Annual Review of Applied Linguistics (2001) **21**, 90 111. Printed in the USA.
Copyright © 2001 Cambridge University Press 0267-1905/01 $9.50

6. APTITUDE FOR LEARNING A FOREIGN LANGUAGE

Richard Sparks and Leonore Ganschow

What has happened with the construct of foreign language aptitude since 1990, at which time symposium participants from around the world agreed that the &time has come to rethink the notion of what constitutes aptitude to learn foreign languages? To answer this question, we begin with a review of studies on foreign language aptitude and its measurement prior to 1990. We then describe research and thinking in the 1990s in several areas, including affective variables; language learning strategies; learning styles as contributors to aptitude; and aptitude as a cognitive construct affected by language variables. Next, we review research on individual differences in language learners and the importance of phonological/orthographic processing for foreign language learning. Finally, we suggest new directions for research in foreign language aptitude.

In 1990, 65 international experts on foreign language (FL) instruction from across the world reached agreement that &the time has come to rethink the whole notion of what constitutes aptitude to learn FL s (Parry & Stansfield, 1990, p. 2). In this chapter, we first review studies up to 1990 and then describe research and thinking in the 1990s. In particular, we pay attention to topics such as FL aptitude tests, affective variables as contributors to aptitude, language learning strategies as contributors to aptitude, and the linguistic coding differences hypothesis (LCDH) as a plausible construct for the study of FL aptitude. In the last section, FL Aptitude Reconsidered, we summarize our findings on recent changes in thinking on FL aptitude and suggest directions for future research.

FL Aptitude Up to 1990

Foreign language (FL) aptitude has been of interest to FL researchers in the U.S. since the 1920s. Spolsky (1995) reports that the initial interest in

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

language aptitude came from colleges and universities. However, the major developments in FL aptitude testing in the 1960s were the results of initiatives by the government.

The first attempts to develop FL aptitude tests occurred in the late 1920s and 1930s when language specialists constructed prognosis tests. These tests were developed to determine both how well one might perform in FL learning situations and also who might not benefit from FL instruction. Stoddard and Vander Beke s (1925) test included subtests involving English grammar and Esperanto words. A group at George Washington University developed a test that involved learning elements of an artificial language (Hunt et al., 1929). Luria and Orleans (1928) developed a test that included vocabulary exercises and grammar translations in Spanish and French. Symonds (1930a, b), who also developed a test for FL prognosis, suggested that three types of aptitude were important: ability in the student s native language, general intelligence, and quick learning tests in the new language. His test was useful for predicting performance in French high school classes (e.g., see Michel, 1934, 1936). However, Kaulfers (1931) reported that IQ scores or English grades were better predictors of FL performance than were the prognosis tests. He suggested that prognosis tests were actually weighted intelligence tests. Kaulfers (1939) also suggested that the effectiveness of aptitude tests for FL learning was dependent on the instructional situation.

During World War II, admission to intensive language training courses in the military was based primarily on previous education (Spolsky, 1995). As language training increased in the military, the U.S. Army funded a study of FL aptitude led by Dorcus, et al. (1953) at UCLA. The group developed a paper and pencil test measuring ten major aptitude skills. However, the results of the project were disappointing and did not improve upon the predictive power of earlier prognosis tests.

In the 1960s, John Carroll conducted studies on FL aptitude and based his investigation on two propositions: facility to learn to speak a FL is a specialized talent, or group of talents, independent of intelligence; and strong FL aptitude is rare in the general population (1962). He noted that general intelligence tests had been relatively unsuccessful in screening individuals who were successful in language training. Through factor analytic studies, Carroll found that four independent variables proved most relevant to FL learning: (a) phonetic coding, or the ability to code and remember auditory phonetic material over time; (b) grammatical sensitivity, or the ability to handle grammar; (c) inductive language learning ability, or the ability to infer linguistic forms, rules, and patterns from new linguistic content; and (d) rote memory, or the capacity to learn phonetic and grammatical associations (Carroll, 1962, 1981, 1985). Based on his model of FL aptitude Carroll, in conjunction with Stanley Sapon, published the *Modern Language Aptitude Test* (*MLAT*) (Carroll & Sapon, 1959). The *MLAT* measures FL aptitude using a simulated format (i.e., a fake FL) and English grammar to provide an indication of one s probable degree of success in learning a FL. In the

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

1960s, Paul Pimsleur also developed a measure of FL aptitude, the *Language Aptitude Battery* (*LAB*) (Pimsleur, 1966). The *LAB* consists of a Verbal Ability score (tests of Vocabulary and Language Analysis) and an Auditory Ability score (tests of Sound Discrimination and Sound-Symbol Association). A FL aptitude measure similar to the *MLAT*, the *Defense Language Aptitude Battery* (*DLAB*) (Petersen & Al-Haik, 1976), is used by the Defense Language Institute (see Lett & O Mara, 1990).

Carroll (1963, 1973) also hypothesized a model of FL school learning that incorporated the variables in the *MLAT* found to be predictive of successful FL learning. The Carroll Model of School Learning includes two primary components: *instruction* and *individual learning differences*. The instruction component is influenced by: (a) time devoted to FL study; and (b) quality of instruction. The individual differences component comprises the following: (a) general intelligence, or ability to profit from general instruction; (b) language aptitude, or the skills assessed by the *MLAT*; and (c) motivation to study and learn the FL. Drawing upon Carroll s model, Wesche (1981) and Skehan (1986a) noted that more successful FL learning occurred when findings from FL aptitude tests (e.g., language strengths and weaknesses, individual differences) corresponded with teaching methods.[1] Skehan (1986b) concluded that Carroll s model is applicable to both formal (i.e., school learning) and informal (e.g., immersion) language learning situations.

According to Spolsky (1995), Carroll s work in FL aptitude and the development of the *MLAT* added three vitally important dimensions to the study of FL aptitude. First, Carroll developed a test that measured, as well as anything can, some of the components of individual variation in ability to learn to speak a FL (p. 338). Second, Carroll developed a model of FL aptitude that showed how measurable abilities interact with goals and methods (p. 338). Third, his model made the whole issue [of FL aptitude] clearer, by showing that aptitude was only one of the factors involved (p. 338) in a general theory of FL learning.

In the late 1960s and 1970s, FL educators began to focus on the role that affective variables might play in successful FL learning. Gardner (1990) defines affective variables as & those motivational or predispositional characteristics of individuals that influence their perceptions and impressions of the language learning context (p. 179). Examples of frequently investigated affective variables are attitude and motivation (Gardner, 1985; Gardner & Lambert, 1972), anxiety (Horwitz, Horwitz, & Cope, 1986), and personality (Brown, 1973; Ehrman, 1990).

In the 1970s and 1980s, Gardner and his colleagues conducted studies to analyze the effects of attitude and motivation on FL learning. Their studies showed that high motivation and positive attitudes correlated positively with strong FL achievement. (See Gardner, 1990, for a related review.) They suggested that attitudes and motivation are relatively independent of FL aptitude and speculated further that attitude and motivation are comprised of three

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

components: (a) motivation to learn the FL; (b) desired affiliation with the target language community; and (c) attitude toward the learning situation.

Others have speculated that high levels of anxiety can negatively affect the learning of a FL. Scovel (1978) reviewed studies on FL learning and anxiety and concluded that the relationship between the two was unclear. Horwitz, Horwitz, and Cope (1986) hypothesized that there is an anxiety specific to FL learning and developed a self-report measure, the Foreign Language Classroom Anxiety Scale, to measure the construct (see Horwitz, this volume). Gardner (1990) reviewed studies on anxiety and suggested that measures of anxiety involving the learning of a FL correlate negatively with measures of FL achievement (i.e., as FL achievement increases, anxiety decreases).[2]

Ehrman hypothesized that personality type is important for FL learning and used the *Myers-Briggs Type Indicator* (*MBTI*) in studies to determine its applicability (Ehrman & Oxford, 1989; Oxford & Ehrman, 1989). Qualitative findings of her research suggest that personality measures provide useful information about the compatibility of individual student s learning types with teaching styles and teaching methods; however, studies showed that personality instruments were not good predictors of FL learning success (Ehrman, 1990).

Some researchers have questioned the role of affective variables as a primary causal factor in FL learning. Oller (1981) speculated that the self-report instruments used to measure affective states may unintentionally be measuring language proficiency. Au (1988) criticized Gardner s theory on attitudes and motivation for its failure to establish a causal link between motivation and FL learning. Sparks and Ganschow criticized self-report instruments of FL anxiety because most of the items are also measuring receptive language, expressive language and verbal memory skills (Sparks & Ganschow, 1991), or reading skills (Sparks, Ganschow, & Javorsky, 2000).

In the 1980s, FL educators speculated that inefficient use of language learning strategies and a learner s cognitive style affected FL learning. Oxford (1990) detailed six categories of language learning strategies: metacognitive, cognitive, compensation, memory, affective, and social. She and other learning strategy researchers found that good language learners use more efficient strategies than poor FL learners and suggested that poor FL learners can be trained to use strategies to improve their learning (see, e.g., O Malley & Chamot, 1990; Oxford & Crookall, 1989). Oxford acknowledged that there is a lack of consensus among researchers about how to measure and use the aforementioned categories of learning strategies.

Some researchers have expressed caution about the role of cognitive style and learning strategies in FL learning. Tiedeman (1989) reviewed cognitive styles research and found that most measures of cognitive style are best interpreted as tests of ability, not as measures of preferences for information processing. Sparks

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

and Ganschow (1993a) suggested that linking inefficient use of language learning strategies to poor FL learning is problematic because it implies that students with FL learning problems are likely to be deficient in dealing with language tasks generally. Sparks (1995) reported that neither cognitive style nor learning strategies have been shown to be related specifically to the learning of language. Skehan (1991) reported that there is little or no evidence to suggest that strategies or style training improve FL learning.

Some researchers have suggested that native language (L1) skills impact upon FL learning (L2). Carroll (1973) hypothesized that FL aptitude is a residue of native (first) language learning. In a study of first language learning, Wells (1985) reported that there were wide individual differences in the speed at which individuals acquired their native language. In a follow-up investigation, Skehan (1986a) examined the relationship between language acquisition, language aptitude, and second language learning by administering measures of FL aptitude to the students from Wells' 1985 study who were now in secondary school. Results showed that their native language ability correlated highly with their skill in learning a FL. Findings also showed that FL aptitude tests (such as the *MLAT*) were good predictors of FL learning skill. Skehan suggested that aptitude tests were good predictors of FL learning because they: (a) tap relevant linguistic skills and knowledge; and (b) draw on skills in using decontextualized language.

Skehan (1986b) also supported Carroll's Model of School Learning. He argued that other approaches to language learning and language aptitude devoted "insufficient attention to individual differences between learners, in terms of their language aptitude, motivation, cognitive style, or learning strategies, emphasizing instead the common features of instructional conditions" (p. 188). He speculated that Carroll's model did not have an impact on other models of FL learning because of: (a) the appeal of newer models of acquisition-oriented (i.e., communicative) approaches to FL learning; (b) the model's "perceived irrelevance" for informal FL learning contexts; and (c) its perceived alliance with "unfashionable" approaches to FL instruction (e.g., direct instruction in the rule systems of the FL). He concluded that Carroll's model was still the "most viable framework" for studying individual differences in FL learning (Skehan, 1986b, p. 217).

FL Aptitude in the 1990s

Much of FL research in the 1990s to the present has focused on the concept of "individual differences" (Ehrman & Oxford, 1995). Two themes govern research and thinking about individual differences in relation to FL aptitude: (a) the continuation of consideration of aptitude as affected primarily by affective variables; and (b) the (re)consideration of aptitude as a cognitive construct, affected to a large extent by language variables, in particular, the individual's facility with language and his/her skill with the phonological/orthographic rule system of language. An assumption regarding the first theme is

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

that FL learners can modify some personality factors, such as motivation to learn the FL and/or anxiety about learning a FL, through external strategies devised by the student or instructor. Another assumption of the first theme is that FL teachers can improve FL students' learning through instruction in language learning strategies or by matching instruction in the FL with students' learning styles. An assumption regarding the second theme is that FL learners have innate differences in basic language abilities and that there are limitations in the extent to which specialized instruction in the FL will result in enhancing FL aptitude and FL learning. Here, we describe research on aptitude as it relates to each of these two themes.

Individual Differences: Personality Variables

Learning styles and strategies. A considerable body of research in the 1990s has continued to address styles of thinking and their influence on FL aptitude (Barnwell, 1992). Sternberg (1995) defined style as a "way of thinking" not an ability, but rather how we use the abilities we have. Oxford and Ehrman (1993) used the term "language learning styles" to describe the approaches students "are predominantly disposed to use in order to learn a new language" (p. 69). The instruments used to identify learning styles are primarily self-report measures and include inventories such as the National Association of Secondary Schools Principals' *Learning Style Profile* (*LSP*) (Keefe, et al., 1989), the *Myers-Briggs Type Indicator* (*MBTI*) (Myers & McCaulley, 1985), the *Type Differentiation Indicator* (*TDI*) (Saunders, 1989), and the *Strategy Inventory for Language Learning* (*SILL*) (Oxford, 1989). In general, research findings show positive but modestly significant correlations between these instruments and FL proficiency. (See Ehrman, 1996, for a summary of other studies related to language learning strategies.)

Anxiety. Of primary interest in research on anxiety and its relationship to FL achievement has been the question of the role anxiety plays in predicting achievement in FL classes (MacIntyre & Charos, 1996). Most studies have continued to use Horwitz's FL anxiety scale (Horwitz, Horwitz, & Cope, 1986). Gardner & MacIntyre (1993) reported that language anxiety is the best single correlate of FL achievement. Sparks and his colleagues (Sparks, Ganschow, Artzer, Siebenhar, & Plageman, 1997) found differences in anxiety between good and poor FL learners on end-of-year high school oral and written proficiency measures. Onwuegbuzie, Bailey, and Daley (1999) reported that several aspects of students' self-perception were predictors of FL anxiety: their expectation of overall achievement in FL courses, their perceived self-worth, and their perceived scholastic competence (p. 228).

A new question raised in the 1990s was whether anxiety is a cause or a consequence of FL achievement (Ganschow & Sparks, 1996; Sparks & Ganschow, 1991). Findings suggest that, to date, researchers have not factored out the role of basic language ability in studies involving FL anxiety (Ganschow & Sparks,

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

1996). Ganschow et al. (1994), for example, found that a large number of college FL learners reported having high anxiety (on the Horwitz anxiety scale); however, some indicated learning a FL was easy and others reported that it was quite difficult. The authors inferred that those students who reported having high anxiety and found learning a language very difficult may have had broad basic language learning difficulties. Some researchers have reported that FL anxiety interferes with language learning because it reduces the ability to concentrate on the target language and is likely to impede memory efficiency (MacIntyre & Gardner, 1991, 1994).

Motivation. Motivation and its effect on FL proficiency also has continued to generate much discussion in the 1990s. Gardner and Tremblay (1994) outlined how the *Attitude Motivation Test Battery* (Gardner, 1985) might be used to facilitate investigations on the role of motivation in FL learning. Tremblay and Gardner (1995) suggested that there might also be new indices of motivation such as goal specificity, persistence, and attention that are causally related to each other and also to measures of achievement in French. In their study, they found significant relationships among motivational constructs and FL achievement.

Individual Differences: Cognitive Aptitude Factors

FL aptitude. In 1990, John Carroll wrote the opening chapter of the Conference Proceedings on Aptitude Reconsidered. Here he again clarified the importance of cognitive abilities in FL aptitude and suggested that his test of FL aptitude, the *MLAT*, would likely continue to provide a good predictor of aptitude for learning a FL.[3] As noted earlier, this test measures an individual's facility with several aspects of the rule systems of language in a nonsense language format. Much of the research from the 1990s to the present has supported Carroll's claim. Studies on high school and college FL learners by Sparks, Ganschow, and colleagues have consistently shown that the *MLAT* is an important predictor of FL achievement after one and two years of study (Sparks, Ganschow, & Patton, 1995; Sparks, Ganschow, Patton, Artzer, et al., 1997). Several studies showed that good FL learners have significantly stronger FL aptitude on the *MLAT* than poor FL learners (Ganschow, Sparks, Javorsky, Pohlman, & Bishop-Marbury, 1991; Ganschow et al., 1994; Sparks & Ganschow, 1996; Sparks, Ganschow, Javorsky, Pohlman, & Patton, 1992a, b; Sparks, Ganschow, Fluharty, & Little, 1996). Other studies have shown that students who score higher on the *MLAT* achieve higher levels of oral and written FL proficiency after two years of FL study than students who obtain lower *MLAT* scores (Sparks, Ganschow, Artzer, Siebenhar & Plageman, 1998). Studies with adults at the Foreign Service Institute and other government agencies have indicated that the *MLAT* is the best of the available predictors of language learning success (Ehrman, 1998; Ehrman & Oxford, 1995).

In 1998, Child reported on a FL aptitude test he developed, the *VORD* (which means "word" in the artificial language he developed for the test). Using this test, Child and his colleagues identified "adult subjects with a talent for

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

acquiring languages that are markedly different syntactically from English (Parry & Child, 1990, pp. 30 31). In a study that involved use of the *VORD* and *MLAT* with adults enrolled in government intensive language training programs, the *MLAT* still proved to be the best overall instrument for predicting language learning success. It was unclear, however, whether or not the two aptitude tests differed in their predictive value for non-Indo-European languages. More recently, Child (1998) suggested that *VORD* may be particularly useful in predicting higher level language ability (above Interagency Language Roundtable Level 2) and for indicating whether channel of communication (i.e., through the eye or the ear) makes an essential difference (p. 5). He concluded that more research on the *VORD* is needed.

In the 1990s then, much of the research on cognitive aptitude factors aimed at substantiating and extending recognition of the central role in FL learning played by individual differences in basic language aptitude. The following discussion addresses this theme.

Linguistic Coding Differences Hypothesis (LCDH). In the early 1990s, Sparks and Ganschow introduced the LCDH into the FL literature (Sparks & Ganschow, 1991). The LCDH derives from native language research in reading conducted by Vellutino and Scanlon (1986), who found that poor readers have problems with the phonological/orthographic (sound and sound/symbol) and syntactic (grammatical) but not the semantic (meaning) components of language. In the LCDH Sparks and Ganschow speculated that: (a) native language skills serve as the foundation for learning a FL; (b) difficulties with one component of language (e.g., phonology/orthography) are likely to have a negative effect on both native and FL learning; and (c) there are innate individual differences in students ability to use language.

During the past ten years, Sparks, Ganschow, and colleagues have conducted a series of studies to test the efficacy of the LCDH. Several studies have compared good and poor FL learners in high school and college (Ganschow et al., 1991, 1994; Sparks et al., 1992a,b, 1996; Sparks, Ganschow, Artzer, Siebenhar, & Plageman, 1997, 1998). In brief, findings showed: (a) successful FL learners exhibited significantly stronger native language skills than unsuccessful FL learners on measures of phonological/orthographic and syntactic skills, but not on semantic tasks; (b) successful FL learners exhibited significantly stronger FL aptitude on the *MLAT*; and (c) students with stronger native language skills and higher FL aptitude achieved higher levels of proficiency in the FL after two years of FL study. The authors also conducted factor analytic studies that supported the tenets of the LCDH (see, e.g., Ganschow, Sparks, Patton, & Javorsky, 1992; Sparks, Ganschow, & Patton, 1995; Sparks, Javorsky, Patton, & Ganschow, 1998). Studies by other researchers have provided support for the basic premise of the LCDH, i.e., that native language skills are important for learning a FL (see Dufva & Voeten, 1999: Humes-Bartlo, 1989; Olshtain, Shohamy, Kemp, & Chatow, 1990; Papagno, Valentine, & Baddeley, 1991).[4]

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Phonological/othographic processing and cross-linguistic transfer. In a review, Koda (1996) reported that FL word recognition (i.e., decoding) is a relatively unexplored area in FL research. This finding is surprising given the longstanding emphasis on aspects of word recognition in native language reading. In native language research, phonological processing skills, in particular, phonemic awareness, (e.g., knowing that spoken words are composed of speech sounds, the ability to segment sounds in spoken words), are among the best predictors of reading acquisition (see reviews by Gough, Ehri, & Treiman, 1992, and Stanovich, 1998). The relationship between reading difficulties and poor phonological processing is also apparent in other languages, such as Danish, French, Greek, Hebrew, Italian, Portuguese, Spanish, Turkish, and Swedish. (For related references, see, Geva, Wade-Woolley, & Shany, 1997; Sparks, Ganschow, & Javorsky, 2000). Even in nonalphabetic languages (e.g., Chinese), research has shown that phonological processing skills are important for learning to read words Hu & Catts, 1993; Leong, Cheng, & Lam, 2000; Suk-Han-Ho & Bryant, 1997. Findings indicate that the development of word decoding and reading comprehension is similar in first and second languages (Geva, 2000; Geva & Wang, this volume) and that FL word recognition plays a significant role in reading comprehension (Koda, 1992, 1996).

Several studies, our own and others, support the importance of the phonological code for successful FL learning. For example, three separate factor analytic studies that we conducted showed a separable phonological factor that contributed significantly to the variance in FL learning (Ganschow, Sparks, Patton, & Javorsky, 1992; Sparks, Ganschow, & Patton, 1995; Sparks, Javorsky, Patton, & Ganschow, 1998). In another study, we found that word recognition in the FL was one of the best predictors of FL proficiency among secondary FL learners (Sparks, Ganschow, Patton et al., 1997). Other researchers have recently supported this finding across several alphabetic languages and among younger learners. In a study with Finnish children, Service (1992) found that phonological/orthographic tests (pseudoword repetition and writing) combined with the ability to comprehend syntactic-semantic structures predicted English learning. In two studies, Cheung (1996) and Service and Kohonen (1995) found that phonological memory (pseudoword repetition) was important for learning FL vocabulary. In a study with Finnish children learning English, word recognition was the best predictor of English proficiency (Dufva & Voeten, 1999). Durgungoglu, Nagy, and Hancin-Bhatt (1993) found that native language word recognition and phonological awareness were good predictors of word recognition skill in Spanish. Crombie (1997) reported similar findings for Scottish children learning French.

Further support for the importance of phonology/orthography in FL learning comes from studies on the effects of specific training in the sound system of the foreign language and its application to the orthography of the language. For example, in several studies with at-risk high school learners, Sparks, Ganschow, and colleagues reported that direct teaching of the sound/symbol system of Spanish resulted in improvement in both FL aptitude as measured by the *MLAT*

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

and native language performance on sound-symbol tasks (Ganschow & Sparks, 1995; Sparks, Ganschow, Pohlman et al., 1992; Sparks & Ganschow, 1993b; Sparks, Ganschow, Artzer, & Patton 1997; Sparks, Artzer, Patton, et al., 1998). These studies, too, have their basis in native language research, which shows improvement in the literacy skills of learners who receive direct training in the phonological/orthographic rule system (Bradley & Bryant, 1983; Byrne & Fielding-Barnsley, 1991; Compton, 2000; Lundberg, Frost, & Peterson, 1988).

Another area providing new research directions on FL aptitude in the 1990s is the reemergence and extension of thinking about cross-linguistic transfer, again in relation to the role of the phonological/orthographic system. Findings suggest that phonological awareness transfers across alphabetic languages and that it may be a general, rather than language-specific, cognitive mechanism (Cisero & Royer, 1995). Most studies have been conducted with young beginning-level readers/spellers. For example, Durgunoglu et al. (1993) found that Spanish phonological awareness and Spanish word recognition predicted children s performance on English word and pseudoword recognition tests. Comeau and colleagues (Comeau, Cormier, Grandmaison, & LaCroix, 1999) reported similar findings for English-speaking children learning French in an immersion setting. Service (1992) reported that pseudoword repetition was a good predictor of learning English as a FL among a group of Finnish children. Holm and Dodd (1996) reported findings on ESL students showing that students from non-alphabetic written language backgrounds had more limited phonological awareness when compared to students with alphabetic first language literacy. Cheung (1996) reported on the importance of phonological short-term memory in long-term learning of FL/second language vocabulary (see also, Papagno, Valentine, & Baddeley, 1991). In a recent study with Hebrew-speaking children learning to read English in the fourth grade, Kahn-Horwitz (2000) found that phonological awareness and orthographic skill in Hebrew predicted skill in learning to read English; moreover, there were significant differences in phonological, orthographic, morphological, and word recognition skills in both Hebrew and English among the strong and weak fourth graders. All of these studies provided support for the position that first-language learning and experience with the phonology/orthography of the language affect reading, vocabulary development, and other aspects of FL/second language learning.

In sum, the following developments shaped FL aptitude research in the1990s and have helped to prepare the way for new thinking about FL aptitude:

1. Reemphasis on the *MLAT* as a valuable predictor of FL aptitude;
2. Consideration of possible confounding of affective variables and language factors in prediction studies;
3. Research on native language predictors of FL achievement;
4. Reference to bottom-up models of reading processes in English as they relate to aptitude for learning a foreign/second language; and

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

5. Emergence of studies on cross-linguistic transfer of phonological skills across language systems and their potential role in relation to research on language aptitude.

FL Aptitude Reconsidered

What, then, lies ahead for those interested in further exploration of FL aptitude? We make several suggestions here:

"Develop or use existing phonological measures in one s native and/or foreign language for prediction of FL aptitude. Aptitude tests using phonological measures might include tasks such as word recognition, pseudoword decoding, phonological memory, and phonemic awareness. Evidence primarily from native language research in the 1990s indicates that these variables may be potential indicators of FL aptitude as well.

"Establish new norms for the MLAT. In the 1990s the *MLAT* was reported to be one of the best predictors of FL aptitude in the field. Yet FL educators seldom use the instrument, except in occasional research studies and in specialized settings such as government agencies. Use of the *MLAT* as a current predictor is problematic because of its outdated norms (1959) and because the test is no longer being published. A challenge for the future is to update the instrument by developing new norms. Another challenge is developing norms for younger age levels. Researchers might consider renorming the elementary form of the *MLAT* (Carroll & Sapon, 1967).

"*Clarify the role of personality variables in FL aptitude.* To date, researchers have not clarified the issue of attitude/motivation/anxiety (or the role of personality variables) in learning a FL because no one has determined the role of basic language aptitude in the FL learning of, for example, students with high anxiety about learning a FL. A challenge for the future is for researchers to include measures of native language and/or FL proficiency in their studies on affective variables.

There are several additional areas for possible exploration that researchers have not addressed sufficiently, or at all, to date. They include:

1. Clarifying the relationship between literacy and oral proficiency in a FL. For example, are there different kinds of FL aptitude, depending on the task?
2. Examining similarities and differences between languages, especially the transfer from morphosyllabic languages, such as Chinese, to alphabetic languages (and vice versa) and their impact on FL aptitude. For example, would an individual whose native language is Chinese have more difficulty learning an alphabetic

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

language such as English than s/he would have learning another morphosyllabic language?

3. Reassessing Carroll s Model of School Learning (1962, 1973) and testing the efficacy of the model. For example, does type of instruction make a difference in FL proficiency? Would more time spent on FL learning allow students with FL learning problems to achieve a certain level of FL proficiency or permit average students to become more proficient FL learners?

Future research that provides data relevant to these questions will promote more precise understanding of FL aptitude and its many possible influences on learner success.

Notes

1. Based on the results of FL aptitude tests, both Wesche and Skehan found three different groups of FL learners who exhibited the following characteristics: (a) strengths in analyzing language; (b) strengths in learning large amounts of material through memory; and (c) a balance of skills in analyzing language and memory.

2. In a recent study, Saito, Horwitz, and Garza (1999) suggested that there is also a specific anxiety when learning to read a FL. However, Sparks, Ganschow, and Javorsky (2000) questioned this hypothesis because: (a) the items on Saito et al. s reading anxiety instrument are related to students word decoding and language comprehension skills; (b) research in native language reading has demonstrated conclusively that difficulties in learning to read are due to problems with the cognitive skills necessary for reading (e.g., phonological processing or word decoding); and (c) Saito et al. did not measure the native language or FL reading skill of their participants.

3. Carroll reported that the validity of the *MLAT* and other FL aptitude tests had been amply demonstrated (1990, p. 12).

4. Sparks and Ganschow have extended the LCDH to include a concept called the assumption of specificity (AOS). The premise of the AOS concept is that students with a particular learning problem have a cognitive deficit (or difference) that is reasonably specific to the task at hand (Hall & Humphreys, 1982; Stanovich, 1988). With FL learning problems, the cognitive difference is likely to be language-related because FL learning is a language-related task. (See Sparks & Ganschow, 1993a, 1995a for a more detailed description of the AOS.) Sparks and Ganschow also suggest that researchers trying to determine the underlying cognitive factors related to poor FL learning should first specify the particular learner differences to be studied. Thus, participants in research studies should display similar performance differences in order to combat heterogeneity in research studies (Sparks, Ganschow, & Javorsky, 1995; Sparks, Javorsky, & Ganschow, 1995).

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

ANNOTATED BIBLIOGRAPHY

Dufva, M., & Voeten, M. (1999). Native language literacy and phonological memory as prerequisites for learning English as a foreign language. *Applied Psycholinguistics, 20*, 329–348.

This article provides empirical support for the premises of the Linguistic Coding Differences Hypothesis for English as a FL and demonstrates the importance of native language literacy for FL learning. The authors examined the effects of phonological memory and native language literacy on learning English as a FL by following the performance of 160 Finnish children from first through third grades. Using structural equation modeling, they examined the influence of phonological memory and native language literacy on FL learning. The authors found that the strongest predictor of English proficiency was second grade word recognition skill. Together, word recognition with reading comprehension and phonological memory explained 58% of the variance in later English language proficiency (p. 341). They concluded that native language word recognition forms the basis for learning a FL, even though orthographies may differ, as they do between Finnish and English. The authors also suggested that the faster the child's speed of word recognition, the better he/she would perform in English and that native language comprehension may become more important as FL skills develop. They recommend that educators attempt to identify children with native language decoding difficulties early in order to provide intensive literacy instruction, which may in turn enhance learning a FL.

Durgunoglu, Y., Nagy, W., & Hancin-Bhatt, B. (1993). Cross-language transfer of phonological awareness. *Journal of Educational Psychology, 85*, 453–465.

This article is one of the few empirical studies that uses research findings on first language reading research to demonstrate the importance of word recognition in higher level processing skills, such as reading comprehension. The authors raise the question of whether skills from the first language transfer to second language reading, i.e., cross-language transfer. They examined variables affecting the English word recognition skills of 31 Spanish-speaking bilingual beginning readers. The results indicated that both phonological awareness and word recognition skills in Spanish were predictors of word recognition in English (p. 463) and that oral proficiency in English was not a reliable predictor of certain reading abilities such as word recognition.

Muljani, D., Koda, K. & Moates, D. (1998). The development of word recognition in a second language. *Applied Psycholinguistics, 19*, 99–113.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

In this article, the authors raise the question of the relationship between first and second language learning and, in particular, the impact of L1 orthography on L2 word recognition. Using a comparison between Indonesian and Chinese adults learning English as a second language, the authors conducted a cross-linguistic experiment using two different types of orthographies to examine L1-L2 orthographic distance and L2 word frequency. Findings showed that familiarity with an alphabetic writing system (Indonesian) helped ESL readers read English words, thus supporting a connectionist word recognition model as a framework for understanding L2 word recognition.

Skehan, P. (1986b). The role of foreign language aptitude in a model of school learning. *Language Testing, 3*, 188 221.

Skehan reexamines Carroll s Model of School Learning, developed in 1962, to explain variables that comprise FL aptitude. Carroll s model has two variables: individual differences and instruction. According to Skehan, both need to be considered. Instruction is influenced by two factors. One is time: the more time one devotes to language study, the higher the level of accomplishment. The second factor is instruction: the better the quality of instruction, the higher the student s level of attainment. The second variable, individual differences, includes general intelligence, aptitude for learning a FL, and motivation. General intelligence relates to the individual s ability to profit from instruction; aptitude is what Carroll and Sapon attempt to measure in the *MLAT*; and motivation has to do with the individual s need to learn the language and his/her willingness to persevere. Skehan emphasizes that Carroll . . . has always been careful to define aptitude in terms of time required to reach a criterion level, not in terms of some people being unable to learn languages (p. 192). He presents research supporting the model and argues that the model has explanatory power in both informal (contextualized) and formal (decontextualized) situations. Skehan concludes that educators should reevaluate the relevance of FL aptitude in order to devise &group instructional procedures for different learners with different strengths and weaknesses in language learning skills (p. 215). He cautions educators not to emphasize one class of variables over the other, because it is the interaction between the two that comprises aptitude.

Sparks, R. (1995). Examining the Linguistic Coding Differences Hypothesis to explain individual differences in foreign language learning. *Annals of Dyslexia, 45*, 187 219.

This article provides a theoretical underpinning for a viable hypothesis about language aptitude, the Sparks-Ganschow Linguistic Coding Differences Hypothesis (LCDH), and forms the basis for extensive

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

research on FL learning in high school and college. Sparks describes the theory and rationale behind the LCDH in which the authors speculate that FL learning problems are likely to arise from difficulties in native language learning and that phonological (sound)/orthographic (symbol) processing difficulties represent the primary problem for many at-risk FL learners. He reviews research supporting the LCDH and argues that this hypothesis provides the strongest inference among competing theories of FL aptitude that include affective, motivational, and language learning strategies and styles. Sparks uses criteria from psychology, the concept of modularity, and the assumption of specificity to support his position.

Spolsky, B. (1995). Prognostication and language aptitude testing, 1925–1962. *Language Testing, 12*, 321–340.

This article provides an historical review of FL aptitude research. Spolsky presents a social and political perspective on the history of FL aptitude in the U.S. from the 1920s through the early 1960s. Spolsky divided his paper into two parts. Part I is a description of "prognosis" tests in the 1920s, which Spolsky says were developed primarily to "exclude unqualified students from high school FL classes" (p. 321). Research on prognosis established the place of aptitude testing as a central topic in language testing research (p. 328). Spolsky suggests that the main research approach during this time was one of hypothesis testing that helped to clarify problems of testing aptitude for learning a FL. In the second part, Spolsky describes research on aptitude tests to identify appropriate candidates for intensive language training. The first effort, test batteries developed for government language programs, were not successful. In the 1950s, however, John Carroll was successful in developing the Modern Language Aptitude Test to predict oral and written language skills. Spolsky describes Carroll's test and its importance for the understanding of FL aptitude today. He concludes, along with Carroll, that "aptitude is only one of the factors that can be used to predict success in L2 learning" (p. 338).

UNANNOTATED BIBLIOGRAPHY

Au, S. (1988). A critical appraisal of Gardner's social-psychological theory of second language (L2) acquisition. *Language Learning, 38*, 75–100.

Barnwell, D. (1992). *Applications of foreign language aptitude and learning style research.* (ERIC Document Reproduction Service No. EDU 364 075).

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Bradley, L., & Bryant, P. (1983). Categorizing sound and learning to read A causal connection. *Nature, 301*, 419 421.

Brown, H. (1973). Affective variables in second language acquisition. *Language Learning, 23*, 231 244.

Byrne, B., & Fielding-Barnsley, R. (1991). Evaluation of a program to teach phonemic awareness to young children. *Journal of Educational Psychology, 83*, 451 455.

Carroll, J. (1962). The prediction of success in intensive foreign language training. In R. Glaser (Ed.), *Training and research in education* (pp. 87 136). Pittsburgh, PA: University of Pittsburgh Press.

Carroll, J. (1973). Implications of aptitude test research and psycholinguistic theory for foreign language teaching. *International Journal of Psycholinguistics*, *2*, 5 14.

Carroll, J. (1981). Twenty-five years of research on foreign language aptitude. In K. C. Diller (Ed.), *Individual differences and universals in language learning aptitude* (pp. 83 117). Rowley, MA: Newbury House.

Carroll, J. (1985). Second language abilities. In R. Sternberg (Ed.), *Human abilities: An information processing approach* (pp. 83 102). New York: W.H. Pressman.

Carroll, J. (1990). Cogitive abilities in foreign language aptitude: Then and now. In T. Parry & C. Stansfield (Eds.), *Language aptitude reconsidered* (pp. 1 29). Englewood Cliffs, NJ: Prentice-Hall.

Carroll. J., & Sapon, S. (1959). *Modern Language Aptitude Test (MLAT): Manual*. San Antonio, TX: Psychological Corp.

Carroll, J., & Sapon, S. (1967). *Elementary Modern Language Aptitude Test*. San Antonio, TX: Psychological Corp.

Cheung, H. (1996). Nonword span as a unique predictor of second-language vocabulary learning. *Developmental Psychology, 12*, 867 873.

Cisero, C., & Royer, J. (1995). The development of cross-language transfer of phonological awareness. *Contemporary Educational Psychology, 20*, 275 303.

Child, J. (1998). Language aptitude testing. *Applied Language Learning*, 9, 1 20.

Comeau, L., Cormier, P., Grandmaison, E., & Lacrois, D. (1999). A longitudinal study of phonological processing skills in children learning to read in a second language. *Journal of Educational Psychology, 91*, 29 43.

Compton, D. (2000). Modeling the responses of normally achieving and at-risk first grade children to word reading instruction. *Annals of Dyslexia*, *50,* 53 84.

Crombie, M. (1997). The effects of specific learning difficulties (dyslexia) on the learning of a foreign language in school. *Dyslexia, 3*, 27 47.

Dorcus, R., Mount, G., & Jones, M. (1953). *Construction and validation of foreign language aptitude tests*. Los Angeles, CA: Univ. of California, Los Angles.

Ehrman, M. (1990). The role of personality type of adult language learning: An ongoing investigation. In T. Parry & C. Stansfield (Eds.), *Language aptitude reconsidered* (pp. 126 178). Englewood Cliffs, NJ: Prentice-Hall.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Ehrman, M. (1996). *Understanding second language learning difficulties.* Thousand Oaks, CA: Sage.

Ehrman, M. (1998). The Modern Language Aptitude Test for predicting learning success and advising students. *Applied Language Learning, 9*, 31–70.

Ehrman, M., & Oxford, R. (1995). Cognition plus: Correlates of language learning success. *Modern Language Journal, 76*, 67–89.

Ganschow, L., & Sparks, R. (1995). Effects of direct instruction in Spanish phonology on the native language skills and foreign language aptitude of at-risk foreign language learners. *Journal of Learning Disabilities, 28*, 107–120.

Ganschow, L., & Sparks, R. (1996). Foreign language anxiety among high school women. *Modern Language Journal, 80*, 199–212.

Ganschow, L., Sparks, R., Anderson, R., Javorsky, J., Skinner, S., & Patton, J. (1994). Differences in anxiety and language performance among high-, average-, and low-anxious college foreign language learners. *Modern Language Journal, 78*, 41–55.

Ganschow, L., Sparks, R., Javorsky, J., Pohlman, J., & Bishop-Marbury, A. (1991). Identifying native language difficulties among foreign language learners in college: A foreign language learning disability? *Journal of Learning Disabilities, 24*, 530–541.

Ganschow, L., Sparks, R., Patton, J., & Javorsky, J. (1992). Factors relating to learning a foreign language among high and low risk high school students and students with learning disabilities. *Applied Language Learning, 3*, 37–63.

Gardner, R. (1985). *Social psychology and second language learning: The role of attitudes and motivation.* London: Arnold.

Gardner, R. (1990). Attitudes, motivation, and personality as predictors of success in foreign language learning. In T. Parry & C. Stansfield (Eds.), *Language aptitude reconsidered* (pp. 179–221). Englewood Cliffs, NJ: Prentice-Hall.

Gardner, R., & Lambert, W. (1972). *Attitude and motivation in second language learning.* Rowley, MA: Newbury House.

Gardner, R., & MacIntyre, P. (1993). On the measurement of affective variables in second language learning. *Language Learning, 43*, 157–194.

Gardner, R., & Tremblay, P. (1994). On motivation: Measurement and conceptual considerations. *Modern Language Journal, 78,* 524–527.

Geva, E. (2000). Issues in the assessment of reading disabilities in L2 children: Beliefs and research evidence. *Dyslexia, 6*, 13–28.

Geva, E., Wade-Woolley, L., & Shany, M. (1997). Development of reading efficiency in first and second language. *Scientific Studies of Reading 1*, 119–144.

Geva, E., & Wang, M. (This volume). The development of basic reading skills in children: A cross-language perspective.

Gough, P., Ehri, L., & Treiman, R. (Eds.) (1992). *Reading acquisition*. Hillsdale, NJ: Erlbaum.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Hall, J., & Humphreys, M. (1982). Research on specific learning disabilities: Deficits and remediation. *Topics in Learning and Learning Disabilities, 2*, 68 78.

Holm, A., & Dodd, B. (1996). The effect of first written language on the acquisition of English literacy. *Cognition, 59*, 119 147.

Horwitz, E. K. (This volume). Language anxiety and achievement.

Horwitz, E., Horwitz, M., & Cope, J. (1986). Foreign language classroom anxiety. *Modern Language Journal, 70*, 125 132.

Hu, C., & Catts, H. (1993). Phonological recoding as a universal process? Evidence from beginning readers of Chinese. *Reading and Writing: An Interdisciplinary Journal, 5*, 325 337.

Hulstijn, J., & Bossers, B. (1997). Individual differences in L2 proficiency as a function of L1 proficiency. *European Journal of Cognitive Psychology, 4*, 341 353.

Humes-Bartlo, M. (1989). Variation in children s ability to learn second languages. In K. Hyltenstam & L. Obler (Eds.), *Bilingualism across the life span* (pp. 41 54). Cambridge: Cambridge University Press.

Hunt, T., Wallace, F., Doran, S., Buynitzky, K., & Scharz, R. (1929). *Language Aptitude Test: George Washington University*. Washington, DC: George Washington University.

Kahn-Horwitz, J. (2000, July). *Identifying the best reading-related predictor variables for English foreign language reading achievement in elementary school age Hebrew speakers*. Paper presented at the meeting of the Society for the Scientific Study of Reading, Stockholm, Sweden.

Kaulfers, M. (1931). Present state of prognosis in foreign languages. *School and Society, 39*, 585 596.

Kaulfers, M. (1939). Prognosis and its alternatives in relation to the guidance of students. *German Quarterly, 12*, 81 84.

Keefe, J., Monk, J., Letteri, C., Languis, M., & Dunn, R. (1989). *Learning style profile*. Reston, VA: National Association of Secondary School Principals.

Koda, K. (1992). The effects of lower-level processing skills on foreign language reading performance: Implications for instruction. *Modern Language Journal, 76*, 502 512.

Koda, K. (1996). L2 word recognition research: A critical review. *Modern Language Journal, 80*, 450 460.

Leong, C., Cheng, P., & Lam, C. (2000). Exploring the reading-spelling connection as the locus of dyslexia in Chinese. *Annals of Dyslexia*, *50*, 239 259.

Lett, J., & O Meara, F. (1990). Predictors of success in an intensive foreign language learning context: Correlates of language learning at the Defense Language Institute Foreign Language Center. In T. Parry & C. Stansfield (Eds.), *Language aptitude reconsidered* (pp. 222 260). Englewood Cliffs, NJ: Prentice-Hall.

Lundberg, I., Frost, J., & Petersen, O. (1988). Effects of an extensive program for stimulating phonological awareness in preschool children. *Reading Research Quarterly, 23*, 263 284.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Luria, M., & Orleans, J. (1928). *Luria-Orleans Modern Language Prognosis Test*. Yonkers, NY: World Book.

MacIntyre, P., & Charos, C. (1996). Personality, attitudes, and affect as predictors of second language communication. *Journal of Language and Social Psychology, 15*, 3–26.

MacIntyre, P., & Gardner, R. (1991). Methods and results in the study of anxiety and language learning: A review of the literature. *Language Learning, 41*, 85–117.

MacIntyre, P., & Gardner, R. (1994). The subtle effects of language anxiety on cognitive processing in the second language. *Language Learning, 44*, 283–305.

Michel, S. (1934). *Prognosis in the modern foreign language*. Unpublished MA thesis: University of Minnesota.

Michel, S. (1936). Prognosis in German. *Modern Language Journal, 20*, 275–287.

Myers, I., & McCaullen, M. (1985). *Manual: A guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press.

Oller, J. (1981). Research on the measurement of affective variables: Some remaining questions. In R. Andersen (Ed.), *New dimensions in second language acquisition research* (pp. 14–32). Rowley, MA: Newbury House.

Olshtain, E., Shohamy, E., Kemp, J., & Chatow, R. (1990). Factors predicting success in EFL among culturally different learners. *Language Learning, 40*, 23–44.

O'Malley, J., & Chamot, A. (1990). *Learning strategies in second language acquisition*. Cambridge: Cambridge University Press.

Onwuegbuzie, A., Bailey, P., & Daley, C. (1999). Factors associated with foreign language anxiety. *Applied Psycholinguistics, 20*, 217–239.

Oxford, R. (1989). *Strategy Inventory for Language Learning*. Alexandria, VA: Oxford Associates.

Oxford, R. (1990). Styles, strategies, and aptitude: Connections for language learning. In T. Parry & C. Stansfield (Eds.), *Language aptitude reconsidered* (pp. 67–125). Englewood Cliffs, NJ: Prentice-Hall.

Oxford, R., & Crookall, D. (1989). Language learning strategies: Methods, findings and instructional implications. *Modern Language Journal, 73*, 404–419.

Oxford, R., & Ehrman, M. (1989). Psychological type and adult language learning strategies: A pilot study. *Journal of Psychological Type, 16*, 22–32.

Oxford, R., & Ehrman, M. (1993). Second language research on individual differences. *Annual Review of Applied Linguistics, 13*, 188–205.

Papagno, C., Valentine, T., & Baddeley, A. (1991). Phonological short-term memory and foreign language vocabulary learning. *Journal of Memory and Language, 30*, 331–347.

Parry, T., & Child, J. (1990). Preliminary investigation of the relationship between VORD, MLAT, and language proficiency. In T. Parry & C. Stansfield (Eds.), *Language aptitude reconsidered* (pp. 30–66). Englewood Cliffs, NJ: Prentice-Hall.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Parry, T., & Stansfield, C. (Eds.). *Language aptitude reconsidered*. Englewood Cliffs, NJ: Prentice-Hall.

Petersen, C., & Al-Haik, A. (1976). The development of the Defense Language Aptitude Battery (DLAB). *Educational and Psychological Measurement, 36*, 369–380.

Pimsleur, P. (1966). *Language Aptitude Battery*. New York: Harcourt Brace.

Saito, Y., Horwitz, E., & Garza, T. (1999). Foreign language reading anxiety. *Modern Language Journal, 83*, 202–218.

Saunders, D. (1989). *Type Differentiation Indicator Manual*. Palo Alto, CA: Consulting Psychologists Press.

Scovel, T. (1978). The effect of affect on foreign language learning: A review of the anxiety research. *Language Learning, 28*, 129–142.

Service, E. (1992). Phonology, working memory, and foreign language learning. *Quarterly Journal of Experimental Psychology, 45A*, 21–50.

Service, E., & Kohonen, V. (1995). Is the relation between phonological memory and foreign language learning accounted for by vocabulary acquisition? *Applied Psycholinguistics, 16*, 155–172.

Skehan, P. (1986a). Where does language aptitude come from? In P. Meara (Ed.), *Spoken language* (pp. 95–113). London: Centre for Information on Language Teaching.

Skehan, P. (1991). Individual differences in second language learning. *Studies in Second Language Acquisition, 13*, 275–298.

Sparks, R., Artzer, M., Javorsky, J., Patton, J., Ganschow, L., Miller, K., & Hordubay, D. (1998). Students classified as learning disabled (LD) and non learning disabled students: Two comparison studies of native language skill, foreign language aptitude, and foreign language proficiency. *Foreign Language Annals, 31*, 535–551.

Sparks, R., Artzer, M., Patton, J., Ganschow, L., Miller, K., Hordubay, D., & Walsh, G. (1998). Benefits of multisensory language instruction in Spanish for at-risk learners: A comparison study of high school Spanish students. *Annals of Dyslexia, 48*, 239–270.

Sparks, R., & Ganschow, L. (1991). Foreign language learning difficulties: Affective or native language aptitude differences? *Modern Language Journal, 75*, 3–16.

Sparks, R., & Ganschow, L. (1993a). Searching for the cognitive locus of foreign language learning problems: Linking first and second language learning. *Modern Language Journal, 77*, 289–302.

Sparks, R., & Ganschow, L. (1993b). The impact of native language learning problems on foreign language learning: Case study illustrations of the Linguistic Coding Deficit Hypothesis. *Modern Language Journal, 77*, 58–74.

Sparks, R., & Ganschow, L. (1993c). The effects of a multisensory structured language approach on the native language and foreign language aptitude skills of at-risk learners: A follow-up and replication study. *Annals of Dyslexia, 43*, 194–216.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Sparks, R., & Ganschow, L. (1995a). A strong inference approach to causal factors in foreign language learning: A response to MacIntyre. *Modern Language Journal, 79*, 235–244.

Sparks, R., & Ganschow, L. (1995b). Parent perceptions in the screening for performance in foreign language courses. *Foreign Language Annals, 28*, 371–391.

Sparks, R., & Ganschow, L. (1996). Teachers' perceptions of students' foreign language academic skills and affective characteristics. *Journal of Educational Research, 89*, 172–185.

Sparks, R., Ganschow, L., Artzer M., & Patton, J. (1997). Foreign language proficiency of at-risk and not-at-risk learners over two years of foreign language instruction. *Journal of Learning Disabilities, 30*, 92–98.

Sparks, R., Ganschow, L., Artzer, M., Siebenhar, D., & Plageman, M. (1997). Language anxiety and proficiency in a foreign language. *Perceptual and Motor Skills, 85*, 559–562.

Sparks, R., Ganschow, L., Artzer, M., Siebenhar, D., & Plageman, M. (1998). Differences in native language skills, foreign language aptitude, and foreign language grades among high, average, and low proficiency learners: Two studies. *Language Testing, 15*, 181–216.

Sparks, R., Ganschow, L., Fluharty, K., & Little, S. (1996). An exploratory study on the effects of Latin on the native language skills and foreign language aptitude of students with and without learning disabilities. *Classical Journal, 91*, 165–184.

Sparks, R., Ganschow, L., & Javorsky, J. (1995). I know one when I see one (or I know one because I am one): A response to Mabbott. *Foreign Language Annals, 28*, 479–487.

Sparks, R., Ganschow, L., & Javorsky, J. (2000). Déjà vu all over again: A response to Saito, Horwitz, and Garza. *Modern Language Journal, 84*, 251–255.

Sparks, R., Ganschow, L., Javorsky, J., Pohlman, J., & Patton, J. (1992a). Test comparisons among students identified as high-risk, low-risk, and learning disabled in high school foreign language courses. *Modern Language Journal, 76*, 142–159.

Sparks, R., Ganschow, L., Javorsky, J., Pohlman, J., & Patton, J. (1992b). Identifying native language deficits in high- and low-risk foreign language learners in high school. *Foreign Language Annals, 25*, 403–418.

Sparks, R., Ganschow, L., & Patton J. (1995). Prediction of performance in first-year foreign language courses: Connections between native language and foreign language learning. *Journal of Educational Psychology, 87*, 638–655.

Sparks, R., Ganschow, L., Patton, J., Artzer, M., Siebenhar, D., & Plageman, M. (1997). Prediction of proficiency in a foreign language. *Journal of Educational Psychology, 89*, 549–561.

Sparks, R., Ganschow, L., & Pohlman, J. (1989). Linguistic coding deficits in foreign language learners. *Annals of Dyslexia, 39*, 179–195.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press

Sparks, R., Ganschow, L., Pohlman, J., Artzer, M., & Skinner, S. (1992). The effects of a multisensory, structured language approach on the native and foreign language skills of high-risk foreign language learners. *Annals of Dyslexia, 42*, 25–53.

Sparks, R., Javorsky, J., Patton, J., & Ganschow, L. (1998). Principal components analysis of a test battery to predict proficiency in a foreign language. *Applied Language Learning, 9*, 71–106.

Sparks, R., Javorsky, J., & Ganschow, L. (1995). Satiating the appetite of the sociologic sponge: A rejoinder to Mabbott. *Foreign Language Annals, 28*, 495–498.

Stanovich, K. (1988). The right and wrong places to look for the cognitive locus of reading disability. *Annals of Dyslexia, 38*, 154–177.

Stanovich, K. (1998). Twenty-five years of research on the reading process: The grand synthesis and what it means for our field. In T. Shanahan & F. Rodriguez-Brown (Eds.), *Forty-seventh yearbook of the National Reading Conference* (pp. 44–58). Chicago: National Reading Conference.

Stoddard, G., & Vander Beke, G. (1925). Iowa Placement Examinations: Foreign Language Aptitude. Iowa City, IA: State University of Iowa Press.

Suk-Han-Ho, C., & Bryant, P. (1997). Phonological skills are important in learning to read Chinese. *Developmental Psychology, 33*, 946–951.

Symonds, P. (1930a). *Foreign Language Prognosis Test*. New York: Teachers College, Columbia University.

Symonds, P. (1930b). A foreign language prognosis test. *Teachers College Record, 31*, 540–546.

Tiedemann, J. (1989). Measures of cognitive styles: A critical review. *Educational Psychologist, 24*, 261–275.

Tremblay, P., & Gardner, R. (1995). Expanding the motivation construct in language learning. *Modern Language Journal, 79*, 505–518.

Vellutino, F., & Scanlon, D. (1986). Linguistic coding and metalinguistic awareness: Their relationship to verbal and code acquisition in poor and normal readers. In D. Yaden & S. Templeton (Eds.), *Metalinguistic awareness and beginning literacy* (pp. 115–141). Portsmouth, NH: Heineman.

Wells, G. (1985). *Language development in the preschool years*. Cambridge: Cambridge University Press.

Wesche, M. (1981). Language aptitude measures in streaming, matching students with methods, and diagnosis of learning problems. In K. C. Diller (Ed.), *Individual differences and universals in language learning aptitude* (pp. 119–139). Rowley, MA: Newbury House.

https://doi.org/10.1017/S026719050100006X Published online by Cambridge University Press