

4 Interdependence of first- and second-language proficiency in bilingual children

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When children begin the acquisition of a second language (L2), whether in the home or at school, their cognitive resources clearly play a central role in the rapidity and ultimate success with which that language is acquired. Other individual factors, such as motivation, and contextual factors that determine amount and type of exposure to the second language, are also central to the acquisition process and in most situations are likely to interact with cognitive factors. I argue in this chapter that the process of second-language acquisition can be clarified by distinguishing between two dimensions of proficiency that relate in specific ways to determinants of the acquisition process, namely, *attribute-based* and *input-based* aspects of proficiency.

Attribute-based aspects of proficiency refer to those dimensions of proficiency whose acquisition is strongly influenced by relatively stable attributes of the individual learner, for example, cognitive and personality variables. Input-based aspects of proficiency, on the other hand, are considerably less related to stable attributes of the individual than they are to the quality and quantity of L2 input received from the environment. In the initial stages of acquiring the L2 the distinction between attribute- and input-based dimensions of proficiency may not be apparent but, over time, the distinctive influences of attributes and input will result in differentiation between these dimensions. The chapter focuses in particular on the role of one aspect of the cognitive resources that children bring to L2 acquisition, namely, their first-language (L1) proficiency. The purpose is to elucidate the extent to which different aspects of L1 and L2 proficiency are related in the L2 acquisition process. An initial step in this analysis is to clarify the dimensions of proficiency in one language.

Dimensions of language proficiency

A number of investigators have pointed to a distinction between *contextualized* and *decontextualized* language as fundamental to understanding the nature of children's language and literacy development. The terms used

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by different investigators have varied but the essential distinction refers to the extent to which the meaning being communicated is supported by contextual cues (such as the paralinguistic cues present in face-to-face interaction) or dependent largely on linguistic cues that are independent of the immediate communicative context. Among the distinctions that have been made are Bruner's (1975) distinction between communicative and analytic competence, Olson's (1977) utterance and text, Donaldson's (1978) embedded and disembedded thought and language, Bereiter and Scardamalia's (1981) conversation and composition, Cummins' (1981, 1984) context-embedded and context-reduced language proficiency (recently labeled simply as conversational- vs. academic-language proficiency; e.g., Cummins, 1989), and Snow *et al.*'s (this volume) contextualized and decontextualized use of language. Snow's terminology will be adopted in the present chapter.

The distinction between contextualized and decontextualized language skills is consistent with the research of Biber (1986), who used psychometric analysis of an extremely large corpus of spoken and written textual material in order to uncover the basic dimensions underlying textual variation. Three major dimensions were labeled by Biber as *interactive vs edited text*, *abstract vs situated content*, and *reported vs immediate style*. The first dimension is described as follows:

Thus, Factor 1 identifies a dimension which characterizes text produced under conditions of high personal involvement and real-time constraints (marked by low explicitness in the expression of meaning, high subordination and interactive features) – as opposed to texts produced under conditions permitting considerable editing and high explicitness of lexical content, but little interaction or personal involvement. (Biber, 1986, p. 385)

The second factor reflects a “detached formal style vs. a concrete colloquial one” (p. 396). Although this factor is correlated with the first factor, it can be empirically distinguished from it, as illustrated by professional letters, which, according to Biber's analysis, illustrate highly abstract texts with a high level of personal involvement. The third dimension “distinguishes texts with a primary narrative emphasis, marked by considerable reference to a removed situation, from those with non-narrative emphases (descriptive, expository, or other) marked by little reference to a removed situation but a high occurrence of present tense forms” (Biber, 1986, p. 396). Although Biber's three dimensions provide a more detailed analysis of the nature of language proficiency and use than the contextualized/decontextualized distinction (as would be expected in view of the very extensive range of spoken and written texts analyzed), it is clear that the distinctions highlighted in his dimensions are consistent with those distinguishing contextualized and decontextualized language. The narrower range of language

used and/or required by developing children makes the contextualized/decontextualized distinction adequate for purposes of this chapter.

There is considerable empirical evidence for this distinction in the sphere of second-language acquisition. Several investigators (Collier, 1987; Cummins, 1981; Cummins & Nakajima, 1987) have reported that at least four years is required even for socioeconomically advantaged immigrant students to attain grade norms in English academic skills. Peer-appropriate conversational L2 skills are usually attained within a considerably shorter period (on average about two years of exposure to the L2 in the L2 context) (Cummins, 1984; Gonzalez, 1986; Snow & Hoefnagel-Hohle, 1978). Both Snow *et al.* (this volume) and Gonzalez (1986) have reported that contextualized and decontextualized language skills are relatively independent of each other among bilingual students.

In summary, the distinction between contextualized and decontextualized language use has been drawn by a considerable number of investigators and is supported empirically in a substantial number of studies. To what extent are each of these dimensions related across languages? In other words, to what extent is there evidence that students who manifest high levels of contextualized and decontextualized skills in their L1 will develop similarly high levels of these skills in their L2?

The relation between L1 and L2 proficiency

Investigations of the relationships between L1 and L2 contextualized and decontextualized language skills among immigrant students will be reviewed according to the background of the students involved. The three major categories are Finnish students in Sweden, Hispanic students in the United States, and Asian students in the United States and Canada. Then some additional evidence from bilingual programs involving both majority and minority students will be reviewed and finally we will examine studies involving adult L2 learners.

Studies of immigrant students

Finnish minority students in Sweden Two sets of studies involving Finnish-background students in Sweden are relevant; the first set consists of studies carried out in the early 1970s synthesized by Skutnabb-Kangas and Toukoma (1976), while the second consists of more recent studies reported by Linde and Lofgren (1988). In reviewing these studies our purpose is to assess the extent to which students' acquisition of Swedish (L2) academic skills is related to their Finnish (L1) proficiency. In some studies, data are also reported on the relationships between contextualized (conver-

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sational) and decontextualized (academic) language skills and these data will also be reviewed.

The Skutnabb-Kangas and Toukoma report The studies synthesized by Skutnabb-Kangas and Toukoma (1976) were carried out primarily in Olofstrom and Gothenburg and were designed to determine the level of Finnish immigrant students' academic achievement in both Finnish and Swedish and to explore some of the determinants of their achievement. A variety of tests in both languages were used; most assessed cognitive and academic abilities such as vocabulary knowledge, synonyms, antonyms, etc. as well as academic achievement in reading, math, and other school subjects. Skutnabb-Kangas and Toukoma summarize the Olofstrom data as follows:

those who attended school in Finland (prior to immigration) approached the level of achievement of normal Swedish pupils . . . in the written comprehension test considerably more often than those who began school in Sweden. Those who attended school in Finland for at least three years did best. The explanation for this can perhaps be found in their better skills in their mother tongue, which laid the basis for understanding a test written in Swedish. Two years in a Finnish class in Sweden did not, on the other hand, make for as good a basis for learning Swedish as the corresponding time in Finland. (1976, pp. 65–66)

Significant correlations were observed for both the Olofstrom and Gothenburg samples between Finnish and Swedish verbal academic proficiency. For example, among the Olofstrom sample, the partial correlations (with length of residence held constant) between Finnish and Swedish for grades three to six students ($N = 165$) ranged from 0.20 ($p < 0.01$) to 0.41 ($p < 0.001$) (table 8, p. 60). For the grades seven to nine sample, five out of six partial correlations of Finnish with Swedish verbal academic skills were significant. A similar pattern of significant L1–L2 partial correlations was found for the Gothenburg sample (tables 11 and 12, pp. 64 and 65). The interdependence of L1 and L2 verbal academic skills was further indicated by the fact that Finnish skills correlated about as highly with subject-matter achievement as did Swedish skills, despite the fact that all subjects were taught in Swedish (table 14, p. 68).

The analyses presented by Skutnabb-Kangas and Toukoma are limited by the absence of powerful statistical tools (such as path analysis) that would have allowed the interaction among predictor variables to have been assessed. From this perspective the studies reported by Linde and Lofgren present a more complete picture of factors involved in predicting L2 academic achievement.

The Linde and Lofgren studies. Linde and Lofgren used path-analysis procedures to fit causal models to data on Finnish children's achievement

in Swedish schools. The first study was longitudinal in nature and involved 32 grade-three children attending a bilingual instructional program. Children's proficiency in Finnish on entry to school was strongly related to achievement at the grade-three level (path coefficient 0.66) while initial Swedish proficiency was related to a lesser level (path coefficient 0.26). A positive relation between Finnish and Swedish language skills was also observed (path coefficient 0.36).

The second and third studies involved 319 and 157 Finnish-background grade-six students respectively. In both studies a positive relation between Finnish and Swedish verbal academic proficiency was reported (path coefficients 0.30 and 0.33 respectively). In spite of these positive relations, a negative relation was observed between attendance at Finnish classes and Swedish proficiency. This may be partially a function of the fact that students who have been in Sweden for less time are more likely to be in Finnish-medium classes. Length of time in Sweden was not assessed in either of these two studies but was strongly related to Swedish proficiency in the first study.

The fourth study involved 388 grade-eight students and again reported a positive relation between Finnish and Swedish proficiency (path coefficient 0.24). Unlike the grade-six studies, no negative relation was observed between amount of Finnish-medium instruction and Swedish proficiency. In other words, students instructed primarily through Finnish in the elementary school were performing as well in Swedish as those whose instruction had been largely through Swedish. As in the grade-six studies, however, a limitation of this study is that length of residence in Sweden was not included as a variable in the analysis. It should be noted that the relation between L1 and L2 in these studies cannot be accounted for by specific transfer of linguistic elements across languages since Finnish and Swedish are not closely related to each other.

In summary, in the Scandinavian studies a significant positive relation between Finnish and Swedish verbal academic proficiency is consistently obtained and transfer of academic skills across languages is evident in the fact that instruction through Finnish entails no long-term lag in the development of Swedish academic skills. Both of these sets of findings are consistent with the postulation of a moderate degree of interdependence between L1 and L2 verbal academic proficiency in the L2 acquisition process.

Hispanic students in the United States Two longitudinal studies provide strong support for the notion of linguistic interdependence. Ramirez (1985) followed seventy-five Hispanic elementary-school students in Newark, New Jersey, enrolled in bilingual programs for three years. It was found that Spanish and English verbal academic language scores loaded on one single

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factor over the three years of data collection. Only students with relatively high levels of Spanish academic proficiency (as assessed by the C.T.B.S. Español) on entry to the program developed high levels of English proficiency (as assessed by the Maculaitis English proficiency test).

Hakuta and Diaz (1985) with a similar sample of Hispanic students found an increasing correlation between English and Spanish academic skills over time. Between kindergarten and third grade the correlation between English and Spanish went from 0 to 0.68. The low crosslingual relationship at the kindergarten level is likely to be due to the varied length of residence of the students and their parents in the United States, which would result in varying levels of English proficiency at the start of school.

An evaluation study of five schools attempting to implement the Theoretical Framework for the Education of Language Minority Students developed by the California State Department of Education (1981) showed consistently higher correlations between English and Spanish reading skills (range $r = 0.60-0.74$) than between English reading and oral language skills (range $r = 0.36-0.59$) (California State Department of Education, 1985). Oral language skills were assessed by a detailed rating scale completed by teachers. In these analyses scores were broken down by months in the program (1-12 months through 73-84). It was found that the relation between L1 and L2 reading became stronger as English oral communicative skills grew stronger ($r = 0.71$, $N = 190$ for students in the highest category of English oral skills).

A well-designed study carried out by Gonzalez (1986) with Hispanic immigrant children similarly demonstrated a considerably stronger relationship between English and Spanish reading skills than between English reading skills and English oral communicative skills. Two groups of grade-six students attending a bilingual program were compared on English and Spanish measures: thirty-four students who were born and schooled for at least two years in Mexico prior to emigrating to the United States and thirty-eight students who were born in Mexico but emigrated to the United States before beginning school. Both groups were of low socioeconomic status. It was found that the Mexican-schooled group performed significantly better on both Spanish and English reading tasks (assessed by means of the C.T.B.S. Español and Stanford Reading Test respectively) than the group schooled entirely in the United States. The U.S.-schooled group outperformed the Mexican-schooled group on an English oral-language measure (the Bilingual Syntax Measure (B.S.M.) II) and on ratings of English communicative proficiency. Both groups showed a high level of competence in conversational aspects of Spanish proficiency, with the Mexican-schooled group scoring somewhat higher on the Spanish B.S.M. II and the U.S.-schooled group being rated more fluent in Spanish communicative skills. In the total sample, Spanish and English reading comprehen-

sion scores showed a correlation of 0.55 ($p < 0.01$) with each other but neither reading score was significantly correlated with ratings of communicative competence. Gonzalez concluded that the academic foundation developed by the Mexican-schooled students transferred to the acquisition of English academic skills, giving them an advantage over their U.S.-schooled peers, despite the fact that both groups attended the same bilingual program.¹ An interesting aspect of Gonzalez' findings is that high crosslingual correlations were obtained between the ratings of Spanish and English communicative skills, suggesting transference of some aspects of oral-language skills in addition to academic-language skills.

The studies outlined above used standardized reading tests as the major dependent variables in both English and Spanish. However, similar patterns of crosslingual transfer were observed in several other studies that used more authentic measures of verbal academic skills. Goldman (1985), for example, examined the retelling of narratives in both English and Spanish by bilingual children and compared these retellings with those of a monolingual group presented with narratives in English only. Children were in kindergarten through sixth grade. It was found that children used similar comprehension strategies whether they were exposed to the story in their L1 or L2. The bilingual children performed as well in English as their monolingual peers in grades three, four, five, and six, although differences in favor of the monolingual children were observed in the lower grades.

Carlisle (1986) examined the writing development of grades four and six Anglo students in regular programs and Hispanic students in either submersion or bilingual programs. An analysis of covariance revealed an advantage for the bilingual-program students in comparison to the submersion-program students in English rhetorical effectiveness, syntactic maturity, and productivity, although both groups performed less well than the Anglo students in regular programs on rhetorical effectiveness and overall quality of writing. A multiple regression analysis revealed a significant relationship between rhetorical effectiveness in Spanish and rhetorical effectiveness in English.

A number of other studies have reported significant correlations between Spanish and English reading skills among Hispanic students in the United States. For example, a study of seventy sixth-grade Hispanic students in a bilingual program in Rochester, New York, showed a correlation of 0.59 between the Degrees of Reading Power test (a modified multiple-choice cloze procedure) in English and Spanish (Bull, 1986). Fradd (1983) similarly reported a significant correlation of 0.41 ($p < 0.01$) between Spanish and English reading skills among forty-one Cuban-background high-school students in Florida.

In summary, the findings of studies involving Hispanic students in the United States are consistent with those of Scandinavian researchers in point-

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ing to a moderate degree of interdependence between minority students' L1 and L2 academic skills.

Asian students in Canada and the United States Genesee (1979) has reported that correlations between L1 and L2 reading skills tend to be lower (although still significant) when the orthographies of the two languages are dissimilar. For example, his studies of bilingual and trilingual immersion programs found lower correlations between Hebrew and both English and French than between these latter two languages themselves. Languages such as Chinese and Japanese differ even more significantly from English in their writing systems. Consequently, investigations of L1–L2 relationships involving these languages pose a stringent test for the interdependence hypothesis. Several studies involving Asian immigrant students to North America have been carried out that suggest that cognitive and personality attributes of individual learners, in particular their literate competence in L1, contribute significantly to the acquisition of certain aspects of L2, despite the dissimilarity of languages and writing systems.

Cummins *et al.* (1984) set out explicitly to test the interdependence hypothesis in a study of ninety-one Japanese and forty-five Vietnamese-background students in Toronto. The Japanese students were the children of temporary residents who were in Canada for business or professional reasons, whereas the Vietnamese sample consisted of refugee students. The Japanese students attended a Saturday Japanese school which aimed to help students keep up with the curriculum in Japan in order to ease scholastic reintegration when they returned (often after as much as five to six years of residence abroad). Students were selected from grades two to three and five to six (Canadian grades) in order to allow the effects of length of residence (L.O.R.) to be separated from age of arrival (A.O.A.). Thus, a grade-two student with two years L.O.R. has an A.O.A. of about five years whereas the A.O.A. for a grade-six student with two years L.O.R. is about nine years. All the Vietnamese sample were recent arrivals (L.O.R. 5–22 months) and ranged in age between nine and seventeen years. Thus, all the sample had received at least some education in Vietnamese prior to immigration to Canada. The dependent variables for the Japanese group consisted of five English decontextualized verbal academic measures (two reading measures from the grade-two Gates McGinitie reading tests and three oral-language tasks) and contextualized measures derived from ratings of student interviews (administered to a subsample, $n = 59$). Students were also interviewed in Japanese and were administered a Japanese standardized diagnostic reading measure.

A factor analysis of English measures in the Japanese study revealed three factors: (1) a grammatical-competence factor; (2) an interactional-style factor related to the amount of elaboration and detail volunteered

by students in the interview; and (3) a decontextualized or verbal academic-competence factor. Regression analyses of these three factor scores on L2 exposure (i.e., L.O.R.) and personal attribute variables (e.g., parent ratings of student personality traits) showed a strong relationship between L.O.R. and all three dimensions. The proportion of explained variance ranged from 0.26 for the English grammatical factor to 0.17 for the verbal academic factor with the interactional-style factor in an intermediate position ($R^2 = 0.21$). A block of variables representing L1 cognitive/academic attributes of the students (e.g., Japanese reading T-score, A.O.A. in Canada) was entered next into the equation. This block added only 3 percent and 6 percent to the explained variance for L2 grammatical competence and interactional style but 18 percent explained variance for the L2 verbal academic factor. Next, a block representing Japanese interactional style and parental ratings of their children's extraversion-introversion was added. This block accounted for only 4 percent and 2 percent increment to explained variance for L2 grammatical competence and verbal academic abilities but 17 percent increment for the English interactional-style factor. In other words, variables related to students' L1 cognitive and literacy skills contributed significantly to the development of L2 cognitive and literacy skills while interactional-style dimensions in L1 and L2 were closely related to personality attributes of the students. In contrast to the role individual attributes of the students played in the development of these aspects of L2 proficiency, grammatical proficiency in L2 was most significantly influenced by variables related to the amount of L2 input that students received (i.e., L.O.R.). We will return to this distinction between attribute-based and input-based predictors of L2 proficiency in a later section.

The interdependence hypothesis was also supported in the Vietnamese study, where performance on a Vietnamese antonyms measure together with students' age accounted for 61 percent of the variance in an English antonyms measure. Probably due to the restricted range for L.O.R. among the Vietnamese sample, L.O.R. accounted for only 6 percent of the variance in the English antonyms measure when entered first into the regression equation.

A more recent study of 273 grades two to eight Japanese students in Toronto (Cummins & Nakajima, 1987) reported findings consistent with those of the previous study. English and Japanese standardized measures of reading were administered to the sample together with assessments of writing skills in both languages. L.O.R. accounted for 35 percent of the variance in English reading scores with the verbal academic block (Japanese reading, A.O.A. and age) accounting for an additional 20 percent. Minimal variance was accounted for by these variables on measures of English writing (e.g. holistic ratings of writing quality and spelling errors). It was poss-

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ible to examine the relationship between English and Japanese writing measures for a subsample ($n = 70$). A number of Japanese writing variables related significantly to overall quality of English writing and to English spelling. Among the strongest relationships was that between Japanese spelling (*katakana*) and English spelling. This relationship was independent of more general cognitive/academic variables such as Japanese reading proficiency and age.

Consistent results are also reported by Iwasaki (1981) in a study of Japanese children in New York. She investigated the effect of initial age of intensive exposure to L2 and transferability of cognitive/academic skills across languages among grades seven and eight students in both full-time ($N = 76$) and part-time ($N = 72$) Japanese schools. The Gates McGinitie level E reading-comprehension test Normal Curve Equivalent scores were used as the dependent measure for English cognitive/academic proficiency. Japanese measures were developed by the investigator and combined into grade-normed scores so that the grades seven and eight data could be combined.

Length of local schooling (an index of L.O.R.) was strongly related to English reading performance, accounting for 52 per cent of the variance in the regression equation ($N = 106$). Performance on the Japanese measures added an additional 9 percent ($p < 0.001$) to the explanation of variance. A chi-square analysis for thirty-nine students with more than twenty-seven months of local schooling showed a significant ($p < 0.01$) relationship between Japanese and English proficiency. For example, of those who were in the high and medium ranges in Japanese proficiency eighteen were above the mean in English reading and only six below the mean. Of those low in Japanese proficiency only four were above the mean in English compared to eleven below the mean. Iwasaki also reported that grade-norm acquisition of English reading occurred at twenty-seven months of local schooling, suggesting an acquisition process that appears more rapid than the forty-eight months L.O.R. required by similar economically advantaged Japanese students in Toronto. The difference may be due, in part, to the non-equivalence of L.O.R. and length of local schooling indices.

In short, moderately strong relationships are observed between reading performance in Japanese and English despite the differences in writing systems. Some crosslingual relationships are also evident in Japanese and English writing skills, although these are less clear-cut than those observed for reading. The final study to be examined in this section focuses on the bilingual development in English and Chinese of 112 grades four to six Chinese-background students in Seattle. This study, prepared by the Southwest Educational Development Laboratory (S.E.D.L.) (Hoover, 1983), included a large number of English oral language and literacy variables

as well as a measure of L1 (Cantonese) reading skills. Here we are primarily concerned with predictors of children's performance on the Interactive Reading Assessment System (IRAS²) developed by Calfee and Calfee (1979). Part of the sample had started schooling in the United States and had been in a Chinese-English bilingual program, while the remainder had immigrated to the United States after the start of formal schooling and had received varying amounts of L1 literacy instruction abroad. Thus, it is possible to examine L1-L2 relationships for these two groups separately. For the U.S.-schooled students ($n = 66$) a significant positive correlation was found between IRAS performance and both amount of L2 instruction ($r = 0.28$, $n = 112$) and amount of L1 instruction ($r = 0.24$, $n = 112$). The effect of bilingual instruction can be seen in the difference between subgroups who had minimal bilingual instruction (0-2 semesters, IRAS mean = 6.2) and those who had substantial amounts of bilingual instruction (8 semesters, IRAS mean = 7.5). For this group regression analyses showed length of residence in the U.S.A. accounting for 19 percent of the variance in IRAS scores, while an L1 cognitive/academic block consisting of amount of bilingual instruction, Cantonese IRAS, and age of arrival in the U.S.A. accounted for an additional 14 percent. Of these latter variables only amount of bilingual instruction attains significance ($p < 0.05$), while the other two variables entered subsequently approach significance (see Cummins, 1983; Hoover, 1983).

For the initially foreign-schooled group, L.O.R. explained 29 percent of the variance in English IRAS performance while the L1 cognitive/academic block explained almost 11 percent. Of the L1 cognitive/academic block, only amount of L1 instruction abroad attained significance ($p = 0.05$), accounting individually for 6 percent of the variance. The fact that Cantonese reading proficiency does not attain significance in this equation can be attributed to its overlap with L1 instruction, since its partial correlation with English IRAS attains significance after L.O.R. is initially entered into the equation ($r = 0.23$, $p < 0.02$) but drops to insignificance after amount of L1 instruction is entered.

In summary, although the amount of variance accounted for by variables reflective of L1 cognitive/academic proficiency is less than that accounted for by L.O.R. for both foreign-and U.S.-schooled groups (11 percent and 14 percent respectively), the effect does attain statistical significance and is consistent with the pattern observed for Japanese students in the Toronto studies. These findings appear consistent with Genesee's (1979) observation that the transfer of reading skills from L1 to L2, while significant, is less when the languages are very dissimilar than is the case with similar languages. Sociocultural variables such as motivation to maintain and develop literacy skills in Chinese and Japanese are also likely to affect the relation between L1 and L2 literacy skills.

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Additional studies of bilingual students Several additional studies can be briefly noted. Falter (1988) reported correlations between English and French reading and writing tasks among 145 grade-five students in French immersion programs in Northern Ontario. The intercorrelations between English and French standardized reading, cloze, and writing measures were 0.59, 0.61, and 0.47 respectively. All were significant beyond the 0.001 level.

Davidson, Kline, and Snow (1986) reported that decontextualized language skills (operationally defined as ability to give definitions) were highly correlated across languages in French-English bilingual children. Correlations across languages were stronger than correlations between decontextualized and contextualized skills within languages. This finding parallels that of the California State Department of Education (1985) reviewed above. Snow (this volume) also reports a strong relationship of definitional ability to reading achievement.

Geva and Ryan (1987) investigated the interdependence hypothesis as part of a study of cognitive, memory, and linguistic-processing predictors of L2 reading development. Subjects were seventy-three grade five to seven children attending a bilingual Hebrew-English day school in Toronto. The test battery included measures of non-verbal intelligence, linguistic proficiency in L1 (English reading, vocabulary, and clause-completion tasks³), linguistic proficiency in L2 (Hebrew oral-proficiency ratings and reading ability), and memory measures in L1 and L2. The results pointed to an important role for memory processes in performing linguistic tasks in L2 as a result of the fact that L2 linguistic processing is less automatized than L1 processing. A significant correlation ($r=0.37$, $p<0.001$) was found between the English clause-completion task and Hebrew reading, suggesting that those children who can more systematically employ executive-control functions in their L1 are more likely to do so in their L2 as well. This correlation maintained significance ($r=0.26$) even when grade and non-verbal intelligence were partialled out. Strong correlations were also observed between verbal memory-span tasks in Hebrew and English. However, the relationship between Hebrew and English reading was not significant. Geva and Ryan interpret these results as supporting the interdependence hypothesis, but caution that the "common underlying proficiency" involves more than just non-verbal intelligence; linguistic analytic skills or executive functions and memory span represent independent components of the common underlying proficiency."

The lack of significant relationship between Hebrew and English reading in the Geva and Ryan study cannot be attributed to unique characteristics of the Hebrew language in view of the fact that Kemp (1984) reported that Hebrew (L1) cognitive/academic abilities accounted for 48 percent

of the variance in English cognitive academic skills among 196 seventh-grade Israeli students.

Malakoff (1988) reported crosslingual relationships of French-English bilingual students' performance on a verbal-analogies task. The students were sixth graders attending the International School of Geneva. Eighteen of the students were attending a program that carried out instruction primarily in English and twenty-four were in a predominantly French-language program. The verbal analogies were divided into easy and hard sets in both French and English. For the easy task the correlations between performance in French and English were $r=0.56$ ($p<0.01$) for the English-language program and $r=0.77$ ($p<0.001$) for the French-language program group. For the hard analogies the correlations were also significant: $r=0.78$ ($p<0.001$) for the English language program and $r=0.58$ ($p<0.01$) for the French-language program.

Canale, Frennette, and Belanger (1987) tested the extent to which the interdependence hypothesis applied to writing skills among a sample of grades nine and ten Franco-Ontarian students who were being educated predominantly through French. A sample of 128 essays (64 English, 64 French) written by thirty-two students equally divided between narrative and expository genres and randomly drawn from a larger data base of student writing formed the data for the study. It was found that crosslingual correlations between analytic scores were highly significant for the same mode of writing ($r=0.77$ for narratives, $r=0.78$ for expositions).

Ho (1987) has reviewed three studies carried out in Singapore that examined crosslingual interdependence among English-Chinese ($N=296$), English-Malay ($N=91$), and English-Tamil ($N=28$) bilinguals. Significant correlations were obtained for verbal/academic performance among the Chinese and Tamil bilinguals ($r=0.21$, $p<0.01$, and $r=0.56$, $p<0.01$ respectively) but the correlation for the Malay group was not significant. This latter finding was attributed to the mixed nature of the Malay learners; when the group was separated into those of Malay ethnic origin and those of non-Malay origin the correlations were 0.28 ($p<0.05$) and -0.25 (n.s.) respectively for these two groups. The negative correlation in the latter group was attributed to the diversity of language background and abilities in this group. In summary, in these studies a moderately significant correlation was observed between languages that are quite dissimilar in orthography, syntax, and directionality.

A European study described by McLaughlin (1986) also suggests that interdependence of academic skills operates across languages that are quite dissimilar, in this case Turkish and German. The study carried out by Rehbein (1984) found that

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the ability of Turkish children to deal with complex texts in German was affected by their ability to understand these texts in their first language. Rehbein's investigations suggest that there is a strong developmental interrelationship between the bilingual child's two languages and that the conceptual information and discourse strategies acquired in the first language transfer to the second. (McLaughlin, 1986, pp. 34–35)

Finally, a study of 191 grade-seven Portuguese-background students in Toronto showed that measures of students' discourse proficiency (i.e., judgments regarding coherence and cohesiveness of text) in Portuguese and English were strongly interrelated ($r = 0.54$, $p < 0.001$, $n = 65$). The English discourse measure loaded on a Portuguese proficiency dimension in a principal components analysis carried out on the data (Cummins, Lopes, & King, 1988).

Studies of adult second-language learners

Several studies of adult L2 learners support the interdependence hypothesis. Salgado (1988), for example, reported a correlation of 0.58 ($p < 0.001$) between reading scores in Spanish and English among 201 Hispanic-community-college students in the New York area. In a sample of 182 Hispanic-community college students in Houston, Guerra (1984) studied the relationship between students' ability to judge and correct syntactic errors in English and their ability to judge and correct similar types of syntactic errors in Spanish. Other variables in the analysis included length of residence in the United States and amount of instruction in English as a second language (E.S.L.). Guerra reported that Spanish language skills and years of schooling in Spanish significantly predicted students' ability to recognize errors in English. In predicting ability to correct errors in English, E.S.L. instruction was equally significant to these variables. The ability to recognize and correct syntactic acceptability in Spanish was the highest predictor of the same ability in the second language (English).

The interdependence notion is also supported in one of the few studies to focus on cognitive processes and text production (Cumming, 1987). The study assessed the relationship of writing expertise and second-language proficiency to adults' writing performance in E.S.L. Both writing expertise and second-language proficiency accounted for large proportions of variance in the qualities of E.S.L. texts and composing behaviors. These effects were independent of each other, however, suggesting that they are psychologically distinct abilities. The relation of these findings to the interdependence hypothesis is that writing expertise is common across languages but for effective writing performance in an L2 both expertise and specific knowledge of the L2 are required. As expressed by Cumming:

the present research has identified the empirical existence of certain cognitive abilities entailed in writing expertise – problem solving strategies, attention to complex

aspects of writing while making decisions, and the qualities of content and discourse organization in compositions – which are not related directly to second language proficiency but which appear integral to effective performance in second language writing. (1987, p. 175)

Writing expertise is viewed as a central cognitive ability with second-language proficiency an additive factor that facilitates the operation of writing expertise in a new domain and possibly enhances writing expertise in subtle ways. In Cumming's study second-language proficiency was very closely related to length of residence in an English-speaking milieu, but both these variables were less fundamentally related to L2 composing behavior than was their writing expertise that manifested itself in both languages.

Conclusion

The data reviewed in this chapter suggest that both attributes of the individual learner and aspects of the input received by the learner contribute in important ways to the development of different aspects of L2 proficiency. The importance of quantity of input is clearly indicated by the consistently strong relationships observed between length of residence and L2 acquisition. However, L.O.R. was not equally related to all aspects of proficiency. For example, in the Cummins *et al.* (1984) study, acquisition of L2 conversational syntax was considerably more dependent on L.O.R. than either L2 academic proficiency or interactional style. Cognitive and personality attributes of the individual contributed as much to the explanation of variance in these dimensions as did L.O.R. These learner attributes, however, were unrelated to individual differences in L2 conversational syntax. In general, moderately strong crosslingual relationships are observed for attribute-based aspects of L1 and L2 proficiency as a result of the fact that underlying attributes of the individual manifest themselves in the individual's performance in both languages.

Within the sphere of cognitive attributes, the data show consistent moderate relationships between decontextualized aspects of L1 and L2 proficiency in studies carried out in a wide variety of sociolinguistic situations and involving subjects ranging in age from early childhood to adult. Relationships tend to be somewhat smaller, albeit still statistically significant, in the case of languages that differ markedly in writing systems.

Although the most consistent relationships are found in the sphere of decontextualized language proficiency, some crosslingual relationships were also observed in aspects of contextualized language proficiency that reflect particular learner attributes (e.g., interactional style).

In short, the crosslingual relationships for academic or decontextualized aspects of proficiency are a function of the fact that both L1 and L2 proficiencies are subsumed by cognitive attributes of the learner, while

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the learner's personality attributes are manifested in the cross-lingual relationship of interactional style. As Geva and Ryan (1987) suggest, it may be possible to develop a more refined model of the cognitive attributes that subsume L1 and L2 decontextualized abilities; for example, by distinguishing the contribution of non-verbal ability, verbal analytic functions, memory span, etc. This direction is consistent with Cumming's (1987) conclusion that writing expertise represents a specific underlying competence that manifests itself in writing performance in both languages and is not reducible to other underlying cognitive attributes such as verbal or non-verbal I.Q.

It should be emphasized that the distinction between attribute-based and input-based aspects of proficiency is a relative one in that individual learner attributes will be involved in most aspects of L2 learning to a greater or lesser extent and appropriate input is clearly essential for development of all aspects of proficiency. Thus, attributes and input are not totally independent of each other, as illustrated by the fact that highly motivated individuals are likely to seek out a greater amount of input than those less motivated. The point is, however, that the relative importance of attributes and input will vary for different aspects of the L2. The relatively weak relationship between contextualized and decontextualized (or conversational and academic) aspects of proficiency in a language can thus be understood as a function of the distinction between attribute-based and input-based aspects of proficiency. A weak relationship is observed either because different attributes are involved (e.g., cognition and personality) or because input characteristics are relatively more significant for acquisition (e.g., of L2 conversational syntax) than individual attributes. Clearly, the acquisition context must be considered also in that acquisition of L2 syntax may be considerably more dependent on cognitive attributes in formal classroom contexts than in naturalistic settings, where quantity and quality of input are primary determinants of acquisition.

How does the attribute-based/input-based distinction relate to the common distinction made between contextualized and decontextualized aspects of proficiency and to Biber's three dimensions of language use? Biber's dimensions and the contextualized/decontextualized distinction refer primarily to characteristics of the language itself (i.e., to the type of input the learner receives) rather than to characteristics of the learner or user of the language. In these formulations, no relationship is posited between attributes of the learner and the development of proficiency in different dimensions of language use (e.g., contextualized/decontextualized).

The present conceptualization goes beyond these distinctions to posit relationships that are predictable, at least in principle, between learner attributes and characteristics of the language. Thus, the strong crosslingual relationship between L1 and L2 decontextualized language skills found

in the research of Snow and her colleagues is interpreted as a function of the fact that decontextualized skills in L1 and L2 reflect underlying cognitive attributes of the individual that manifest themselves in both languages. As the Cummins *et al.* (1984) study suggests, certain aspects of contextualized language skills are also reflective of underlying personality attributes, whereas for others (e.g., conversational syntax) the role of quality and quantity of input largely overshadows individual difference factors.

Predictions that emerge from this conceptualization are (1) consistent crosslingual relationships between aspects of L1 and L2 are reflective of underlying attributes of the individual in addition to characteristics of L2 input; and (2) aspects of L1 and L2 proficiency that are unrelated across languages are also largely unrelated to underlying individual difference dimensions (e.g., cognition, personality) but strongly related to quality and/or quantity of L2 input received by the learner.

Research directions suggested by this approach include refining the attribute dimensions that can be distinguished within the more general categories of cognition and personality and, in turn, the crosslingual aspects of language proficiency that are subsumed by these underlying attribute dimensions.

Notes

1. Findings reported by Baral (1979) appear at first sight inconsistent with the findings of Gonzalez' study. Baral reported that immigrant students who had at least two years of schooling in Mexico performed significantly lower in English academic skills than Mexican-American students born in the United States. However, the socioeconomic status of the immigrant students was significantly lower than that of the native-born students and their length of residence in the United States (two to five years) is likely to have been insufficient to catch up with the native-born students.
2. IRAS scores can be read as approximations of grade equivalent scores.
3. The clause-completion task involved items such as "She cooked the potatoes and meat for him because——(a) she wishes to be helpful; (b) he could fly airplanes; (c) he had eaten supper; (d) she wanted to help him." It was designed to assess children's level of analyzed linguistic knowledge in L1 (see Bialystok & Ryan, 1985).

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