationale of the current volume, highlighting the key contents of each major chapter and their contributions to enhancing our understanding of the nature and implications of language aptitude theory and practice. We conclude the introduction by calling on scholars from multiple disciplines to make concerted efforts to follow and extend Richard Snow's legacy (Corno et al., 2002) to build a viable language aptitude theory that will allow us to diagnose, predict, and explain the second language learning process and outcomes.

## Language Aptitude: From Testing to Theory and Practice

### *Achievements in Language Aptitude Test Development*

In the six decades following the publication of the MLAT in 1959 (Carroll & Sapon), scholars from diverse disciplines and academic backgrounds have endeavored to construct an array of language aptitude test batteries (see major chapters in **Part I** of this volume for updates). Overall, they have extensively explored and refined the predictive and explanatory power of these aptitude test batteries in accounting for the individual differences (IDs) manifested in the second language acquisition process and outcomes (Wen et al., 2017; Wen, 2021).

Research into language aptitude can be analyzed from different perspectives. For example, in terms of theorizing and testing language aptitude, diverse approaches have been derived from multiple

disciplines and theoretical perspectives. These disciplines span the broad fields of educational psychology, applied linguistics, cognitive science, and neuroscience (Reiterer, 2018; Wen et al., 2019; Griffiths & Soruç, 2020; Wen, 2021). These multidisciplinary insights have subsequently given rise to several cognitive aptitude models that are buttressed by psychometric test batteries. The best examples of these test batteries have included the seminal MLAT (Carroll & Sapon, 1959; also see Stansfield & Reed, 2019) and its elementary version (MLAT-E; Reed & Stansfield, Chapter 2, this volume), the CANAL-F tests (Grigorenko et al., 2000), the LLAMA tests (Meara, 2005; Rogers et al., Chapter 3, this volume), and more recently, the Hi-LAB tests (Linck et al., 2013; Doughty, 2014, 2019; Hughes et al., Chapter 4, this volume).

Regarding impact, large-scale narrative analyses and meta-analyses have pointed to the strong predictive validity of these aptitude test batteries for foreign language learning outcomes (Skehan, 2002, 2012; Li, 2015, 2017; Li & Zhao, 2021). Strikingly, the MLAT remains the best predictor, outperforming other candidates even some sixty years after its publication (Li, 2015). In more recent decades, the LLAMA (Meara, 2005) has been gaining popularity thanks to its user-friendly interface, its first language–neutral feature, and its easy-to-administer and online free availability. LLAMA has been partially validated by Rogers et al. (2016, 2017), Granena (2013), and Suzuki (2021), as well as being thoroughly reviewed by Bokander and Bylund (2020; see also Bokander, Chapter 5, this volume). The results were mostly encouraging, though there is still room for improvement and refinement (Rogers et al., Chapter 3, this volume; see also Bokander, Chapter 5, this volume). As for the Hi-LAB, Doughty (2019) has reported encouraging validation results, showing that it can complement the MLAT by distinguishing the top levels of advanced language learners from the fairly good learner groups (Doughty et al., 2010; Linck et al., 2013; Doughty, 2014). Regarding many other aptitude tests, such as the CANAL-F (Grigorenko et al., 2000) and the DLAB, unfortunately, they are classified by the US military and not readily available for public use, so not much information could be obtained regarding their reliability and validity, let alone their validation data. On the whole, the achievements of language aptitude testing has been impressive over the past six decades (Skehan, Chapter 9, this volume), though it is true that MLAT is the most dominant battery, making it almost synonymous with the concept of language aptitude per se (Wen et al., 2017). The MLAT has now been translated and adapted into many different languages (e.g., Hungarian, Spanish, Japanese, and Chinese), and it is now available online (Reed & Stansfield, Chapter 2, this volume).

## Achievements in Language Aptitude Models

Besides these well-established and validated aptitude tests, several important language aptitude models are also emerging from the multiple fields of educational psychology (Sparks, Chapter 11, this volume), second language acquisition (SLA; Robinson, 2005; Skehan, 2016; Wen, 2016), and cognitive neuroscience (Turker & Reiterer, 2021, and Chapter 10, this volume) that focus more on the *explanatory* power to account for IDs in SLA process and outcomes. Among these, Peter Skehan (2012, 2016, 2019) has explored how potential language aptitude constructs can be brought into alignment with the three major acquisitional stages (i.e., the input-oriented stage, the interlanguage developmental stage, and the output-oriented stage), which are subserved by embedded mechanisms/processes such as input processing, noticing, pattern identification, complexification, handling feedback, error-avoidance, automatization, and lexicalization (see also Wen & Skehan, 2021). Working in tandem with these perceived mechanisms are putative aptitude constructs that subsume both well-attested existing aptitude components (such as phonetic coding ability and language analytical ability, as conceived in Carroll's four-factor model, 1990) and emerging constructs, such as phonological working memory, attentional control, memory retrieval, and chunking (see also Wen et al., 2017).

In a slightly different manner, Peter Robinson (2001, 2005, 2007, 2013, 2019) has followed the interactionist perspective of Richard Snow to conceptualize language aptitude(s) as the effective combination(s) of more basic cognitive abilities, thus constituting aptitude complexes (Snow & Lohman, 1984; Snow, 1987). These combinatorial aptitude complexes in turn dynamically influence and attenuate second language task performance (which can be called "task aptitudes") under different learning conditions (implicit, incidental, rule-search, instructed, etc.) and linguistic problems in the real-world contexts. Conceived this way, aptitude complexes constitute the rationale and backbone for constructing aptitude test batteries to be implemented within the triadic componential framework of syllabus design and task sequencing (Baralt et al., 2014).

The latest proposal in formulating an SLA-informed aptitude model is the phonological/executive (P/E) model of working memory (Wen, 2012b, 2016, 2019; Wen & Skehan, 2021). The P/E model was motivated as a partial response to update and refine the memory component of Carroll's classical four-factor model (1990), expanding the understanding of memory in the 1950s from the "passive" association between form and meaning (as tested in the MLAT I; Stansfield

& Reed, 2019) to a more dynamic and adaptive construct of working memory (WM). Drawing on insights from well-established WM theories and models across multiple disciplines of cognitive science (Miyake & Shah, 1999; Baddeley, 2012; Cowan, 2017; see also Logie et al., 2021 and Wen & Schwieter, 2022), the P/E model argues that the limited capacity of WM serves to constrain and shape key aspects of language acquisition and processing, ranging from domains of phonology to grammar and discourse (O'Grady, 2017), as well as modulating L2 sub-skill learning (Wen, 2016). More specifically, WM, as conceived in the P/E model, consists of the domain-specific phonological component (following Baddeley & Hitch, 1974) and the domain-general executive control processes (following Cowan, 1999 and Engle, 2002, 2018), rendering the concept part and parcel of the "*language learning device*" (Baddeley et al., 1998; Lu & Wen, 2022; cf. Chomsky, 1965).

The specific implications of the P/E model for language are twofold. First, the model stipulates that phonological WM is the "*language learning device*" (following Baddeley et al., 1998), which is purported to play an instrumental role in the sound-based and chunking-oriented aspects of language acquisitional domains, thus underpinning the acquisition and development of lexical knowledge, grammatical knowledge, and collocational knowledge (e.g., Pierce et al., 2017; Llompart & Dabrowska, 2020). On the other hand, the P/E model also postulates that executive WM (EWM) functions to regulate and control attention resources (including information updating, task switching, and inhibitory control) during task completion (Miyake et al., 2000). Thus, EWM is likely to impact cognitive processes that influence and modulate cognitively demanding L2 sub-skills processing, such as listening comprehension (Chang & Zhang, Chapter 12, this volume), speaking performance dimensions, reading skills and comprehension, writing skills and performance, as well as bilingual processing and interpreting (Han et al., Chapter 13, this volume).

It should be clear by now that all these post-MLAT, SLA-informed language aptitude models, including Skehan's staged model and Robinson's complexes model discussed here, have all ascribed a central role for WM, thus significantly broadening the traditional conception of Carroll's language aptitude model. Indeed, though it is premature to say that WM *is* language aptitude (Skehan, Chapter 9, this volume), the incorporation of WM as a central component of language aptitude has received the most attention and thus become the most vibrant endeavor to reconceptualize language aptitude in recent years (Miyake & Friedman, 1998; Juffs & Harrington, 2011; Wen & Skehan, 2011, 2021; Wen, 2012a, 2016; Griffiths & Soruç, 2020;

Doughty & Mackey, 2021). An increasing number of empirical studies, longitudinal investigations, and large-scale meta-analyses have all found positive links with and significant effects of WM on first ad second language processes and learning outcomes (Wen, 2012b, 2016; Linck et al., 2014; Wen et al., 2015; Schwieter & Wen, 2022; Wen & Jackson, 2022).

## Critiquing Current Language Aptitude Paradigms and Methodologies

When looking back at foreign language aptitude research over the past sixty years, it is equally surprising to note that, though numerous studies and volumes have been published on this topic, the methodological issues have not been adequately addressed. However, in a paper published in a special issue of the *ARAL*, Li and Zhao (2021) offered a systematic analysis of the methodology of language aptitude research by drawing on insights from sixty-five studies in three meta-analyses conducted by the authors and colleagues (Li, 2015, 2016, 2017) as well as additional papers in the special issue of *Studies in Second Language Acquisition (SSLA)* (Li & De Keyser, 2021). The authors identified three research paradigms of language aptitude, namely naturalistic learning contexts, instructed SLA, and interactional studies of aptitude that include age, learning experience, and other ID variables. The authors also provided an overview and critique of major aptitude tests and discussed their psychometric properties, that is, construct validity, reliability, content validity, divergent/convergent validity, and predictive validity (see also Li, 2016). In addition, the authors highlighted a new language aptitude construct – implicit aptitude – and discussed its content and measurement, informed and expanded by empirical papers included in the special issue of *SSLA* (Li & De Keyser, 2021; see also Skehan, Chapter 9, this volume). Based on these reviews, the authors proposed a nuanced approach to implicit language aptitude, which is viewed as (a) dynamic rather than fixed, and (b) multicomponential rather than monolithic (cf. Wen, 2021). Thus, our current conceptions of language aptitude are expanded to subsume multiple components and multicompetence (see also Han et al., Chapter 13, this volume).

## Background and Rationale of the Book

In the past ten years, several monographs and edited volumes (e.g., Granena & Long, 2013; Granena et al., 2016; Hyltenstam et al.,

2018; Reiterer, 2018; Wen et al., 2019; Granena, 2020) and two recent special journal issues (i.e., *ARAL,* Doughty & Mackey, 2021, and *SSLA,* Li & Dekeyser, 2021) have all been devoted to addressing theoretical and methodological issues of language aptitude. In addition, an increasing body of empirical studies has examined its predictive and explanatory roles in accounting for IDs in online and offline linguistic task performance, long-term development, and ultimate attainment of language training programs and classroom instruction (Li, 2015, 2017, 2019; Li & Zhao, 2021).

One may wonder, then, given that there have been such extensive publications addressing theoretical and methodological issues in language aptitude, why there should still be room for another book on this topic. The idea of editing this new volume followed from the Zhuhai International Roundtable Forum on language aptitude with the sub-theme of "pushing the boundaries" at the Beijing Normal University Zhuhai Campus in China between 8 and 10 November 2019. This roundtable was our second forum on this important topic, carrying on the discussion from a previous one held in June 2017 in Macau (co-organized by Macao Polytechnic Institute and University of Macau). That 2017 roundtable resulted in the publication of *Language Aptitude: Advancing Theory, Testing, Research, and Practice*, published by Routledge in the Second Language Acquisition Research Series (Wen et al., 2019).

During the 2019 roundtable forum, we intended to significantly expand the scope of the existing themes of language aptitude by inviting both seasoned and upcoming scholars and experts based across the globe (USA, UK, Sweden, Austria, Germany, Poland, Japan, China, etc.) to address broader and deeper issues related to theorizing and testing language aptitude. Subsequently, a distinguished lineup of both senior and rising scholars active in language aptitude research gathered on the beautiful Zhuhai campus of Beijing Normal University to present and exchange innovative perspectives on critical theoretical, methodological, and practical issues. Topics in the roundtable forum were well received and included theoretical accounts, cognitive models, test instrumentation implementation and refinement, and empirical studies exploring aptitude–treatment interaction (ATI) effects. The outcome of this successful roundtable was rewarding and encouraging, leading to major papers not only in the latest issue of *ARAL* (Doughty & Mackey, 2021) but also the major chapters of the current volume. Both volumes are further enhanced by additional contributions from scholars who were not able to attend and present at the roundtable. As the theme of the forum indicated, we hope that these two sister volumes will indeed serve to push the

boundaries of language aptitude research beyond its current state of play in terms of aptitude testing, aptitude theory, and practice, the latter two components giving rise to the title of the current volume.

## Organization of the Volume

That said, as shown in the table of contents, we have aimed even higher in this new volume with a clear view to significantly distinguish it from our previously published title (Wen et al., 2019). Specifically, the current book is organized into five major parts, plus two final commentary chapters.

## Part I Revisiting and Refining Aptitude Tests

To begin, the first part revisits, updates, extends, and refines current (post-Carroll) aptitude test batteries. The section begins with **Chapter 2** by Daniel Reed and Charles Stansfield, who review the major developments of the MLAT and its variants and then turn to the MLAT-Elementary test battery that was designed specifically for young L2 learners of primary and middle school age. The authors provide a review of the history of MLAT-E and its application and validation over the past five decades and conclude by examining its uses for further research and aptitude assessment. It is conceivable that the MLAT-E will make a contribution to emerging research with young L2 learners in current SLA (Philp et al., 2008).

In **Chapter 3**, Vivienne Rogers, Paul Meara, and Brian Rogers provide an overview of the development of the LLAMA aptitude test battery since its inception in 2005. They discuss the potential limitations of the test's current format in terms of internal and external validity. Then, they describe some new features of, and changes to, this increasingly popular language aptitude test battery (Bokander, Chapter 5, this volume). The new LLAMA tests are now available online on Meara's lognostics website: www.lognostics.co.uk/tools/LLAMA_3/index.htm.

The High-Level Language Aptitude Battery (Hi-LAB) measures the cognitive and perceptual abilities hypothesized to be important for post-critical-period adults to reach advanced levels of foreign language proficiency (Doughty et al., 2010; Linck et al., 2013; Doughty, 2019). For **Chapter 4**, Meredith Hughes teams up with colleagues Ewa Golonka, Alison Tseng, and Susan Campbell to provide a historical overview of the Hi-LAB, from the selection of constructs to measure through the development of the battery to an exploration of the battery's measurement properties, including how the test can be used

today. They describe the work dedicated to selecting, refining, and validating the measures in the battery and explore how researchers have used Hi-LAB to investigate aspects of language aptitude, most notably the potential for the test to inform language ATIs. Potential directions are also provided for language learning across populations, including language learners themselves, language instructors, academic researchers, and organizations interested in training personnel in new languages.

Among the three aptitude batteries reviewed and updated here, the LLAMA has garnered the most prominence in recent years, gradually emerging as the most popular battery in current SLA research (Bokander & Bylund, 2020). Despite its popularity and importance, very few empirical studies have directly addressed how well it actually predicts variance in SLA. As Lars Bokander demonstrates in **Chapter 5**, one approach to addressing this is to systematically examine LLAMA's correlations with learning outcomes. The chapter reports validation results from a systematic review of previously published correlations probing the association between LLAMA and various L2 tasks (e.g., grammaticality judgments, pronunciation, and overall L2 proficiency). Several studies pointed to significant correlations between LLAMA scores and L2 tasks, but the sample sizes were often very small, and many studies reported ambiguous or near zero correlations with outcome variables. The chapter also reveals that the four LLAMA tests have been unevenly represented in research. In light of these results, the author calls for more empirical studies that use the full LLAMA suite in correlational designs with a variety of L2 outcomes so that its external validity can be further investigated.

## Part II Aptitude Testing of Diverse Groups

The second part of the book aims to put current language aptitude tests into practice by targeting more specific groups of L2 participants in diverse contexts. In **Chapter 6**, Haiyong Zhao, Shaoqian Luo, and Ailan Fu report an investigation comparing the Language Aptitude Test for Chinese (LAT-C) learners of foreign languages with LLAMA. They analyze their data using descriptive, correlational, and factor analyses. Their findings show that (1) LAT-C was significantly correlated with LLAMA, suggesting that the two tests have strong concurrent validity; and (2) LAT-C had higher predictive validity than LLAMA for predicting foreign language learning among the specific group of Chinese learners of foreign languages.

In **Chapter 7**, Amelia Lambert discusses the results of a longitudinal study on age and aptitude in pairs of recently arrived Spanish-speaking

immigrants to the USA. Each pair consisted of one adult and his/her child, aged 7–14 years. Their English proficiency was measured in three sessions over one year with a listening comprehension test, a verbal fluency test, and an oral narrative measure. Participants' WM and language aptitude (LLAMA) were measured in the first session, and they answered a questionnaire on English exposure, motivation, and anxiety when speaking in English at all three sessions. The scores of the adult participants were compared to those in studies with college students on the same tests. The findings showed that the adult participants' scores were significantly lower than the college students on three of the four LLAMA subtests. Both children and parents performed similarly to the children samples ($n = 7$) from former studies (see also Lambelet, 2021). Based on these strikingly low scores, Lambelet calls for more studies in SLA research to investigate non-WEIRD (Western, educated, industrialized, rich, and democratic) populations, especially low socio-economic status participants and recent immigrants.

**Chapter 8** in this section is by Niclas Abrahamsson and Helena Smeds, who first review and reflect on the thorny issue of whether language aptitude is a normally distributed, innate, and fixed talent for language learning that is distinguished from, and independent of, other cognitive and non-cognitive traits, abilities, and functions. They note that aspects of this conceptualization of language aptitude are currently being challenged, and they also present original data on the cognitive advantages for language learning found in the specific group of blind individuals, which would allow the researchers to cast doubt on language aptitude as something innate, stable, and immune to experience. The chapter provides (at least) two theoretical alternatives: Aptitude researchers (1) reconceptualize language aptitude as a flexible ability or trait that can be acquired or enhanced through experience, or (2) hold to the innateness and fixedness position but accept (with the ambition to resolve) the ambiguity that arises when aptitude tests also tap into superficially similar but fundamentally different experience-based skills.

Indeed, the last twenty years have seen a welcome resurgence of interest in aptitude theory and practice as well as a range of innovative research programs and designs to explore links between aptitude constructs in tandem with SLA acquisitional stages or processes (Skehan, 2016, 2019). Together with the WM perspective (Wen, 2016), this particular line of research has transformed our understanding and approach to the aptitude construct (Wen & Skehan, 2021). However, what has remained fairly constant are the available aptitude tests and how these batteries are used and administered, somewhat

opportunistically, in research studies. Peter Skehan's commentary in **Chapter 9** accomplishes its two general aims. First, he surveys existing aptitude tests and explores how they relate to some basic underlying dimensions, namely, the extent to which they are language-oriented or general cognition-oriented, their focus on explicit learning/processing versus implicit learning/processing, and the proposed stages within an acquisitional sequence. Second, after examining existing aptitude tests, Skehan proposes a potential new aptitude test that attempts to probe the capacity to handle language, specifically in a post-critical period context. The broad claim of the chapter is that the renewed interest in language aptitude raises the imperative to develop a wider range of aptitude tests for a broader base of L2 learner groups.

## Part III Innovative Perspectives and Emerging Paradigms

The third section of the book discusses theoretical perspectives and emerging research paradigms regarding language aptitude. The section begins with **Chapter 10** by Sabrina Turker and Susanne Reiterer, who examine brain functions and structures that bear on language aptitude, thus providing a solid neurocognitive perspective on language aptitude emergence and development, buttressed by behavioral and neural evidence (also see Turker & Reiterer, 2021). Such an aptitude perspective highlights the complex interplay between musicality/music aptitude and WM, with supporting evidence gleaned from structural and functional correlates that characterize the structural variation in the auditory cortex and its relationship to high language aptitude in children and adults. Another highlight is the portrayal of the developmental perspective on the correlations between stable anatomical predictors vis-à-vis other cognitive predictors for language and speech abilities.

In **Chapter 11**, the highly experienced educational psychologist Richard Sparks traces back the thirty years of research on his language aptitude model, namely, the Linguistic Coding Differences Hypothesis (LCDH), which emphasizes IDs in L1 attainment and their attested role in L2 aptitude and L2 achievement. Sparks contends that, although IDs in L1 attainment have been downplayed or ignored by many SLA researchers, these differences have been shown to emerge early in development (cf. Andringa & Dabrowska, 2019). Such IDs in L1, as further argued by the author, are large and stable across development, can be observed in all domains of L1 development, and predict differences in several aspects of L1 acquisition. In this chapter, Sparks probes into a series of thorny questions about the relationships between L1 skills, L2 aptitude, and L2 achievement. He

answers the questions by reviewing the results of empirical studies whose findings reinforce the tenets of the LCDH by showing that L2 learning is the learning of *language* and that the skills necessary for successful L2 learning are necessarily language-related. Similar to the arguments by Skehan (2019), Sparks takes the position that language is special for L2 learning and that L1 attainment places constraints on L2 outcomes.

In **Chapter 12**, Pengyun Chang and Lawrence Jun Zhang expand on their recent paper (Chang & Zhang, 2021) to further explore IDs in language aptitude and WM among a group of Chinese learners of English as a foreign language (EFL). Drawing on the increasingly influential Complex Dynamic Systems Theory (CDST) approach and techniques in SLA (Lowie, 2017), three L2 learners' language aptitude and listening performance were traced and portrayed via the CDST time-series technique of min–max graphs over time. Other techniques, including moving-window correlations and Monte Carlo and Loess smoothing analyses, were also applied to gauge degrees of variability and interactions in aptitude and listening performance. The findings suggest that the learners' listening performance showed different non-linear developmental patterns. Changes were identified in some learners' language aptitude components. Overall, the authors conclude that a complex and dynamic relationship exists between language aptitude and listening performance over the study period, thus adding a new window into the development of IDs in language aptitude and WM.

The past two decades have also witnessed the emergence of a powerful and practical theory of human cognition and communication: the translanguaging theory (Li, 2018). Such translanguaging movements have influenced a broad range of language and education domains that are characterized by superdiverse, multilingual, multicultural, and multisemiotic social contexts, including translation and interpreting practice (Baynham & Lee, 2019; Runcieman, 2021). To further expand on this latter phenomenon, the last chapter in this section (**Chapter 13**), by Lili Han, Zhisheng Wen, Zi-Yu Lin, and Li Wei, aims to devise an aptitude model of interpreting by drawing on insights from translanguaging theory. Such a translanguaging-informed model portrays the translating/interpreting process as the fluid, complex, and dynamic interactions between the interpreter's cognitive multicompetence (Cook, 2016) and those multimodal affordances, as well as the broader socio-cultural contexts. Specifically, the aptitude model of translating/interpreting is premised on three hierarchical levels categorized as the macroscopic level, the meso level, and the micro level (thus nicknamed the 3M model) with

each level subsuming multiple components and facets that interact to generate multilayered translanguaging spaces. Overall, the authors argue that such a translanguaging lens for translating and interpreting, augmented by the key tenets of the CDST, can serve to mobilize scholars in related fields to reconsider and reconceptualize translating and interpreting aptitude.

## Part IV Aptitude–Treatment Interaction (ATI) Studies

Aptitude–treatment interaction (ATI) research seeks to determine whether learners extract more benefit from a specific type of instruction as a result of their language aptitude profile. Previous research has often compared the role of language aptitude concerning the explicit and implicit nature of treatments, while some studies have considered learners' level of proficiency and timing of instruction. However, no research has studied the timing of form-focused instruction (FFI) *and* the level of proficiency with respect to the role of language aptitude. In **Chapter 14**, Gabriel Michaud and Ahlem Ammar report a study in which the moderating role of language aptitude was assessed by taking into account the timing of FFI within a task cycle as well as the learners' level of proficiency. Results from multiple regressions showed that (1) language analytic ability (measured by LLAMA F) significantly predicted unique variance for the lower-level proficiency learners who received explicit instruction before or during the tasks; (2) implicit learning (measured by LLAMA D) significantly predicted unique variance for the higher-level proficiency learners who received explicit instruction during the task; and (3) no significant interactions were observed for the control group (pure implicit learning condition).

In **Chapter 15**, Yuichi Suzuki, Robert DeKeyser, and Yi Ting Huang examine the extent to which aptitude components for explicit and implicit learning could predict the acquisition of English grammatical structures by late L2 English learners in a naturalistic acquisition context. A visual–word task (eye-tracking) was employed to measure participants' real-time processing of two grammatical properties of the English nominal phrase: definiteness and mass-count. Predictors were implicit learning aptitude, measured by a serial–reaction time task, and explicit learning aptitude, measured by MLAT and LLAMA subtests. The results showed that implicit learning aptitude was particularly related to definiteness, but not to mass-count. The aptitude for explicit learning was not related to sensitivity to either definiteness or mass-count. The interactions between aptitudes and linguistic structures suggest that explicit and implicit learning mechanisms (aptitudes) are recruited differentially during L2 grammar learning.

Recent theoretical advances (Skehan, 2019, and this volume) have found that aptitude measures invariably tap into a range of cognitive processes (domain-general vs. domain-specific) and knowledge types (implicit vs. explicit). In **Chapter 16**, Daniel Jackson and Ryo Maie consider the potential role of implicit and/or statistical learning (ISL) mechanisms in language aptitude. The goals of their chapter are (1) to clarify the processes and knowledge that ISL tasks claim to involve; (2) to consider theoretical justifications for research into the potential link between ISL and SLA put forth by researchers while considering the componential nature of language aptitude, effects of age on attainment, and need for advanced L2 learning under incidental conditions; and (3) to provide a synthesis of studies yielding empirical evidence to assess the link between ISL and L2 outcomes. They propose several research questions that aim to facilitate understanding of empirical evidence concerning the strength of the relationship between ISL and L2 outcomes, whether focused on acquisition or processing.

## Part V Final Commentaries

The volume concludes with two final commentary chapters: a reflective chapter and an epilogue. **Chapter 17** by Peter Skehan provides a reflective synthesis of the progress achieved in current language aptitude theory and practice, highlighting, in particular, the theoretical and methodological contributions made by the individual chapters in the current volume. Specifically, the volume further pushes the boundaries in language aptitude research by revisiting and refining current language aptitude test batteries (Part I), expanding language aptitude tests to more diverse groups (Part II), providing innovative theoretical perspectives and research paradigms that have expanded our understanding of the language aptitude in broader contexts (Part III), and showcasing the significant roles played by explicit language aptitude in L2 classroom instructions and that of implicit language aptitude in predicting acquisition of L2 grammar structures and L2 outcomes (Part IV). As such, it can be concluded that the volume has achieved the original goal set for the 2019 roundtable forum and the two ensuing major publications (the 2021 *ARAL* and the current volume), thus pushing the boundaries of language aptitude research towards a more promising future.

The **epilogue** (**Chapter 18**) is by Michael Bunting, who has been extensively involved in the interdisciplinary fields of cognitive psychology (in particular WM) and language sciences, and most relevantly in the development and project supervision of many aptitude tests, including the Hi-LAB at Maryland. Bunting reflects on the prodigious

foresight of the founder of social psychology, Kurt Levin, who lamented on the lack of attention to the "*practical aspects of memory*" research in that "There is nothing so practical as a good theory" (Greenwood & Levin, 1998, p. 19). Such a comment serves as a sober reminder for language aptitude scholars to focus not only on constructing language aptitude tests, but also on addressing other key questions and issues related to language aptitude theory and practice.

Overall, Bunting argues that while previous aptitude research produced psychometrically sound aptitude test batteries that can predict language learning outcomes generally, most of the tests' authors have not constructed an overarching theory about the nature of language aptitude, or matched language aptitude theory with effective guidelines for such practical aspects as cognitive/aptitude training, syllabus design, and classroom-based pedagogy (Robinson's triadic componential framework can be considered a significant move in this direction). To that effect, the author agrees with the editors' call for a paradigm shift from aptitude testing to aptitude theory and practice, couched within a whole set of "important questions" that all current and future language aptitude theorists and practitioners should attempt to answer. These fundamental and practical questions are framed around the WHAT, WHY, and HOW questions, including "What is language aptitude and what is it not?," "Why is language learning so hard?," and "How come it takes so long?" Answers to these fundamental questions will be important in guiding future research endeavors to theorize, measure, and utilize language aptitude constructs and tests.

## Final Remarks

In sum, although we have witnessed increasing interest in language aptitude research in the last sixty or seventy years and have made some progress in aptitude testing in more recent decades, further developments in theory construction and practical applications are imperative and essential for language aptitude to sustain its momentum in SLA research (Li, 2019; Chalmers et al., 2021; Wen, 2021). Given the status quo in aptitude research, we as editors anticipate that the current volume will boost developments in these two major areas (theory and practice), particularly towards more practical aspects of language aptitude research (cf. Neisser, 1978). As such, we hope that the individual chapters have not just provided language aptitude theorists and researchers with state-of-the-art reviews of aptitude test development, but also provided inspiration for theorizing language aptitude constructs and applying language aptitude in pedagogy and practice. Thus, we expect the volume to serve as a useful reference not

just for academic researchers and language aptitude practitioners but also for other end users or stakeholders of language aptitude tests, such as language teachers and learners, educators, and language policymakers. Above all, we hope that the updated, in-depth, and innovative analyses offered in this volume will inject further dynamics to the burgeoning research enthusiasm directed towards this key ID factor for foreign/second language learning and teaching (cf. Doughty & Mackey, 2021).

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