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INDIVIDUAL DIFFERENCES IN SECOND LANGUAGE ACQUISITION

Theory, Research, and Practice

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Introduction

Individual difference (ID) variables are learner traits and characteristics that may have an impact on learning processes, behaviors, and outcomes. This book provides a thorough discussion of the theory, research, and pedagogy pertaining to the role ID factors play in second language acquisition (SLA). It goes beyond the traditional repertoire and includes more than 32 chapters covering a full spectrum of ID topics on learners' cognitive, conative, affective, and demographic/sociocultural variations as well as commonly used methods in ID research. The book is motivated by the importance of IDs in SLA and the lack of a handbook-type volume that provides a comprehensive coverage and in-depth discussion of the various facets of each ID construct. In SLA, IDs receive extensive attention in nearly all start-of-the-art volumes (Ortega, 2009), handbooks (Loewen & Sato, 2017), and introductory guides (Gass et al., 2013). There have also been monographs on IDs as a substantive domain (Robinson, 2002; Skehan, 1989) and on single ID variables such as language aptitude (Wen et al., 2019), working memory (Wen et al., 2015), motivation (Dörnyei & Ushioda, 2021), learning strategies (Griffiths, 2013), and anxiety (Gkonou et al., 2017). In psychology, there are specialized journals for IDs in general, such as the *Journal of Individual Differences* and *Learning and Individual Differences*, as well as journals for specific ID variables, such as *Emotion*, *Journal of Memory and Language*, and *Motivation Science*. In our field, there is only one such journal—the *Journal for the Psychology of Language Learning*.

Despite the importance attached to IDs in SLA and the large amount of research that has been conducted, there has been no volume providing a systematic, thorough examination of ID research. The only volumes that focus exclusively on IDs are Skehan (1989), Dörnyei (2005), and Dörnyei and Ryan (2015), which provide invaluable insights and guidance for ID research. However, these volumes mainly include the “classic” ID variables such as personality, aptitude, motivation, learning styles, and learning strategies. Other important and extensively researched variables, such as working memory, age, identity, and so on, were either excluded or received little attention. For example, in Dörnyei (2005), while the “major” variables (such as motivation) received chapter-length discussions, other variables (such as anxiety and learner beliefs) were condensed into one chapter because “they do not warrant a chapter of their own” (p. 8). Clearly, the field is in urgent need of a volume that serves as a one-stop reference where the reader has comprehensive access to knowledge and

information about all ID variables. This volume would constitute a timely initiative that fills a significant gap. In the rest of this chapter, we discuss the scope and significance of IDs, present views of the role of IDs in SLA theories, provide an overview of ID research, and give an introduction to the volume including chapter structure, major sections, and contributions to the field.

Scope and Significance of IDs

Individual difference factors or variables refer to traits, dispositions, and characteristics, be they biological, social, psychological, or a combination of these, that make learners unique individuals, cause variation among learners, and are hypothesized to have a direct and/or indirect impact on learning outcomes. In this conceptualization, IDs go beyond the cognitive and affective domains such as language aptitude, motivation, and anxiety, and include learners' individual variations in age and social identity, such as gender and ethnicity. Also, IDs are predictors of learning outcomes rather than learning outcomes per se; in other words, they are conceived as independent variables that influence learners' achievements in a second language. However, conceiving IDs as predictor or independent variables does not prevent researchers from investigating IDs as dependent variables, for example whether working memory is subject to training or whether aptitude increases with age. Rather, it is meant to clarify that the rationale for investigating IDs is primarily because of their significance in making a difference in learning outcomes. It is also possible that the predicted learning outcome of an ID variable may have a subsequent impact on the ID variable itself. For example, while anxiety is often hypothesized to be an independent variable that causes low achievement, it is also possible that anxiety is a result of low achievement (Skehan, 1989). Notwithstanding the possibility that low achievement is a source of anxiety, the primary reason for investigating anxiety is its posited harmful effects on learning outcomes. It is necessary to further clarify that as independent variables, IDs may be directly related to learning outcomes or indirectly associated with learning outcomes by influencing learning behaviors and processes that are considered or proven important for learning outcomes, such as learners' noticing of corrective feedback and production of language-related episodes.

The taxonomy of ID factors in second language (L2) research has been notoriously equivocal. For example, Robinson (2002) divided ID factors into two broad categories: cognitive and conative/affective, with the former being more stable (e.g., working memory) and the latter more malleable (e.g., anxiety). MacIntyre (2002) stated that affective variables include attitude and motivation, anxiety, and self-confidence, while cognitive variables include aptitude, intelligence, and strategies. The categorization scheme proposed by Cronbach (2002), which includes affective, conative, and cognitive dimensions, seems more informative and elaborate: "Affective has to do with feelings and emotions. Conative has to do with goal setting and the will. And cognitive refers to analysis and interpretation. It includes reasoning, remembering, and using symbols" (p. 4). Drawing on Cronbach's typology and adding one more category, we divide the ID factors covered in this volume into four categories: cognitive, conative, affective, and sociocultural/demographic differences. In this taxonomy, cognitive variables include language aptitude, working memory, declarative/procedural memory, learning strategies, cognitive styles, and metacognition; conative variables subsume motivation, mindsets, goal complexes, and willingness to communicate; affective variables encompass anxiety, enjoyment, self-efficacy, and learner beliefs; and sociodemographic variables comprise age and identity. We realize that this taxonomy may not be perfect and that there may be an overlap between certain categories, especially between conative and affective variables, but it provides a convenient framework to organize the chapters.

The significance of ID factors lies in their predictive power on learning outcomes, their explanatory functions in the mechanisms of L2 learning, and their implications for the practice of language teaching and learning. First, regarding the predictive power of IDs, a number of meta-analyses have been conducted that aggregated all empirical evidence on particular ID variables, such as language

aptitude (Li, 2016), motivation (Masgoret & Gardner, 2003), anxiety (Zhang, 2019), and working memory (Linck et al., 2014). These variables have been found to be significantly predictive of L2 achievements, the mean correlations ranging from 0.3 to 0.5, suggesting that the variables account for around 10–25% of the variance in L2 learning, which is remarkable given the multitude of factors contributing to L2 achievement, such as the quality of instruction and availability of resources.

Second, the findings of ID research contribute to a more accurate understanding of the mechanisms of language learning. By way of illustration, to examine the theoretical dispute over the nature of language learning, such as whether it is explicit or implicit or whether it involves the dual process of implicit and explicit learning (Krashen, 1982), one can explore whether implicit and explicit cognitive abilities contribute to L2 proficiency and whether the two types of cognitive abilities are differentially predictive of implicit and explicit knowledge, learning, and instruction (Li, this volume). Likewise, to ascertain whether early and late bilinguals learn a second language differently, one can explore whether their ID traits or characteristics are associated with their L2 attainment in different ways (Granena, 2013). Similarly, to understand whether learning at initial and later stages occurs in different ways, one can collect evidence to examine whether different ID factors, such as declarative and procedural memory, are implicated at different stages of learning (Hamrick, 2015).

Third, the findings of ID research have invaluable pedagogical implications. One way to draw on ID research is to design remedial treatments based on research findings to change learners' propensity or performance on a certain variable, such as enhancing learners' motivation (Le-Thi et al., 2020), boosting learners' self-efficacy (Wyatt, this volume), and decreasing their anxiety (Kralova et al., 2017). A second way is to take pedagogical steps to support learners with weaknesses on a certain variable that impacts learning. For example, the meta-analyses on anxiety (Zhang, 2019) showed that anxiety has stronger associations with listening than speaking, writing, and reading, suggesting that teachers should make a special effort to reduce learners' anxiety and mitigate the harmful effects of anxiety in listening activities or assessments, such as allowing students to view questions before starting to listen or providing background information about the listening activity. A third way practitioners can take advantage of research findings is to adapt instruction and utilize activities that fit learners of different ID profiles (Papi, 2018). This recommendation is based on evidence that the same ID variable has differential associations with the effectiveness of different types of instruction (Li, 2013), and that instruction that matches learners' cognitive strengths is more effective than instruction that does not (Wesche, 1981). Skehan (1989, 2002), citing several aptitude studies using cluster analysis to profile learner types, claimed that there seem to be three types of learners: those who are balanced in both memory and analytic ability and those who are strong in either of the two aptitude components. He indicated that instruction can be tailored to accommodate the three learner types. However, to date, there has been little research on learners' ID profiles and on the matching between learner profile and instruction type. Eventually, it is hoped that sufficient evidence will be accumulated to identify ideal instruction types that fit learners with different ID profiles or configurations, such as high/low anxiety + strong/weak working memory, etc. In order to provide meaningful pedagogical guidance, researchers need to manipulate instructional treatments systematically and maintain a high degree of consistency across studies because slight methodological variation may make a difference in ID–achievement associations. Finally, ID research can serve other pedagogical purposes such as diagnosing learning impairments in cognitive abilities, selecting candidates for language classes/programs, placing learners with comparable profiles into different classes, and evaluating the effectiveness of a language program/class given learners with certain ID profiles (Li, 2017a).

Theoretical Perspectives

A theory explains an observed phenomenon regarding its nature and mechanism and makes predictions or hypotheses about related processes, outcomes, and behaviors (Long, 1990; VanPatten &

Williams, 2015). Theories are important for empirical research because they provide guidance on the conceptualization of the construct to be examined, and make it possible to formulate clear, specific research questions/hypotheses, develop or select valid instruments to answer the research questions or test hypotheses, maintain methodological consistency across studies, and analyze data and interpret results in a meaningful way. Therefore, theories are essential for the construct validity of empirical research (Cooper, 2010), which refers to whether an empirical study is implemented in line with the theoretical conceptualization of the variable and whether the interpretations of the results are accurate. Theories are of special importance to ID research because many ID variables are not directly observable (hence “latent” variables), they are multidimensional/componential, and they overlap. For an ID variable to be a useful construct that explains L2 learning processes, behaviors, and outcomes, the construct needs to be theoretically conceptualized and distinguished from other variables before being empirically tested. ID studies that lack a solid theoretical basis are often based on unsystematic and isolated assumptions, observations, and practical considerations, and do not provide well-defined construct descriptions pertaining to its nature, content, and the nomological network for the ID’s association with other variables and with learning outcomes. Take language aptitude for example. Early aptitude research is, for the most part, atheoretical—it was test-, observation-, and practice-driven and targeted primarily predictive validity, namely whether it is correlated with learning outcomes. The objective was to develop tests based on observations of how learning occurred in the language classes during that period (1950s), and the validity of the tests was determined solely by whether significant correlations could be found between aptitude scores and course grades. However, the measured construct was not clearly defined. For example, the tests, such as the MLAT and the PLAB, include sections on English (L1) vocabulary, and the PLAB even includes sections on candidates’ GPA and motivation. Thus, although significant correlations were found for the test batteries, the results did not seem to accurately represent the way aptitude is conceptualized, which is a predictor of learning outcomes rather than an outcome (such as vocabulary or GPA) per se, and it is a cognitive rather than conative (motivation) variable.

With regard to the theorization of IDs, a distinction can be made between *ID theories* and *SLA theories*. Although both may make claims about the role of IDs in language learning, there are differences in the focus of the two types of theory. In an ID theory, the starting point is the ID variable in question, and the theory focuses more on defining the concept and specifying its components and less on how learning occurs and how the ID impacts different aspects of learning. Although there is much variation in what an ID theory entails, this seems to be the pattern with at least certain ID variables, such as motivation, anxiety, and working memory. An SLA theory, however, prioritizes how learning occurs, and the role of IDs, albeit important in certain theories, is not a central focus. Of course, an ideal theory should make clear claims about both IDs and learning and the relationship between the two. However, covering certain but not all aspects of the construct in question is acceptable, given the challenge of developing an overarching theory that includes everything. As Long (1990) argued: “Theories need not account for all the facts in every description to be viable” (p. 653).

In this book, ID theories are discussed in the chapters on ID variables. Here, in the introduction chapter, we focus on what an ID theory should or can entail. Based on principles of psychometric assessments and our observations of ID research in the field, we recommend considering the following possible parameters for an ideal ID theory.

- *Content*. This concerns what the construct entails and what the components are if it is multi-componential. The content of an ID construct must be clearly defined and specified so that instruments can be developed to accurately measure it and the same ID variable can be operationalized consistently across different studies.
- *Malleability*. This relates to whether the ID trait is changeable or variable as a function of age, gender, learning experience, or ethnicity. This might also implicate whether the ID in question

is amenable to treatment effects, in the case of targeted interventions in the L2 classroom. In this case, the ID factor is conceived as a dependent or outcome variable rather than an independent variable that causes differences in an outcome.

- *Relationship with other ID variables.* Specifying an ID factor's relationships with other ID variables makes it possible to examine the convergent and divergent validity of the construct, which refers to whether measures of the same variable are correlated—evidence for what it is (convergent validity)—and whether measures of different constructs are uncorrelated—evidence for what it is not (divergent validity). The two types of validity will be further elaborated on in later sections.
- *Domain specificity.* This parameter has two interpretations. One is whether the construct is specific to language learning or applicable to all kinds of learning. Fundamentally, this relates to whether language learning is something special or the same as other skills such as learning how to play the piano or how to solve math problems. Clarification of this parameter is crucial for the instrumentation of ID research, because if language learning is domain-general, then there is no need to develop and validate language-specific measures of ID variables. Domain specificity can also be applied within the domain of language learning, for example whether L2 motivation is a general concept applicable to L2 learning in general or whether different types of motivation exist for different language skills, such as listening, reading, writing, and speaking, and different aspects of the L2 system, such as grammar, pronunciation, vocabulary, and pragmatics.
- *Relationship with learning outcomes.* This parameter relates primarily to predictive validity—that is, whether an ID factor is predictive of learning outcomes—and it requires the theorist to define and describe several algorithms. The first is the nature of the predicted outcome, such as whether the learned knowledge is implicit or explicit, and this can be called a property theory (Mitchell et al., 2013). The second is the mechanism in which the ID factor affects the process of learning, which involves the transition from point A to point B in the interlanguage. This can be called a transition theory. The third concerns the directionality of the relationship between the ID variable and the outcome variable—that is, whether it is causal or bi-directional. Motivation, for example, can lead to greater achievements, which may in turn enhance motivation, hence a reciprocal relationship between motivation and learning achievements. Finally, the theorist needs to specify settings or instructional conditions where the ID factor influences learning, such as naturalistic versus instructed settings, implicit versus explicit conditions, and simple versus complex tasks. For example, traditional aptitude is relevant to instruction that is heavily form-based and that favors explicit learning, not meaning-oriented approaches that encourage implicit learning.

While an ID theory focuses on the conceptualization and measurement of ID variables, an SLA theory focuses primarily on how learning occurs, and it may draw on ID factors to interpret findings and observations about the process and outcome of L2 learning. Long (1990) listed some “accepted findings” (p. 659) that an SLA theory must account for, such as differences between child and adult language learning, the variability of the learning outcomes of adult learning, the fixed trajectory followed by all learners in acquiring certain morphosyntactic features regardless of their cultural and linguistic backgrounds, the necessity of noticing and awareness, and so on. Long drew on ID factors to explain the variability in the successfulness of adult learning, claiming the primacy of cognitive variables and “subordination” (p. 660) of affective factors. Three decades later, VanPatten and Williams (2015), in their influential volume on theories of SLA, updated Long's list and asked authors of each chapter—leading figures representing major SLA theories—to address common observations about SLA that authors deem relevant to their theories. The observation or finding that “second language learning is variable in its outcome” (p. 10) remained on the list. This finding has an apparent link with individual difference factors, although ID factors may also

be invoked for other observations. We examined how theorists responded to this observation and found that some theories, such as Universal Grammar, Input Processing, and Usage-Based SLA, did not address it; some attributed it to only contextual factors such as context (Complexity Theory); some made a simple mention of ID factors together with learner-external factors. For example, the Input, Interaction, and Output model mentioned learners' differences in the negotiation of meaning and cognitive capacity as sources of variable learning outcomes; Skill Acquisition Theory referred to language aptitude and practice as primary causes of varied learning outcomes; the Sociocultural Theory held that the different types of mediation learners receive as well as different learning goals may lead to different achievements; the Declarative/Procedural model stated that biological factors such as age and gender, as well as external factors such as learning conditions and the nature of the outcome (e.g., whether the predicted outcome is grammar or lexicon), are responsible for variable outcomes. In her conclusive chapter, Ortega identified three sources of variable outcomes: cognitive abilities, learning experience, and inconsistent/unstable interlanguage. Overall, however, in VanPatten and William's volume, SLA theories either did not make overt claims about or did not examine the role of IDs in the mechanism of language learning.

To achieve a clear picture of SLA theories' stances on the role of individual difference factors, we invited leading theorists, some of whom are contributors to VanPatten and William's volume, to answer two questions:

- 1) What are the major tenets of the theory you represent?
- 2) What is the role of ID factors in influencing the process and outcome of SLA based on your theory? How is your theory useful for thinking about and researching ID factors in SLA?

In this section, we report the theorists' answers verbatim, and we will let readers interpret the theorists' positions in their own ways without imposing our own understanding. We would like to clarify that the theories we present here concern how learning happens in general, and we recognize that each learning domain, such as pronunciation, reading, vocabulary, etc., may have its own theories. Those theories, which may or may not make claims on the roles of ID, are synthesized in the background sections of individual chapters in this volume on specific aspects of learning. To fully acknowledge the contributions of the invited authors, we provide the bibliographic information for each excerpt that should be used when they are cited.

Theory: Skill Acquisition Theory

Author: Robert DeKeyser

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Major Tenets of the Theory

Skill acquisition theory (SAT) is part of cognitive psychology, where it has a long tradition covering a wide variety of domains, whether the skill in question is solving algebra problems, learning to swim, or using a new language. A seminal article by Newell and Rosenbloom (1981) showed that for this wide variety of skills, the learning process (as evidenced by error rate or reaction time) can be represented by a power function. The curve that visualizes that function is usually seen as having three parts: a fast decline at the beginning, a slower decline later on, and a very slow, almost asymptotic decline for a very long time after that, corresponding to three different stages in the development of knowledge: acquiring declarative knowledge, proceduralization, and automatization.

The transition from declarative to procedural is often referred to as going from “knowledge that” to “knowledge how”, i.e., from knowing rules to being able to engage in behavior reflecting those rules. The transition from procedural to automatized knowledge is characterized as a refining of procedural knowledge, i.e., a further qualitative change, which is reflected in fewer errors, faster reaction times, and less interference from/with other tasks. Segalowitz (e.g., 2010) has stressed that this qualitative change, and not mere quantitative changes in speed, is a necessary characteristic of automatization, reflected in a change in the coefficient of variation (the ratio of standard deviation over average).

In recent years, skill acquisition theory has gone beyond behavioral data and has drawn increasingly on computer simulations and neuroimaging data. In second language acquisition research, SAT is represented by empirical studies, such as DeKeyser (1997) showing that the learning of L2 grammar followed the same learning curves as the development of skills in other domains; Li and DeKeyser (2017) showing the skill specificity of procedural knowledge of tone in L2 Chinese; and Hui (2020) documenting changes in the coefficient of variation at various stages of word learning. For a more in-depth discussion, see DeKeyser (2020).

The Role of Individual Difference Factors in the Theory

As SAT deals with various forms of knowledge and mental processes at different stages, it is not surprising that it predicts a different role of individual differences at these stages. This idea is not unique to skill acquisition theory, of course. Skehan (2002), in particular, predicted that different aspects of aptitude are differentially important at different points in the learning process, for example attentional control and working memory early on for input processing and segmentation; language analysis ability and working memory for pattern recognition, handling feedback, and complexification; and chunking for lexicalization.

From the perspective of skill acquisition theory, the main prediction is that the aptitudes that are most predictive of proficiency will depend on whether declarative, procedural, or automatized knowledge is predominant. Several SLA studies provide evidence for a changing role of different aptitudes as proficiency increases. Morgan-Short et al. (2014), for example, documented a greater impact of declarative learning ability early on and a greater impact of procedural learning ability later. Pili-Moss et al. (2019) found that accuracy was best predicted by declarative memory, and that automatization was increasingly predicted by procedural memory for learners with high declarative memory, but to a decreasing extent for learners with low declarative memory.

Various caveats must be taken into account: 1) The construct validity, especially the convergent validity, of measures typically used in this area is rather problematic; 2) We need tests for assessing the ability for declarative learning and proceduralization that are more language-specific; 3) As different structures are proceduralized and automatized at different times, studies should really focus on their stage of development rather than on overall proficiency levels; and 4) Given the relatively small body of research about the role of individual differences at different stages of skill development, research in this area needs substantial replication.

Meanwhile, one can argue that research on the role of individual differences from the SAT perspective is providing a welcome complement to previous aptitude research in SLA, which has almost always used tests that were designed to predict learning in the various domains of language rather than in the various stages of learning.

Theory: Universal Grammar

Author: Holger Hopp

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Major Tenets of the Theory

Generative research on L2 acquisition aims to model the nature and acquisition of grammatical interlanguage (IL) competence (for review, White, 2020). Assuming that L2 learners draw on abstract linguistic representations and constraints provided by universal grammar (UG) and instantiated in the L1, research characterizes the learning trajectories of L2 learners as the restructuring of an L1-informed IL grammar at the L2 initial state by virtue of remapping and reassembling grammatical features to the L2 (e.g., Lardiere, 2009). Current approaches conceptualize IL development as driven by parsing failure, i.e. when the language processor is unable to accommodate the L2 input within the L1/IL grammar (Dekydtspotter & Renaud, 2014). In consequence, a main tenet of the approach is to provide a linguistic description of stages of interlanguage grammatical development. Finally, the research investigates the extent to which fossilization and divergent outcomes in L2 acquisition can be characterized in terms of learnability, for example, the L2 input provides ambiguous, insufficient, or misleading information preventing target-like acquisition, and in terms of learner difficulties in coordinating information across different language modules, for example, in mapping syntactic features to inflectional forms (e.g., Prévost & White, 2000) or in aligning syntactic and discourse constraints (e.g., Sorace, 2011).

The Role of Individual Difference Factors in the Theory

Individual differences in learner-internal factors may affect the process and outcome of SLA, with the age of onset and L1 as IDs denoting theoretical constructs within generative approaches. Differences in age of onset may be associated with varying degrees to which IL grammars are constrained by UG and learners can remap grammatical features. According to some approaches, late L2 learners only have partial or even no access to UG, preventing them from restructuring their IL grammars from the L1 to the L2. Hence, late-onset L2 learning may delimit the success of L2 acquisition. Differences in L1s demarcate different starting points in L2 acquisition in that learners initially analyze the L2 input through the lens of the L1 grammar. In development, L1 differences thus implicate different trajectories and, potentially, outcomes of L2 acquisition.

Although not modeled as theory-internal constructs in generative approaches, individual differences in cognitive, conative, affective, and social factors may affect the course and outcome of L2 acquisition by limiting learners' opportunities to acquire the L2 grammar from the L2 input. For instance, IDs in cognitive processing (e.g., in working memory) may constrain a learner's capacity to convert input into intake during language processing. Finally, affective, motivational, or social factors can gate learners' access to relevant L2 input. For instance, L2 learners may seek less L2 input or receive input predominantly from non-native speakers of the L2. Current generative research examines how IDs in linguistic and cognitive processing (for review, Hopp, 2021) and effects of input quantity and quality (e.g., Unsworth, 2016) interact in the acquisition of the L2 grammar.

Theory: Sociocultural Theory

Author: James Lantolf

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Major Tenets of the Theory

Sociocultural theory (SCT) argues that the human mind does not emerge from inside the brain but results from the dialectical interaction between our biological and cultural inheritances. The human mind is a functional system comprising various elements, including perception, attention, memory, emotion, creativity, and imagination structured into a unified process as a result of internalizing the meanings created by our culture and mediated through language. Young children do not perceive reality in the same way as adults until they internalize their language system. A pre-linguistic child does not perceive reality the same way as adults. The child will not know if a glass sitting on a table is a component of the table or a separate object in its own right until they learn to linguistically distinguish “table” from “glass” along with the actions we perform with these objects. Similarly, the child will not understand that objects have essential and peripheral features. Upon seeing that the table is black, a child may well assume that color is a feature of a table and that a white table is somehow not a table.

The Role of Individual Difference Factors in the Theory

To date, SCT-L2 research has not directly addressed IDs. Given the assumptions of the theory, it follows that how individuals react to particular experiences is not a matter of internal stable traits but depends on the specific quality of the socialized world they encounter at any given time and place as refracted through the individual’s mental system. Following are two examples that illustrate this theoretical claim.

The first is Zhang’s (2014) dissertation, which challenged Pienemann’s (1989) teachability hypothesis. Contrary to predictions of the hypothesis, Zhang was able to document the effects of instruction on Chinese topicalization organized in accordance with SCT principles to show that learners do not necessarily follow a predetermined developmental sequence as called for by Pienemann’s hypothesis. One student in Zhang’s study evidenced a limited phonological loop component in her working memory, an indication that she would have had difficulty learning Chinese topicalization. However, on Zhang’s open-ended proficiency tasks the student’s performance was equal to students who scored high on the phonological loop test. The student used the visual-spatial sketchpad component of her working memory when speaking Chinese to compensate for her deficient phonological loop capacity. Specifically, she virtually manipulated the Cuisenaire Rods that Zhang had used for instruction to express a topicalized OSV or Adverb SVO order.

The second study, by Lantolf and Genung (2002), illustrates the model of motivational dialogue proposed by Patyayeva’s (2012). Patyayeva’s model comprises two components, one involving interaction with a social other and one that entails self-talk. In the social version, an “I” and a “You” engage in a dialogue ostensibly to negotiate an agreement on the motivational stance that an individual “I” adopts toward a particular activity. Self-dialogue is a conversation between “I” and “Me” (Vocate, 1994), where “Me” is derived from “You”, because as Vygotsky (1986) argued, our thinking (i.e., self-directed speaking) is always quasi-social.

The student, PG, was enrolled in a linguistics program at a North American research university. She was also a colonel in the US military, who provided her funding to complete the degree in three years’ time. All students were required to demonstrate proficiency in a non-European language either through a test or completion of six credits of course work. PG enrolled in a nine-week intensive Chinese course. She kept a log to document her first experience learning a non-European language. Based on her ability in German, Russian, and French, PG saw herself as a successful language learner. At the outset, she expected the course would follow the general communicative methodology used in other departmental courses. However, the course implemented a rigid audio-lingual approach in which native-speaking teachers conducted intensive grammatical and phonological drill sessions and dialogue enactments. The program director, a non-native speaker of

Chinese, held weekly sessions in English to explain the grammar, vocabulary, pronunciation, and writing system.

Given her disappointment with the pedagogical orientation of the course, PG dialogued with the program director several times in a failed attempt to convince him to modify the pedagogy. The director explained that because Chinese was different from European languages, it was necessary to teach it in a non-communicative format—an unacceptable response for PG. The director adopted an authoritarian stance, which does not allow for dissent or challenge. Thus, no motivational negotiation was feasible. Recognizing that she would be unable to learn Chinese, given the rigid pedagogy, PG faced two incommensurable options—drop the course, which would jeopardize the three-year degree timeline, or acclimate to the pedagogical format to the extent possible in order to pass the course. Her log documents how she grappled with, and resolved, the conundrum through self-dialogue. She managed to pass the course and thus fulfill the requirement to the detriment of learning Chinese. She succeeded in her long-term goal of earning the PhD, but at the cost of surrendering her ideal L2 self (Dörnyei, 2005).

Theory: Complexity Theory

Author: Diane Larsen-Freeman

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Major Tenets of the Theory

Complexity Theory is a transdisciplinary ecological metatheory, which is centrally concerned with the study of nonlinear change in open systems. As applied to second language development (SLD), it has been called the Complex Dynamic Systems Theory (CDST). CDST researchers seek to trace the patterns in a learner's developing language resources as they continuously emerge over time and are constructed in interactions with others. This dynamic emergence takes place through a learner's embodied participation in a spatio-temporal ecology over nested levels of complexity and timescales. The shape of a learner's language resources depends on their initial conditions, shifting configuration within the system, and interface with the external environment. Thus, contingent statements are more appropriate than unqualified causal ones.

Due to contingent factors, the growth of a learner's language resources is ordered but not invariant within and across learners; indeed, there is a great deal of intra-learner and inter-learner variability. For instance, the initial conditions in learning another language for a plurilingual are different from those of a monolingual, and because languages are not hermetic one from another, there is persistent influence from each language on the other(s) in the learner's developing repertoire. In addition, the language resources of a learner are not fixed internal representations but are rather continuously assembled in real time, drawing from multistable co-existing attractor states. The fluid interplay between language use and language learning means that the initial differences are always being updated, which contributes to the unique, unbounded trajectories of learners.

The Role of Individual Difference Factors in the Theory

Individual difference factors feature prominently in the study of second language development, according to CDST. The learner is a complex system. Who the learner is, including their history and future aspirations, will affect the learning process and may result in unanticipated outcomes. In addition, the context in which the learning takes place exercises a profound effect, making it unproductive to talk about “individual differences” in SLA against the standard of some universal

learners. Nonetheless, to hedge a bit, it may still be the case that emerging prototypes and outcome patterns are sufficiently robust to be recognizable across learners.

CDST highlights the mutability of individual differences, which sometimes change from moment to moment. Studying IDs at one time is therefore problematic because IDs are emergent and can be transient. Furthermore, studying an ID in isolation is vexed due to the interconnectedness of the differences, as the influence of each waxed and waned over time. Finally, there are IDs that are only visible at the supra-individual level. For example, although all individuals have the potential for agentive action, agency is determined relationally, i.e., the enactment of agency depends on interactions with another individual, such as the teacher.

When we categorize learners, we fail to honor their agency. CDST treats learners as real persons rather than as theoretical abstractions. It also rejects a view of a language learner as passive, for example, a mere processor of input. From a CDST perspective, then, it is better to think in terms of learners perceiving and acting on affordances, or opportunities to learn, rather than their processing input.

Recognizing that generalizations at the group level do not hold at the level of the individual, the theory is useful for avoiding problems that arise when the ergodicity principle is violated. It also connects the study of the process of language learning with the study of language learners themselves, bridging a chasm that has existed since the onset of the modern-day study of second language acquisition. Finally, it offers a non-reductionist approach, favoring a more holistic view of language learners.

Theory: The Interaction Approach to SLA

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Major Tenets of the Theory

The interaction approach to second language learning holds that input, output, and feedback are important for second language (L2) learning. Each can promote attention to and noticing of gaps in learners' L2. Also important are opportunities to modify production following feedback. The interaction approach represents a crucial departure from the more unidirectional approaches such as the Input Hypothesis and the Output Hypothesis in that it centers the negotiation processes between the learners and their interlocutors as the primary focus of research and draws from both of the earlier approaches. When Long (1981) first advanced the Interaction Hypothesis, he incorporated comprehensible input into his conception of interaction. His model focused on the interaction between more proficient speakers and less proficient speakers and emphasized how more proficient speakers often make adjustments to their speech to accommodate less proficient speakers, detecting the point at which the less proficient speakers were no longer able to successfully negotiate for meaning and adjusting their speech to more closely match the language skills of the less proficient speakers. In other words, the interaction between the speakers informed the way they used their linguistic resources, especially when one speaker is more proficient than the other. This conception of interaction was later advanced with further emphasis on the role of learners themselves in interaction. For example, Gass and Mackey (2012) asked about the developmental processes and outcomes of interaction, collecting evidence, processing corrective feedback, testing hypotheses, and more. Interaction researchers often use communicative tasks as vehicles to promote and study interactional processes. Research using this approach often involves questions like which

types of feedback are most effective at promoting the acquisition of linguistic forms for learners. Today, interaction researchers continue to probe such questions to better understand how learners initiate, react to, and learn from L2 communication, particularly examining factors that might mediate the developmental effects of interaction (e.g., individual differences).

The Role of Individual Difference Factors in the Theory

In interaction, feedback, and task-based research, IDs such as motivation, anxiety, aptitude, working memory, attention, inhibitory control, age, cognitive creativity, and proficiency are considered important variables in the link between interaction and second language development. As one example, differences in working memory capacity might mediate the relationship between corrective feedback (e.g., recasts) and interaction-driven learning. Recasts are argued to be effective because they 1) contain positive evidence in the form of the target-like structure, 2) immediately follow the learner's erroneous utterance, and 3) contain enhanced salience, in that the non-target-like form is juxtaposed with the target-like utterance. As a result, one hypothesis holds that learners with lower working memory capacities might benefit from recasts more than other feedback types because recasts contain the target-like form. Individual differences in proficiency, language awareness, and developmental readiness may be other intervening or moderator variables in how recasts benefit SLA. Attention is another ID that has been found to influence the process and outcome of interaction-based learning. Using increasingly sophisticated measures, such as eye tracking, studies have examined the extent to which attentional mechanisms predicted learning gains from interactional feedback. Findings have suggested a complex relationship between feedback, task type, language construct, and learners' attentional capacities.

The interaction approach provides a helpful framework for studying IDs because of its ability to operationalize both the interaction and developmental variables. For example, corrective feedback can be oral, written, direct, indirect, implicit, or explicit, and it can either contain an example of the target form or not. Likewise, output can be operationalized as being unmodified or modified in the direction of the target, target-like, and so on. Finally, language development can be operationalized linguistically, as in more target-like use, or done in a way that considers a more advanced production of the variables of interest. Hundreds of studies and an increasing number of meta-analyses and syntheses (e.g., Mackey & Goo, 2007) have found connections between various types of interaction and learning. The interaction approach allows us, and indeed requires us, to ask questions like how or to what extent as opposed to whether interaction affects learning, and IDs form an important part of this research agenda. If L2 learners do not benefit from interaction when we expect them to, and vice versa, IDs are likely to be explanatory. This has led to a fruitful line of work at the intersection of ID research and interaction research and contributed to theoretical and methodological developments in operationalizing and measuring IDs. Studies have begun to see motivation and anxiety as dynamic constructs fluctuating moment by moment depending on what is being said and with whom learners are interacting. To reflect this reconceptualization, a classroom-based study may use an uptake chart in which learners are periodically asked to report their anxiety level by labeling the image of a thermometer and their motivation level by circling a thumbs up or thumbs down image (Mackey, 2020). Looking forward, it is paramount for interaction research to continue developing reliable and valid measurement tools so that we can capture the complexity and dynamicity of IDs and their impact on interaction-driven learning.

Theory: The Cognition Hypothesis

Author: Peter Robinson

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Major Tenets of the Theory

The Cognition Hypothesis claims that pedagogic tasks should be sequenced from simple to complex (in instructional settings and syllabuses) in terms of their attentional, memory, reasoning, and other intrinsic cognitive resource demands, and that such sequencing will promote the development of the language needed to accomplish tasks, as well as the ability to successfully perform real-world tasks that pedagogic tasks are based on, outside classrooms, or other settings for second language (L2) instruction (Robinson, 2015). The Cognition Hypothesis distinguishes between *resource-directing* dimensions of task complexity, in which the cognitive demands tasks make (such as understanding and explaining why an event or series of events caused another event to occur) also direct attention to aspects of the second language that can be used to perform them (e.g., causal connectors “because”, “therefore”, linking conjoined clauses), and *resource-dispersing* dimensions of task complexity which increase attentional and other cognitive demands, but without directing attentional or memory resources to any aspects of language that can be used to accomplish the task (such as taking away planning time).

There are five ancillary theoretical claims of the Cognition Hypothesis. The first concerns effects of task complexity on language production: 1) monologic tasks which are complex along resource-directing dimensions lead to greater accuracy and complexity of production, but less fluency than simpler tasks along those dimensions. Interactive tasks which are complex along resource-directing dimensions will lead to greater accuracy and less fluency than simpler counterpart versions of tasks. In contrast, along resource-dispersing dimensions of task complexity, complex versions of tasks will lead to lower accuracy, fluency, and complexity of language used relative to simpler versions. Other ancillary theoretical claims are that 2) complex versions of interactive L2 tasks, along any dimensions of task complexity, will lead to more interaction, negotiation of meaning, and language-related episodes (LREs) to resolve misunderstandings, 3) more uptake of corrective feedback provided proactively in the input or reactively during performance, 4) greater long-term retention and memory for input provided on cognitively complex, compared to simpler, versions of tasks, and 5) individual differences between learners in abilities, affective states, and dispositions will increasingly differentiate learning and performance on tasks as they increase in complexity.

The Triadic Componential Framework provides a taxonomy of task characteristics—that can be manipulated to increase task complexity along resource-directing and resource-dispersing dimensions of task demands—as a basis for designing and sequencing increasingly cognitively complex versions of pedagogic tasks for learners. The *SSARC model* provides a stepwise guide for how to progressively increase the complexity of pedagogic versions of tasks, by first having versions simple on both resource-directing and resource-dispersing dimensions of task demands (SS, simple, stabilize), then second increasing the complexity of the resource-dispersing dimensions (A, automatize access to existing language knowledge), and finally increasing both the complexity of resource-directing and resource-dispersing dimensions (RC, restructure, complexify interlanguage resources). In this way, the full complexity of real-world tasks involving use and comprehension of the L2 can be gradually approximated via a sequence of increasingly cognitively complex pedagogic task versions.

The Role of Individual Difference Factors in the Theory

The Triadic Componential Framework also distinguishes *Task Complexity* (the cognitive demands of tasks just referred to) from *Task Conditions*, which is the interactive participation and participant factors involved in task performance, and *Task Difficulty*, which refers to learners’ perceptions of task demands which will be affected by individual differences between learners in the cognitive abilities

and affective dispositions and traits learners bring to task performance. Task complexity will help explain *within-learner* variance in the extent to which any one person is able to perform two tasks making greater versus lesser cognitive demands (any one person should always find it harder to accomplish, and be less successful at, tasks high in, for example, causal reasoning demands compared to tasks low in, or with no, causal reasoning demands). Task difficulty will help explain *between-learner* variance in the extent to which any two people differing, for example, in their causal reasoning ability will be able to be successful on, and meet the cognitive demands of, any one complex version of a second language pedagogic task that requires causal reasoning ability (such as explaining how multiple factors led to changes in a person's medical condition). So a learner high in causal reasoning ability will find the complex version of a task in the L2 requiring that ability to be less difficult than a learner low in reasoning ability, and so will likely be more successful in performing it.

Task characteristics contributing to their complexity will be differentially related to some ability variables but not others. For example, along a resource-directing dimension of complexity, here-and-now/there-and-then, tasks requiring a series of events that happened sometime in the past, elsewhere (there-and-then) to be described can be expected to draw on working memory abilities much more than tasks requiring a description of events occurring now in a shared setting (here-and-now). Abilities and affective dispositions will therefore interact in specific ways with the specific cognitive demands of tasks to affect the accuracy, fluency, and complexity of language produced, and success in performing the L2 task (Robinson, 2015).

Individual differences between learners in their abilities and affective factors contributing to perceptions of task difficulty will have their greatest effects on L2 learning and performance on cognitively complex versions of tasks. For this reason, it will be important to profile learners' abilities and assess affective dispositions and tendencies, so as to match their "task aptitudes" to more complex versions of tasks having characteristics, described in the triadic componential framework, that draw on the sets of abilities they are high in, thereby helping ensure sequences of those tasks lead to success and optimal opportunities for language use and development. Alternatively, where learners must perform a sequence of tasks having certain characteristics (e.g., + spatial reasoning) that draw on abilities they are low in, then extra practice and compensatory support for performance can be provided.

Theory: Input Processing

Author: Bill VanPatten

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Major Tenets of the Theory

Input Processing (IP) is concerned with the moment-by-moment computation of sentence structure during comprehension along with the connection between form and meaning. It is one part of the complex series of processes involved in acquisition. Central to the theory is that learners come to the task of acquisition with certain universal strategies or heuristics for processing (see, e.g., VanPatten, 2020). Because the acquisition of the formal features of language is not instantaneous, input processing is implicated in the kind of data delivered to the internal mechanisms responsible for the evolution of the learner's linguistic system over time. In other words, the learner's internal mechanisms (e.g., Universal Grammar, and general learning architecture) do not operate on the input the learner encounters in the environment but on whatever data the input processing strategies let in.

Input processing involves unconscious processes and is not equivalent to or related to the construct of noticing as normally described in the research (e.g., VanPatten, 2015). Finally, the strategies and heuristics of input processing do not search for “rules” or traditionally defined elements of language; instead, bits and pieces of data as meaning are constructed in real time (VanPatten & Rothman, 2014).

The Role of Individual Difference Factors in the Theory

Due to the unconscious nature of IP, individual differences as traditionally conceived (e.g., language aptitude, working memory, motivation—in all of its instantiations) play little to no role in how learners compute sentence structure or make form–meaning connections. These factors exist external to those parts of acquisition that are purely linguistic or psycholinguistic (e.g., IP, universal grammar, and markedness) and do not alter or attenuate processing strategies. They may affect explicit learning and/or some kind of explicit processing, and in some cases may affect access to and engagement with communicatively embedded input, but again, given that input processing is unconscious, such IDs do not bear upon its role in acquisition. (For further discussions, see VanPatten & Rothman, 2015.)

Theory: Processability Theory

Author: Manfred Pienemann

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Major Tenets of the Theory

Processability Theory (PT) is a formal psycholinguistic framework that models the dynamics of second language acquisition within a two-dimensional coordinate system. Every point in the dynamic coordinate system can be formally accounted for using lexical-functional grammar. The developmental dimension of the system accounts for L2 development and the range of linguistic options available to the learner at every stage. The horizontal dimension accounts for inter-individual differences in the developing linguistic system based on the constrained range of different structural choices. The specific linguistic choices made by the individual learner have been demonstrated to have repercussions for each individual developmental trajectory, including a complete and premature halt in development.

The constraints on the structural options available to the learner are explained by a psycholinguistic theory of processability that has recently been implemented in an artificial intelligence system (cf. Pienemann & Lenzing, 2020).

The Role of Individual Difference Factors in the Theory

The key “individual difference factor” inherent in PT is the dynamics of the acquisition process. Individual learners make specific structural choices at every step of language acquisition—within the range defined by processing constraints placed on the developing system. Every structural choice made by a given learner adds to the specific linguistic system developed by her or him and determines future structural choices that may be opened up or closed, depending on the interplay of the specific variational and developmental structures the learner opted for throughout the dynamic developmental process. Some structural choices made by the learner (such as no copula in equational sentences) foreclose further development in some areas (such as subject–verb inversion).

When a learner accumulates these “bad” choices, his or her L2 linguistic system will not be able to develop further. The specific point in time when this happens depends on the exact structural choices made by that learner. This effect of structural choices determines inter-learner variability in the shape of the interlanguage and in ultimate attainment.

The contribution made by PT to ID does not—at this point in time—focus on cognitive, conative, affective, or sociocultural variables. This does not in the least imply that the role of these variables in ID is denied. Instead, PT has—until now—pursued a research strategy with a focus on the dynamics of the developing linguistic system. Therefore, PT has not yet addressed the question of what determines the linguistic choices learners make. The determining factors may well be cognitive, conative, affective, or sociocultural in nature. However, the work presented within the PT framework demonstrates that individual differences in SLA in terms of inter-learner variability and ultimate attainment are constrained by the dynamics of the acquisition process. Therefore, the PT position implies that a full account of ID needs to explicate the role of cognitive, conative, affective, or sociocultural factors in the context of the formally modeled structural constraints imposed on learner variation.

Theory: Usage-Based Approaches

Author: Stefanie Wulff

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Major Tenets of the Theory

“Usage-based” is an umbrella term for a number of approaches that share specific working assumptions. Examples of usage-based approaches are usage-based construction grammar, complex dynamic systems theory, and the declarative-procedural model. While diverse in focus and scope, all these theories are united in their commitment to two working assumptions (see Ellis & Wulff, 2020:63):

- (1) Language learning is primarily (although not exclusively) based on learners’ exposure to their second language (L2) in use, that is, their communicative experience using the L2.
- (2) General cognitive mechanisms rather than language-specific language learning mechanisms are at work when learners induce the rules of their second language from this experience.

Our understanding of what exposure in fact entails has significantly expanded over time. A comprehensive definition is offered in the contemporary Complex Systems Theory, which defines language learning as “negotiat[ing] social and linguistic action in the face of minimal common ground and maximal semiotic demands” and thus as “situated and attentionally and socially gated” (The Douglas Fir Group, 2016, p.23). That is, usage events are always heavily context-specific, not only in the linguistic sense of context, but in the extra-linguistic sense of who is talking to whom in what kind of situation, what the state of the speakers’ cognitive apparatus is at the moment of speaking, and how the geo-political background as well as the larger societal implications of the speech setting impact the possible interpretations of what is being said.

Regarding the question of what we learn when we learn a language, usage-based approaches define language learning as the learning of constructions. Constructions are defined as pairings of form and meaning or function, and they range from simple morphemes, like *-ing*, to complex and abstract syntactic frames, such as subject-verb-object-object (as in *Shaofeng made Phil a sandwich*).

Regarding the question of how we learn a language, in keeping with the general commitment in (2) above, usage-based approaches assume that we recruit domain-general associative learning, rational cognitive processing, and exemplar-based learning mechanisms to learn from exposure:

- We learn to associate between forms and their meaning or function (i.e., constructions). The more reliable the association between a form and its meaning or function, the easier it is to learn. For example, the sound sequence /'sæn(d)wɪtʃ/ is reliably associated with a particular meaning (“slices of meat and/or cheese between two slices of bread”). The form *-ing*, in contrast, has different meanings/functions in different contexts, making it comparatively harder to learn.
- Language learning is rational such that a learner’s knowledge of a given form-meaning pair at any point in their language development is a reflection of how often and in what specific contexts the learner has encountered that form-meaning pair.
- The learner’s brain (implicitly) analyzes the exemplars of a given construction, taking various characteristics of the exemplar into consideration, including its frequency, dispersion, and salience. Also tallied are the contingencies of a construction: the other words, grammatical structures, and so on that a construction occurs with. In that sense, language learning is not only learning the association between a form and its meaning or function, but crucially, the sequencing and associations of forms with other forms.

The Role of Individual Difference Factors in the Theory

If we take the complex definition of usage above to heart, one conclusion is inevitable: it must be virtually impossible to find two second-language learners who are identical in terms of all of the factors characterizing their initial state, their language development over time, and their ultimate attainment. Rather than being an alternative hypothesis to be justified, the existence of individual differences must be considered the null hypothesis. As I see it, it is a strength of modern usage-based approaches to understand linguistic, cognitive, and environmental factors as jointly shaping language learning, thus giving rise to considerable variations in learning, from start to finish, between any two individuals. Ultimately, this invites a shift in the research agenda: away from trying to apply (mostly dichotomous) labels to learners, like “native speaker” versus “second language learner” or “monolingual” versus “bilingual”, which describe a majority of multilingual speakers insufficiently, inaccurately, or not at all (which has ramifications above and beyond language; see Ortega, 2019); towards analyses that describe individual learner development as one illustration of the continuous, gradient, and probabilistic phenomenon that multilingualism truly is.

A genuine commitment to the above definition also entails that usage-based linguists have their work cut out when it comes to shedding more light on how individual differences shape a language learner’s journey from the initial state all the way to ultimate attainment. A solid number of studies demonstrate that performance is variable within individuals, and from a dynamic system perspective, “some variability is an intrinsic and central property of a self-organizing, dynamic system” (Verspoor, Lowie, & van Dijk, 2008, p. 229); more usage-based research is needed that quantifies how much of that within-individual variability is, in fact, a side effect of a self-organizing system, and how much of it has to be accounted for by recourse to other factors such as individual differences. Likewise, more research is needed that examines how much between-individual variability in performance is due to cognitive and affective differences between individuals, alongside other factors (Pliatsikas et al., 2020).

ID Research

ID Research as Construct Validation

We argue that the primary objective of ID research is to collect evidence for construct validity. What is a construct? The term “construct” originated in psychological research, and it can be defined as

an ability, trait, disposition, or skill that is not directly observable, and that is represented by one's performance or behavior in a test or measurement task. In this conceptualization, a construct has the following characteristics. First, it is an underlying concept or characteristic that may refer to either 1) cognitive (e.g., language aptitude), affective (e.g., anxiety), and conative (e.g., motivation) traits, or 2) learning achievements (e.g., L2 grammar ability) (AERA et al., 2014). IDs refer to the former category of variables, which are predictive of learning outcomes. Second, a construct has multiple dimensions, for example in traditional conceptualization, language aptitude has three components/dimensions: phonetic coding, analytic ability, and associative memory. Motivation is conceived as consisting of ideal self, ought-to self, and learning experience in Dörnyei's (2005) model. Third, a construct is measurable, and each of the dimensions can be measured via multiple tests or test items. In ID research, constructs have been measured by using psychometric tests, such as tests of declarative and procedural memory, or instruments based on self-reports such as Likert scale questions in the Foreign Language Classroom Anxiety Scale, a measure of anxiety (MacIntyre & Wang, this volume), and the L2 Self scale, a measure of motivation (Papi & Hiver, this volume).

Constructs should be embedded in theories, and the theoretical framework for an ID construct should consist of an internal model and an external model. An internal model spells out the components or dimensions of the construct and their interrelationships, and an external model describes the variable's relationships with other individual difference variables and with learning outcomes. According to Cronbach and Meehl (1955), the external model constitutes a nomological network that consists of laws about relationships between a construct and other constructs. The validity of a construct refers to whether there is evidence for the theoretical claims and hypothesized relationships. In fact, "construct validity" has turned into an overarching, unifying term that refers to all kinds of evidence for the theoretical claims about a construct, including content validity, divergent/convergent validity, and predictive validity. To this repertoire, we add reliability, which is essential for test validity, given that for a test to be valid, it must be reliable in the first place. Construct validity is a concept about psychological assessments, but it fits well with the validity of ID constructs, which concerns whether the research findings based on the tests of a psychological construct support the theoretical conceptualization of the construct. Negative evidence for construct validity may indicate that the test does not measure the construct, the theory about the construct is inaccurate, or the methods of the research are flawed (Cohen & Swerdlik, 2018; Cronbach & Meehl, 1955). In the following sections, we discuss and illustrate the dimensions of construct validity with reference to ID research in SLA.

Originally a concept developed to refer to achievement tests, content validity refers to the extent to which test items represent the skills in the substantive domain, or whether tasks used in the test mirror those in the real world. Content validity has two aspects: relevance and scope, with the former referring to whether the measured content is relevant and the latter to whether all important content is covered in the test. For example, traditional language aptitude consists of three components: phonetic coding, analytic ability, and memory, which roughly correspond to pronunciation, grammar, and vocabulary, but the ability to learn pragmatics is not represented. Therefore, all existing components are relevant but not all relevant content is included. For an ID construct, content validity also concerns whether learners' behavior or the expected process accurately represents the hypothesized attributes of the underlying trait (Popham, 2000). For example, in a test of implicit aptitude, the researcher must ensure that learners are not aware of the process and outcome of learning during the test. Language aptitude is hypothesized to be a relatively stable trait; therefore, learners' aptitude scores should not change within a short period.

How can we ensure and evaluate content validity? Traditionally, content validity is vetted through expert judgments, that is, whether experts in the measured domain believe all important, relevant content is represented in the test (AERA et al., 2014; Cohen & Swerdlik, 2018). However, we would like to renovate and clarify the concept of content validity in several ways. First, expert judgment may be an initial step for content validity during the test development stage. However,

what constitutes expert judgment needs to be clarified. As far as ID constructs in SLA are concerned, expert judgments should be based on views, knowledge, and experiences of stakeholders, including teachers and school or program administrators, and can be extended to learners or even parents who may judge the relevance and coverage of the content from different angles. In this sense, experts should not be restricted to applied linguists who are familiar with the research on language learning, and they should be primarily veteran practitioners and stakeholders who are involved in the practice of language teaching and learning. For example, one way to validate the content of an anxiety scale is to consult teachers and learners who may contribute their “expertise” based on their observations and experiences (Horwitz et al., 1986). Second, for measures of certain ID factors, evidence must be collected for expected behaviors, for example the implicitness of the learning process during a test of implicit aptitude can be verified by asking learners to report whether they learned any rules (Rebuschat, 2013). Third, the content of a construct must be in line with the theoretical conceptualization. For example, based on the assumption that L2 learning occurs in three stages—input, processing, and output—MacIntyre and Gardner (1994) developed a scale that measures anxiety experienced by learners in those three learning stages. Of course, the alignment between tests and theories should be vetted by outsiders’ judgments in addition to the authors’, in which case it can be called face validity, meaning that a test “seems” to accord with the underlying concept. Fourth, given that it is impossible to be exhaustive or to include all content in a test, the key is representativeness, that is, the included content represents key components of the construct. Finally, content validity is not an isolated concept, and evidence for other aspects of the construct, such as the malleability of the trait (whether it is changeable) and convergent and divergent validity, also contribute to content validity. Therefore, while expert judgments and theoretical conceptualization constitute the initial strategies for content validity, empirical evidence may contribute to further adapting and fine-tuning of the content in later stages.

Convergent and divergent validity are a pair of concepts that are often discussed together because of their close connections. Convergent validity concerns whether measures of the same or similar constructs are correlated, and divergent validity refers to whether measures of different constructs are uncorrelated or even negatively correlated if there are theoretical grounds for such a prediction. Both types of validity can be approached in two ways: from an internal perspective and an external perspective. From an internal perspective, convergent validity suggests that the components of the same construct should be correlated; divergent validity means the different components should be distinct or dissociable (albeit correlated). From an external perspective, convergent validity requires evidence that (different) constructs that belong to the same paradigm, such as working memory and language aptitude, both of which are hypothesized to be cognitive abilities for conscious learning, should be correlated; divergent validity predicts that measures of constructs hypothesized to be different, such as explicit and implicit aptitude, should be uncorrelated. For example, L2 enjoyment, a new construct in ID research, seems similar to anxiety in the sense that more enjoyment means less anxiety, and it also feels similar to motivation on the grounds that enjoyment suggests a positive attitude toward the L2. These assumptions suggest a lack of divergent validity for the construct of L2 enjoyment, but there is evidence that it is separable from anxiety and motivation (Dewaele, this volume). Divergent and convergent validity have been investigated primarily by using factor analysis and structural equation modeling analysis (Hiver & Al-Hoorie, 2020a).

Predictive validity refers to how well the construct or test information predicts performance on a criterion measure of learning. Predictive validity is crucial for ID research because the significance of ID factors lies in their role in influencing L2 learning outcomes (Li & Zhao, 2021). The importance of predictive validity in ID research is exemplified by the fact that it has been equated with construct validity in validation research on language aptitude. Carroll and Sapon (2002), for example, only reported the correlations between aptitude and course grades as evidence for construct validity. Similarly, Linck et al. (2013) and Doughty (2019) only addressed predictive validity of the newly developed Hi-LAB without examining other types of validity. Here we identify two

polarized issues with predictive validity in ID research. One is insufficient attention to predictive validity in certain areas of research, such as motivation, where the research has primarily focused on content, divergent, and convergent validity rather than whether it is predictive of learning outcomes or behaviors. The other issue is excessive reliance on predictivity validity as evidence for construct validity, which is the case for aptitude research. We would like to argue that despite its importance in ID research, evidence for predictive validity is insufficient for construct validity. For example, as discussed in previous sections, traditional aptitude tests such as the MLAT and PLAB include measures of L1 vocabulary, and it is unclear what the measured abilities represent; therefore, significant correlations between learners' scores on vocabulary tests and learners' L2 achievements, if any, do not constitute robust evidence for construct validity.

Reliability refers to the consistency of learners' performance on a test. Reliability is of two types: internal reliability and test-retest reliability. Internal reliability concerns the consistency of learners' answers on different items of the test, and a common index of internal reliability is Cronbach's alpha, which refers to the average correlations between learners' answers to all questions of a test or scale. Test-retest reliability refers to the consistency between learners' performances on different administrations of the same test, and it can be indexed by simple correlations between the two sets of scores. While the threshold for acceptable reliability coefficient is 0.7, the criteria should be tailored for different ID constructs. For example, reliabilities for tests of implicit learning (0.4–0.6) are typically lower than tests of abilities or achievements in the explicit paradigm (normally > 0.7) (Li & Zhao, 2021). Reliability is a prerequisite for validity, which is why it is discussed as one dimension of construct validity.

Major Research Foci and Designs

Having established major dimensions of construct validity, in this section we discuss major foci or perspectives of ID research. The objective is to illustrate ways IDs have been and can be examined. In general, ID studies fall into four categories: examining the content and measurement of new constructs, IDs as dependent variables, relationships between ID variables, and the IDs' associations with learning outcomes. We discuss each category of research in the following sections.

The Content and Components of ID Constructs

This category subsumes the so-called validation studies seeking to validate measures of new ID constructs. The primary objective of the research is to 1) develop a new instrument, such as a survey scale or a test of a cognitive ability, adapt an existing instrument, or use an existing instrument with a new population, and 2) collect evidence for the validity of the tested construct. Typically, these studies are conducted at the initial stage of a substantive domain where a new or renovated construct is proposed and measures need to be developed and validated. An ideal validation study would show evidence for all kinds of validity—content, convergent, divergent, and predictive validity as well as reliability. However, given that it may not be feasible to conduct a study that is all inclusive, research that examines all kinds of validity is uncommon. In SLA, validation studies vary considerably in terms of what types of evidence are collected. Some studies, especially those on conative and affective variables, focused on the internal structure of a construct (Papi et al., 2019)—convergent and divergent validity from an internal perspective; others, especially studies on cognitive variables, focus on predictive validity—and whether learners' cognitive abilities are predictive of L2 proficiency (Doughty, 2019; Kiss & Nikolov, 2005; Linck et al., 2013). Still others, especially recent ID research (Li & Qian, 2021; Sudina et al., 2021) reported evidence for multiple types of validity. Cortina et al. (2020) created a checklist of principles for psychometric soundness in psychological research, which are divided into five steps: construct definition, content validation/item generation, initial scale evaluation (e.g., exploratory factor analysis), validation (e.g.,

confirmatory factor analysis and convergent/divergent validity), and replication. They pointed out that the steps were not strictly adhered to in psychological research, and they highlighted the need to replace Cronbach's alpha (α) with omega (ω) as a measure of internal reliability for the sake of psychometric soundness. It is our hope that SLA studies also follow expert advice and best practices when validating ID constructs.

IDs as Dependent Variables

In these studies, IDs are outcome or criterion variables that react to other (independent) variables. Example research questions include: Does language aptitude change or vary as a function of age, gender, and learning experience? Do high school and university language learners have different amounts or types of motivation? What factors are responsible for the variation of learners' anxiety? Can training change learners' working memory? The studies that seek to answer these questions can be roughly divided into two categories: observational and experimental. In observational research, there is no manipulation of variables, and the purpose is to describe how the amount and type of a certain ID trait vary in response to other variables rather than examine causal relationships. For example, Dewaele (this volume) reported that learners' L2 enjoyment is predicted by teacher friendliness, multilingualism, and teachers' use of the target language. Lee et al. (2018) conducted a large-scale survey study examining secondary school students' L2 writing motivation in terms of the amount of motivation and the variation of their motivation as a function of grade level (grades 7, 9, and 11) and gender. They reported a generally low level of writing motivation for the learners (mean < 3 out of 5), a declining trend in motivation with the increase in grade levels, and a larger amount of motivation for girls than boys. Experimental research investigates whether training/instructional treatments or manipulating a learning condition have an impact on a certain learner trait. For example, working memory has been found to be trainable, but the effects are restricted to the training tasks and not transferable to new tasks, nor to learning (Li, in press). MacIntyre and Gardner (1994) found that the introduction of a video camera in a learning task significantly increased learners' anxiety in the experimental groups in comparison with the control group who performed the same learning task without a video camera. In general, affective and conative variables such as motivation (Le-Thi et al., 2020), anxiety (Kralova et al., 2017), learner beliefs (Li, 2017b; Zhong, this volume), and mindset (Lou & Zarrinabadi, this volume) have been found to be subject to instructional treatments or external manipulation.

Relationships Between ID Variables

Research mapping the relationships between ID variables contributes evidence for the divergent and convergent validity of ID constructs. For example, aptitude and working memory have been found to be correlated and yet dissociable (Yalcin et al., 2016); aptitude is uncorrelated with motivation, negatively correlated with anxiety, and positively correlated with intelligence (Li, 2016). Different types of motivation have differential associations with anxiety; whereas ideal self decreases anxiety, ought-to self increases anxiety (Papi, 2010). This type of evidence contributes to the divergent and convergent validity of IDs but also to an accurate understanding of the mechanism through which different variables interact to affect learning outcomes. It is noteworthy that the relationships between ID variables are mostly examined as part of larger projects examining the predictive validity of clusters of ID variables, rather than as an exclusive focus.

IDs as Independent Variables

In general, the research on the predictive power of ID variables can be divided into two broad categories: correlational and experimental. The primary concern of correlational research is to explore whether ID factors are predictive of learning outcomes, regardless of instruction type and

learning context. This is a product-oriented approach where IDs are determinants of learning success, and there is no manipulation of instruction or learning conditions in correlational research. Experimental research is characterized by the manipulation of instruction type and learning tasks, and investigation of the interface between ID variables and the effectiveness of different types of instruction or different stages of learning under highly controlled learning conditions. For instance, Papi and Khajavy (2021) found that enjoyment results in eager L2 use, which in turn contributes to L2 achievement whereas anxiety leads to vigilant L2 use, which in turn negatively predicts L2 achievement. Experimental research is process-oriented and is more revealing of the mechanism of language learning (DeKeyser, 2012; Robinson, 2002). Major treatment types investigated in ID research include corrective feedback (explicit vs. implicit feedback) (Li, 2013), incidental learning (Morgan-Short et al., 2014), spacing of practice (massed vs. spaced) (Suzuki & DeKeyser, 2017), task complexity (simple vs. complex) (Kourтали & Révész, 2020), and deductive and inductive instruction (Erlam, 2005).

For both correlational and experimental research, it is important to examine how ID variables jointly and uniquely contribute to learning outcomes. For example, given that aptitude is uncorrelated with motivation (Li, 2016), these two ID factors may explain a unique, rather than overlapping, portion of variance in L2 proficiency. Anxiety, however, is negatively correlated with aptitude, and it is therefore necessary to ascertain whether they explain a common portion of the variance of L2 proficiency and whether they make an independent contribution to L2 proficiency over and beyond the variance explained by the other variable. Different ID variables may also relate to different aspects of learning, for example Smemoe and Haslam (2013) reported that accuracy of pronunciation was predicted by aptitude and comprehensibility by learning strategies.

Current Trends and Issues

In this section, we identify current trends and directions of ID research, seeking to provide a bird's eye view of the status quo and pressing issues to be addressed. To start with, while early ID research takes a coarse-grained approach looking at the big picture, more recent research suggests the potential and fruitfulness of adopting a more nuanced approach. We discuss a nuanced approach from the following dimensions.

A Domain-Specific Approach

ID constructs are componential, and so is learning. Therefore, instead of investigating the relationships between IDs and learning as global constructs, we need to go beyond the general picture and take a microscopic look at the nuances and subtleties of aspects of ID factors and aspects of the learning process and outcomes. In aptitude research, for example, Saito et al. (2019) have initiated a stream of research exploring pronunciation learning abilities and pronunciation learning. Within pronunciation aptitude, they distinguished abilities for explicit and implicit pronunciation learning, and within each type of pronunciation aptitude, a further distinction was made between abilities for segmental (individual sounds) and suprasegmental (rhythm, pitch, stress, etc.) features. In anxiety research, one current trend is the emergence of anxiety for specific learning skills, such as listening anxiety, writing anxiety, reading anxiety, and speaking anxiety (Cheng, 2017). A similar trend has been observed in motivation research (Papi & Hiver, this volume). A domain-specific approach requires the researcher to clarify whether language learning is something special and requires language-specific conceptualization and measurement of the ID construct in question. Of relevance are concepts and measures that are imported from psychological research such as implicit language aptitude (Li & DeKeyser, in press), a newly emerged ID construct in SLA. In the current research, implicit aptitude is measured via domain-general tasks, such as sequence learning, that

are seemingly unrelated to language learning. Some researchers (Morgan-Short et al., this volume) argue that implicit learning is domain-general and that the underlying abilities are applicable across all kinds of skill learning, not just language learning. However, more research is warranted to verify this claim.

An Interactional Approach

In this approach, the relationship between ID variables and learning outcomes depends on learner-related and environmental factors, including, but not limited to, age (e.g., children vs. adults), gender, learning stage (e.g., early vs. advanced), instruction type (e.g., inductive vs. deductive), learning context (e.g., instructed vs. naturalistic), and so on (DeKeyser, 2012; Li, 2017a). This approach applies to both correlational research where variables are not manipulated and experimental research where variables are highly controlled and where the impact of confounding variables is minimized. The approach is not restricted to research investigating the IDs' interaction with instructional treatments, which is often called aptitude-treatment-interaction (ATI) research, where aptitude refers to any ID variable, including learners' previous knowledge, that contributes to learners' initial preparedness for a certain instruction type or learning condition (Snow, 1991). To exemplify an interactional approach, Granena (2013) found that implicit language aptitude is only predictive of the learning of agreement structures such as subject-verb agreement but not structures involving form-meaning mapping. Working memory is only correlated with the effects of explicit instruction not implicit instruction (Li, 2017a). Under explicit learning conditions, working memory has a positive correlation with the learning of a simple structure but a negative correlation with a complex structure (Li, 2013). Declarative memory is implicated in initial learning and procedural memory in advanced learning (Morgan-Short et al., this volume). Anxiety has a negative effect on vocabulary learning under explicit learning conditions but a somewhat positive effect in incidental learning conditions (Kim & Webb, this volume).

Indirect Effects of IDs

ID variables may have a direct and/or indirect effect on learning outcomes, and IDs' indirect effects can occur in two ways. First, an ID may not have a direct influence on the outcome, but it may contribute to learning outcomes via a *process* feature such as engagement, noticing, language-related episodes (LREs), etc. Of course, whether and in what way a process feature is associated with learning outcomes is another question. For example, noticing may not have short-term effects on learning gains but it may have long-term effects. According to usage-based approaches to SLA and Interaction Hypothesis, noticing may facilitate learning by registering linguistic input, which, once detected, will be processed implicitly through subsequent input- and output-based practice. To date, willingness to communicate has not been found to directly predict learning outcomes (Joe et al., 2017), but it contributes to more engagement in classroom interaction and more L2 production, which may in turn contribute to ultimate learning success. Whereas ideal L2 self has been found to lead to eager use of the target language, which in turn contributes to L2 achievement, ought L2 selves result in vigilance in L2 use, which negatively affects L2 achievement (Papi & Khajavy, 2021). Working memory was found to have a direct effect on grammar learning by helping learners understand and remember grammar rules, and an indirect effect through contributing to vocabulary learning (Martin & Ellis, 2012). Another way an ID variable indirectly influences learning gains is by influencing another ID variable that may contribute to learning gains. For example, Eysenck et al. (2007) hypothesized that anxiety affects learning outcomes by disrupting the executive functions of working memory. Therefore, in a predictive model that includes both anxiety and working memory, it can be hypothesized that anxiety negatively impacts working memory, which in turn positively predicts learning outcomes. In addition to an indirect effect,

anxiety may have a direct effect on L2 development, as found in L2 research (MacIntyre & Wang, this volume). The direct and indirect effects of ID variables can be examined through path analysis.

A Complex/Dynamic Systems Approach

Several chapters in this volume mention this approach as a new way to examine IDs (Griffith, 2022; Gurzynski-Weiss, 2022; Peng, 2022; Wen & Jackson, 2022), and a chapter in the methods section of this volume is devoted exclusively to the methods of this newly emerged approach in ID and SLA research (Hiver, this volume). In this approach, the role of IDs varies at different time points of the learning process, and IDs interact with other factors in a complex, ever-changing system in affecting L2 learning. In just over a decade, this type of ID in SLA research has yielded many valuable insights (Larsen-Freeman, 2017). Some scholars have called for caution in applying systems approaches to the study of human and social phenomena such as learning and learners. However, because it allows researchers to ask entirely new questions and study familiar things in new ways, it continues to gain traction in ID research (e.g., Pinner & Sampson, 2021). Perhaps just as important is the fact that such approaches are equally prominent in more mainstream psychological (Molenaar & Campbell, 2009) and educational research (Koopmans, 2020) fields. Though these fields have traditionally been thought of as parent fields providing guidance for our own, by taking up this somewhat novel approach in ID research, our field is beginning to work on an equal footing with these fields and independently surpass advances in those fields.

IDs in the Digital Age

The advent of the digital age requires researchers to consider the relevance of ID factors in the learning that occurs in this new environment. Learning in a digital setting (abbreviated as “digital learning”) involves mechanisms that are different from classroom learning, and the roles of ID factors are likely also different. Digital learning is characterized by an abundance of authentic audio and visual input materials and opportunities for real-world communication with other learners and native speakers. Classroom learning is more form-oriented and controlled, and the amount of input materials and output practice is smaller and less authentic. Some ID variables, such as anxiety and working memory, are more relevant to classroom learning while learners engage in online information processing under time pressure. These variables are less important in digital learning where learners are more likely involved in offline learning activities that learners complete at their own pace. Classroom learning is more explicit and therefore it is more likely to involve cognitive factors in the explicit paradigm such as explicit aptitude, which consists of memory, phonetic coding, and analytic ability. Conversely, digital learning is more facilitative of incidental and implicit learning, and naturally implicit language aptitude—the ability to learn the probabilistic relationships between linguistic units via exposure to a large amount of input—is more important in this setting. Also, in digital learning, learners have more agency, which may increase learner autonomy, motivation, and enjoyment. Certainly, these are just theoretical assumptions, and they need empirical verification. There has been initial evidence for the different roles of ID factors in digital learning, but the interest in this cutting-edge topic is insufficient or disproportionate to the presence and significance of digital learning in the current world. To exemplify the fruitfulness of this line of research, Peng (this volume) reported that while willingness to communicate is affected by anxiety in instructed settings, it is not in online games and social media such as Facebook, and that digital games reduce learners’ anxiety and increase their self-efficacy. Kim and Webb (this volume) reported research showing that the amount of input learners receive outside of the classroom had a greater effect on vocabulary learning than the length of L2 instruction. However, as the authors noted, there is no research comparing the roles of IDs in the two settings in vocabulary learning.

Next, we would like to identify some issues to be addressed and some gaps to be filled. To start with, although the importance of theories has been recognized in certain research areas, in general, ID research needs more theoretical guidance. For example, no theories make overt claims about the role of IDs in L2 pronunciation (Nagle, this volume). In a similar vein, the research on learning strategies and styles lacks robust theoretical guidance and, with respect to styles, may even run counter to mainstream theorizing regarding the very circumscribed role they play in learner variation, which is reflected in the inconsistent methods and the often conflicting results that are hard to interpret (Griffiths, this volume). Second, there is a lack of research on IDs in certain learning domains, such as listening, pragmatics, vocabulary, and writing (see relevant chapters in this volume). Within certain substantive domains, there is an imbalanced distribution of research between research foci, for example aptitude research has primarily focused on grammar, and there is little research on vocabulary and writing (Li, 2016). In the limited research on listening, most studies investigated strategies, and little research has been conducted on other ID variables. Third, more research is needed for the predictive power of certain ID variables. For example, the study of willingness to communicate has been primarily restricted to factors influencing willingness to communicate, not how it affects learning (Peng, this volume). The same is true of motivation research, where researchers need to investigate not only the content of motivation and strategies to boost motivation but also the effects motivation may have on learning processes and outcomes (Papi & Hiver, this volume). As we argued in previous sections, if an ID variable has little or no impact, be it direct or indirect, on learning outcomes, it is probably not worth prioritizing on researchers' agenda. Fourth, more diversified, innovative data elicitation methods and instruments are needed. For example, affective and conative factors are typically measured by using closed-ended Likert scale questionnaires (Csizér & Simon, this volume). Ethnographic methods, such as interviews, diaries, observations, etc., could be incorporated to provide another perspective, identify the rationale behind learners' responses to survey items, and collect data that are unobtainable through quantitative methods (De Costa et al., this volume; Gao, this volume). Ethnographic methods can also be used to establish content validity and generate initial test/scale items by means of exploring what is relevant to the variable in question. Also, in addition to self-reports, more objective measures such as psychometric tests can be used to measure conative and affective variables, for example the Implicit Association Test (IAT), which is based on reaction time, has been used to measure implicit attitude (Al-Hoorie, this volume). Alternatively, and in addition to psychometric measures, neurological methods can be used to capture learners' neurological responses when engaged in cognitive tests and learning tasks (Morgan-Short et al., this volume), and eye tracking can be used to record learners' psychological processes (Conklin & Pellicer-Sánchez, this volume).

Finally, measures of ID variables must be validated. When investigating an ID construct, the concept must be defined, the content clearly specified and theoretically and empirically justified, psychometric soundness achieved, and evidence collected for convergent, divergent, and predictive validity. Even for existing measures that have been previously validated, it is still necessary to ensure that psychometric soundness is achieved because the psychometric properties of a test or scale may change due to changes in the sample, setting, and other methodological aspects. The reporting practices of ID research also need improvement. For example, only half of the studies in pragmatics synthesized in Taguchi et al. (this volume) reported reliability and checked statistical assumptions. Griffiths (this volume) noted that effect sizes are rarely reported or consulted when interpreting the results in research on learning strategies and styles and that null hypothesis statistical testing (NHST) has been the primary method for discussing and making inferences about population effects. However, NHST based on p values has been criticized on a number of grounds. For example, p is sensitive to sample size: a large sample size may yield a significant p but a small effect, while a small sample may lead to a large effect but a non-significant p . For experimental research, which is typically based on small samples, significant p values are hard to come by,

although effect sizes (standardized mean differences or correlation coefficients) might be large. For correlational research, which is normally based on larger samples and which can easily generate significant results, even a weak correlation can be significant because of the large sample. Therefore, it is important to examine the strength of a correlation and magnitude of an effect, not simply the p or significance value.

This Volume

The handbook includes 32 chapters providing an extensive and in-depth discussion of all ID factors subjected to empirical research. We decided to compile a book on individual differences to bring to center stage this significant dimension of SLA; to present an overview of the theories, research, and practice pertaining to major ID factors and research areas; to provide guidance for ID research; to enhance readers' understanding of current ID research; and to identify issues, solutions, and future directions. We divide the book into seven sections. The first section consists of a foreword and an introduction chapter, the following five sections center on substantive domains, and the final section addresses research methods. Among the five sections on substantive topics, four concern cognitive, conative, affective, and sociocultural/demographic factors, and one addresses ID factors for aspects of L2 learning (grammar, vocabulary, etc.).

To achieve the objectives of the book, we invited leading researchers on each topic and requested that each chapter be prepared following the guidelines we created. In the author guidelines, we provided two templates, one for chapters on substantive topics and one for chapters on research methods. For the chapters on substantive topics—those in sections 2–6—we asked authors to follow this template: background, research, practical applications, and future directions. In the background section, the authors provide a summary of 1) the historical development of the research on the topic of the chapter, and 2) major theories guiding the research to be discussed in subsequent sections. The research section is divided into two subsections: evidence and data elicitation, with the former focusing on research findings and the latter on research methods. For evidence, authors spell out the key issues or research questions that have been investigated in the empirical research and summarize the findings of the research. For data elicitation, the authors synthesize the methodological aspects of the empirical research that has been conducted in this substantive domain. The research section is followed by practical applications, which refer to implications the research findings have for practitioners and policy makers. In the final section, “future directions”, the authors identify areas that need to be further investigated and explain how the research should be conducted. The chapters on ID methods follow a slightly different template: overview, technical features, contributions to ID research, and future directions. The overview section serves as an introduction to the “what” of the research method (or family of methodological tools) presented in the chapter. It provides an overview of the nature, purpose, and procedure of the method and a summary of what it has been used for in ID research in the field. In the following section, “technical features”, authors delve in-depth into the “how” of the research method (or family of methodological tools), providing a detailed description of the components of the method, steps, data elicitation tools, type of data captured, principles to follow to achieve rigor, potential issues, and strategies for avoiding or resolving the issues. In the following section, “contributions to ID research”, the authors discuss the contributions of this research method to individual differences research in the field. The overarching question to address here is “What has this research method taught the field about individual differences?” In the final section, “future directions”, the authors discuss the potential of the research method (or family of methodological tools) for continued ID research in the field and examine fruitful areas for future ID research using this method.

We believe the volume will make a significant contribution to ID and SLA research. The book has the following features:

- *Comprehensive coverage.* The book extends the scope of individual differences beyond the traditional repertoire and includes other important variables such as working memory, declarative/procedural memory, age, identity, willingness to communicate, and so on. Thus, in terms of the coverage of topics, the book is the most comprehensive of its kind compared with other volumes that only include a few “classical” ID variables such as motivation, aptitude, learning styles, and learning strategies. In addition to including chapters on each ID factor, the book takes the outcome variable as the starting point and includes chapters on ID factors related to the learning of different aspects of the L2 system, such as IDs for pronunciation, vocabulary, grammar, and pragmatics, as well as different skills—listening, speaking, reading, and writing.
- *Authoritative voice.* The authors are experts in their respective areas who know the field inside and out, which is an advantage over volumes by one or two authors who may lack the breadth and depth of researchers in specific domains. For each chapter, the authors discuss the theory, research, and pedagogy of the related individual difference variables and identify future directions. Each chapter is a venue where the reader can access knowledge about all aspects of the topic.
- *Expert guidance.* Each ID chapter includes a section on data elicitation where the authors summarize and critique the research methods that have been utilized in the research on the topic, so the reader can 1) evaluate the validity of existing research, and 2) make informed decisions on what methods to use in their own research. The sections for substantive chapters are followed by a section on the common methods used in individual difference research including data elicitation instruments such as surveys, narratives, and psychometric testing, as well as methods of data analysis such as structural equation modeling. Both quantitative and qualitative methods are included in the research methods section.
- *Multiple perspectives.* Authors are required to include all streams of research and present all stances, perspectives, and approaches. The multiplicity represented in the book is an accurate manifestation of individual difference research in SLA, where one variable or construct can be approached and investigated from different angles using different methods. In this respect, it stands in contrast to the limitations of a single voice.
- *Cutting-edge research.* The authors are required to synthesize the latest research findings and the latest methods that have been used in each substantive domain, such as the Hi-LAB as a measure of language aptitude (Linck et al., 2013) and the 2×2 Ideal and Ought-to Self questionnaire as a measure of motivation (Papi et al., 2019). The volume also introduces new theoretical perspectives such as the Complexity Theory as well as its related research methods (Hiver & Al-Hoorie, 2020b). New variables that have been recently introduced into the field, such as mindset, metacognition, and positive psychology (L2 enjoyment), are also included.
- *Unbiased conclusions.* The authors take a neutral position and show what has been demonstrated by research rather than impose a priori assumptions and arbitrary interpretations on empirical evidence. As much as possible, the authors base their conclusions and claims on the findings of meta-analyses or other forms of research synthesis, which rest on the totality of the research instead of selected studies based on unknown criteria; syntheses based on a biased selection of literature may lead to an incomplete and partial understanding of the research.

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