

On the Relationship between Aptitude and Intelligence in Second Language Acquisition

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ABSTRACT

Better understanding of the varied factors that account for successful second language acquisition is a goal that is of obvious interest to anyone within the field of language study. Before the influence of these factors can be adequately understood, of course, they must be defined and utilized in an accurate and consistent way. This paper endeavors to explore and clarify the ambiguity surrounding usage of the terms *intelligence* and *aptitude* in second language acquisition in effort to understand the more central issue of how the qualities designated by these terms relate to second language acquisition. This should enable a clearer picture to emerge about the relative importance of intelligence and aptitude among the constellation of factors associated with second language acquisition.

INTRODUCTION

The role and meanings of the terms *intelligence* and *aptitude* as they have been used in second language acquisition (SLA) discourse are significant for virtually all aspects of SLA. If it were the case that only individuals with what for the moment will be called exceptionally high *innate abilities* are able to become highly proficient in a second language, then it may be sensible to arrange academic programs based on this fact. If, alternatively, it turns out that intellectual abilities are not predictive of success with a second language, the pedagogical ramifications are clearly quite different. Similar significant consequences follow for other elements within the domain of SLA. To mention just a couple, it is probable that an enriched understanding of innate capacity will result both in modifications of theories about how second languages are learned and more effective ways of teaching them. If it turns out that individuals exhibit certain patterns of intellectual ability, it may be possible to devise a pedagogy that caters to these patterns and results in more effective teaching.

After an initial discussion of the background and current status of research on innate abilities in SLA, the task will turn to ascertaining precisely what SLA researchers mean by aptitude and intelligence. Are there real differences in these terms? If so, what are they? This will be done through careful analysis of how the terms are employed in the most salient research articles on the topic. More specifically, articles by researchers such as Skehan (1989), Miyake and Friedman (1989), and McLaughlin (1990) will be examined. As these researchers are some

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of the most prominent in the field, they will serve as representatives of others doing similar work. Once the semantic issues have been clarified, the more central task of the paper can be undertaken: The exploration of the role of innate capacity in actually acquiring a second language. The project here is twofold. The first is to establish the immutable nature of intelligence. The notion that intelligence is largely the product of genetic factors and essentially fixed will be argued for through the examination of studies involving identical twins. This will provide the proper context for dealing with the second task – treating the studies that specifically apply to the relationship between intelligence and second language acquisition. Through addressing these issues, we should be in a better position to characterize the importance of innate capacity for learning a second language.

BACKGROUND

Any effort to describe the role of innate intellectual ability in SLA studies must first acknowledge the relatively minimal amount of research that has actually taken place. Contemporary researchers would readily agree with this assessment (McLaughlin, 1990; Obler, 1989; Skehan, 1989). Not only is there a small amount of research, but the conceptual framework has remained almost unchanged since the late 1960s when it was established by researchers such as Carroll, Sappon, and Pinsleur (Skehan, 1989). The emphasis then was on creating predictive tests whose interrelationships could be compared and evaluated. Through analysis of these tests, Carroll (1965) posited a notion of aptitude that included four distinct components: phonetic coding, associative memory, grammatical memory, and inductive language learning ability. These four components are independent of each other and likely to vary within an individual. Thus each individual will display different patterns of ability. One person may be strong in phonetic coding, but weak on associative memory. As will be shown, research along these lines represents the primary effort of SLA researchers to grapple with the issues of aptitude, intelligence and acquisition.

Why did this limited research end in the late 1960s? Skehan (1989) speculates that the dominance of communicative teaching and acquisition-oriented approaches played a major role. These approaches afforded little place for the study of innate capacity. As will be seen later, the research does seem to show that intelligence plays little or no role in determining basic success in oral communication for second language learners. This may explain why those sympathetic to the theories in vogue after Carroll (1965) had little interest in aptitude. If anyone could succeed with oral communication, the study of intelligence may seem superfluous. Other approaches taken by SLA researchers, such as those inspired by Chomsky (1981) and his work on L1 acquisition and universal grammar, continued to emphasize the lack of individual differences within a speech community. Clearly, the agenda of these theorists was not likely to include the role of individual intelligence.

The circumstances are different now. Given developments in other related fields, such as psychology and neuroscience, one may suspect that the situation will soon change. It seems also true that no single ideological agenda dominates the field in the way it may have in earlier periods. This should allow more room for pursuit from various theoretical perspectives. All of these factors increase the likelihood of finding more satisfactory and definitive answers in the foreseeable future.

THE SEMANTICS OF APTITUDE AND SECOND LANGUAGE ACQUISITION

Some SLA researchers regard intellectual ability as something that can be defined by performance on a standardized test. While they acknowledge that the issue is open to theoretical debate, they accept the general validity of the IQ test as a measure of intelligence (Genesee, 1976). Others utilize IQ and a combination of other tests in their analyses (Obler, 1989). For them, IQ represents one of several valid intelligence indicators. An additional group of researchers does not directly employ IQ, but nevertheless is comfortable using the term *intelligence* (McLaughlin, 1990). The term *aptitude* is preferred by a number of other researchers, in contradistinction to IQ. For them, aptitude is something both independent and unrelated to IQ. Researchers such as Skehan (1989) speak extensively about aptitude and almost never about IQ. Characteristic also amongst aptitude proponents is the absence of the word *intelligence* in their accounts of causal factors in second language acquisition. Explanation for the abandonment of the term *intelligence* is almost never given. Instead, the new term *aptitude* appears in places where one may have expected to find *intelligence*. For some, though, *aptitude* assumes even greater significance than as a substitute for *intelligence*. Indeed, for Skehan (1989), aptitude implies a “talent for learning languages that is independent of intelligence” (p. 276). From reading Skehan, it is exceedingly difficult to determine exactly what aptitude is. Where does it come from? What precisely are the mental properties associated with it? As may be seen below, Skehan does, in fact, have some notion about what aptitude is. This, however, does not induce him to declare that these properties are connected to intelligence.

Other researchers also speak little or nothing about intelligence, but attempt to make more specific their notion of aptitude in a way that Skehan (1989) does not. Miyake and Friedman (1989) regard aptitude as working memory (WM). They note that researchers have correctly identified aptitude as a crucial determinant of L2 proficiency, but have failed to determine precisely what that aptitude consists of. WM represents the attempt by Friedman and Miyake to provide such an account. Their model maintains that three components of language aptitude – language analytic capacity, memory ability, and phonetic coding ability – are distinct cognitive functions frequently associated with WM and are practically synonymous with those described by Skehan. They go on to argue that these components are important determinants in L1 and L2 proficiency and that the WM is the primary common denominator in both L1 and L2 success² and is at the core of linguistic aptitude. They assume that some individuals have greater WM resources than others to perform a given cognitive task. That is, some individuals have greater aptitude than others and this results in greater or lesser L2 attainment. Miyake and Friedman then attempt to break down the components and subcomponents of WM by examining how particular data, from both L1 and L2 subjects, reveals features of the WM system. They hope to establish what they call an “operational capacity” of the WM (Miyake & Friedman, 1989). This would allow them to better understand the way WM constrains specific language processes in both L1 and L2, leading to a clearer conception of aptitude and its implications for both L1 and L2 linguistic attainment.

While efforts such as those by Miyake and Friedman (1989) seem necessary to demystify the concept of aptitude, we must still not lose sight of the essence of what is being discussed. If

² The Bristol Language Project studies described below and utilized by Skehan (1989) constitute a vital connection in this work, as they show the relationship between the rate of L1 acquisition and later L2 proficiency.

aptitude is truly something independent of and distinct from intelligence, one may reasonably ask what precisely aptitude is. For their part, Miyake and Friedman acknowledge that “WM plays a central role in all forms of higher-level cognition” (p. 341). If all forms of higher cognition are included, then WM sounds suspiciously like intelligence. The reader should not be surprised by this, as the components of WM delineated by Friedman and Miyake, such as language analytic capacity and memory, seem to be aspects of intelligence. The IQ test itself clearly probes memory and elements of analytic capacity. At the very least, they seem to arise from innate mental properties.

It is now appropriate to ask: Does aptitude get at something that intelligence does not? Do intelligence tests miss something crucial that aptitude better explains? To address this issue, it might be useful to first say something about IQ. What does an IQ score indicate? A normal full scale IQ score reflects, among other things, individual performance on tests of spatial understanding, memory, pattern recognition, and linguistic knowledge of various sorts. The final numerical score results from a mathematical operation that incorporates the various scores on the subsections in one overall score. The result is that a person with an IQ score of 100 could have a very different individual intellectual profile than five other people with the same IQ score. Each person could perform better or worse on the various parts of the test, yet each could still have a composite score of 100. In theory, this means that one person with an IQ score of 100 could be much better in math than another person with the same score. This, of course, could happen if his intellectual strengths were in areas pertaining to mathematics. The situation is much the same as it pertains to language acquisition. A person could be unusually gifted in capacities associated with language acquisition, yet still have an overall IQ score which is not necessarily even above average. While it may be unusual, such a scenario can and does happen.

The case of CJ, chronicled by Obler (1989), is most interesting in this regard. CJ has an exceptional ability to learn languages. He achieved native-like proficiency in several languages after the onset of puberty. His success was confirmed by native speakers who interviewed CJ and attested to his proficiency. They noted that he lacked a foreign accent and confirmed the speed and ease of his language acquisition. At the time of the study, CJ was a 29-year-old single Caucasian male who was a graduate student in education. He was a native English speaker from a monolingual home. His first experience with a second language came at the age of 15 with formal instruction in French in high school. He excelled in French and began studying German and Spanish as well. Upon graduating from college, CJ learned Moroccan Arabic and Italian through a combination of immersion and formal instruction. It would appear that CJ provides researchers with an excellent opportunity to explore the relationship between intelligence, aptitude, and second language acquisition. To do this, it is necessary to examine CJ’s performance on an IQ test.

In two areas of the IQ test, CJ performed extremely well (Obler, 1989). These areas involved vocabulary and code learning. On the vocabulary portion of the test he was asked to define words of increasing difficulty. He not only knew most of the words, but was able to give precise one-word synonyms for words such as *burden* for *encumber* and *foreboding* for *ominous*. The other tests on which CJ displayed superior functioning required him to decide which of six choices correctly completed a pattern with a piece missing. On this he scored in the 95th percentile. One additional test corroborated his strength in pattern recognition. On this test he was required to find out what relations obtain among a series of letters, numbers or words. He scored in the 93rd percentile. CJ’s performance on most other portions of the test was unexceptional. Interestingly, the tests showed that he does not use words in a very abstract or

sophisticated way. Proverbs proved difficult for him interpret. He also displayed a relatively poor performance on visual-spatial tasks. It might then be accurate to claim that CJ is highly intelligent in areas that pertain to second language acquisition, but only average or below average in other areas.

One may conclude that an exceptionally high IQ, or even one above average, is not necessary for successful second language acquisition. The overall IQ score measures many different, disparate abilities. Yet, it is equally clear that two aspects of CJ's IQ were measured and incorporated into his overall score. Had he not performed as well on these tests, his overall score would have dropped. These tests, then, were part of CJ's intellectual profile and measured by IQ. This would seem to refute Skehan's (1989) notion that aptitude is independent of intelligence. CJ's linguistic abilities, in particular his aptitude, are confirmed by his performance on the IQ test. The contention that aptitude and intelligence are independent entities is therefore demonstrably invalid. For Skehan or anyone else to successfully claim otherwise, they would have to find an adult L2 learner, that is, one who has clearly learned an L2 following the offset of the Critical Period, who could easily acquire second languages without displaying features associated with second language acquisition on IQ tests. Until that is done, the use of the term *aptitude* should be considered synonymous with *intelligence*, and it appears that there is no reason to retain the category of *aptitude*.

INTELLIGENCE AND SECOND LANGUAGE LEARNING

Having disambiguated the problems regarding the issues of intelligence and aptitude, and securing the place of intelligence in the discourse, it is now appropriate to directly address the role of intelligence in the acquisition of a second language. Skehan (1989) states that "aptitude is at least as important, and usually more important, than any other variable investigated" (p. 38). Here, of course, *intelligence* should be substituted for *aptitude*. Virtually all researchers agree that performance on reading and language usage tests correlates strongly with IQ level. That is, those with higher IQ scores tend to do better on these tasks. In the work of Genesee (1976) students were divided by IQ scores and tested in grades 4, 7, and 11. Their performance in second language acquisition (French) was compared with those placed in the lower groups based on IQ scores. Those in the highest group performed in a way that the IQ profile might predict on the reading and language usage tests. In all cases, the above-average IQ group performed better than the average group which performed better than the below-average students (except in the 11th grade case which included no below-average students). These results led Genesee to suggest that a second language program whose goals are centered on academic language should consider results of such tests as IQ in determining which students should be placed in the programs.

Other studies appear to corroborate the findings of Genesee (1976). McLaughlin (1990) is impressed with Skehan's (1989) findings with regard to the rate of first language acquisition and second language acquisition performance. Using children whose first language development had been monitored as part of the Bristol Language Project and whose scores had later been compared with results on foreign language aptitude tests, Skehan noted significant correlations. To explore this data, something must first be said about the study. Skehan was interested in studying the origin of language aptitude. He was aware of the work Wells (1985) had done in the Bristol Language Project, which evaluated the rate of L1 acquisition. The original study involved about 125 children. These children's L1 acquisition rate was studied when the children were

between 3 and 5 years of age. This data was later compared by Skehan with the same children's scores on foreign language aptitude tests when they were 13, who found a significant correlation (as high as 0.50) between these two sets of measures. What was not explicitly shown at this time was whether or not the higher performance on the aptitude tests truly demonstrated a greater ability to learn a second language. Though the link seemed plausible, demonstrable proof was necessary.

Subsequent work with the same children did demonstrate that those children whose first language developed quickly and who performed better on the foreign language aptitude tests also performed better in learning a second language. Roughly 100 of the original 125 children were studied as teenagers learning a second language in a classroom setting (McLaughlin, 1990). The success of these learners with L2 acquisition was most closely connected to their L1 MLU (those who exhibited a longer average length of utterance in their L1 acquisition did better as L2 learners) and sentence structure complexity displayed during L1 acquisition. For Skehan (1989) and McLaughlin, this is evidence of an innate aptitude (intelligence) for languages. These conclusions should surprise no one. The intuitive appeal of the notion that a more intelligent child will learn his or her L1 more quickly is most powerful. Many capacities measured by intelligence tests are employed in language acquisition. The innateness of these capacities, demonstrated in accelerated L1 achievement, makes it logical to predict that those possessing them would have better success with L2 acquisition. The work done by Skehan described above seems to extend beyond the intuitive appeal of the notion and empirically demonstrate its validity.

A point which has thus far remained in the background, but which now deserves explicit attention, is the issue of the innateness of intelligence. Does it change over time? To properly regard intelligence as a primary causal factor in language acquisition, it should be shown that it is a fixed entity. While most researchers do believe that what they call aptitude or intelligence is relatively fixed, some argue that it develops (Gass & Selinker, 2001). They may claim that a person who exhibits greater ease in learning Italian after having learned French, simply relies on more sophisticated study techniques or profits from the lexical and structural similarities of the two languages. The accelerated proficiency is not therefore a product of enhanced aptitude. The argument offered by these critics seems persuasive. The numerous related words in each language can only serve to make the task of mastering the lexicon much easier. The same is true with the basic structural similarities between the two languages. The advantages of these similarities clearly go a long way in explaining why the L2 acquisition is easier. No account of greater aptitude or intelligence is needed. No positive evidence exists that would show how either aptitude or intelligence actually increases through second language study.

An even stronger argument about the innateness and relative immutability of intelligence involves twin studies. What has the evidence shown about genetic twins and their linguistic attributes? Lenneberg (1967) reviewed a number of studies of normal and disordered voice, speech, and language development. He ascertained that 90% of identical twin pairs have a similar developmental history for speech and language compared with 40% of fraternal pairs. He attributed the greater similarity between identical twins to their shared genetic inheritance.

Subsequent work by other researchers confirms his findings. Receptive grammatical development was studied by Munsinger and Douglass (1976), who used the Northwestern Syntax Screening Test to estimate the language heritability of various sets of twins. Similar to Lenneberg (1967), they found the highest correlation with identical twin pairs ($r=0.831$), and a lower correlation with fraternal twin pairs ($r=0.436$). The correlation among fraternal twin pairs

was almost identical to that among siblings ($r=0.492$). They concluded that 80% of the variance in language development was due to inherited factors, but only around 10% to environmental factors. The remainder was attributed to error in measurement.

The important issues in the above studies are the way in which they show how genetic factors have a powerful role in determining the rate of language development. While these studies are about L1 acquisition, their relevance is not diminished for the project here. One must consider the findings in terms of how they apply to the Bristol Language Project described above. The evidence then falls into place and forms a strong case for the role of intelligence in second language acquisition. It is entirely reasonable to assume that had these identical twins been studied for second language acquisition, either before or after puberty, they would have shown similar results to those found in the original study by Wells (1985) and extended by Skehan (1989), and these results would have been based on their intellectual profiles.

If the researchers are unified on the relationship between higher intelligence and greater success with academic L2 language, they are equally convinced that higher intelligence plays little or no role in many communicative tasks (Genesee, 1976; McLaughlin, 1990). Genesee points out that IQ scores played no role in the ability of individuals to acquire certain communicative aspects of a second language. On such skills as interpersonal communication, pronunciation, and listening comprehension, higher IQ scores were shown to be insignificant. Interpersonal communication data was established through individual interviews of each student by one of two native French speakers. The students were asked to describe the story depicted by a cartoon and then engage in a short conversation based on the cartoon. The entire interview was conducted in French and was recorded for later analysis. The speech sample was then rated independently by two native French speakers in five separate categories: listening comprehension, pronunciation, grammar, vocabulary, and communicativeness. The raters did not know which IQ group each individual belonged to at the time of the interviews. In each grade level no statistically significant differences occurred in any of the different IQ groups with regard to listening comprehension, grammar, vocabulary, and communicativeness. On this basis, it is argued that there should be no restrictions on who should be placed in a second language program. If the goals of the program are primarily communicative, there is no justification for excluding anyone.

It may, however, be useful to scrutinize more carefully the evidence and claims made by Genesee (1976) before unconditionally accepting them. The first issue involves the adequacy of what could be called communicative tests. Is it possible that the tests are insufficiently sophisticated to allow meaningful distinctions to be made among those who take them? What if the tests are simply not intellectually demanding enough for the more advanced examinees? Because of this, the individuals who take the tests may do uniformly well. Though the information provided by Genesee (1976) in her report of the communicative elements of her tests is highly informative about the procedures undertaken to obtain the results, it is somewhat less satisfactory about establishing the adequacy of the tests in the context of the questions just posed. Clearly, these issues demand greater scrutiny.

Another problem involves the data itself. The ability to collect and analyze data is obviously much easier with a written test. If they follow a multiple-choice format, written exams can be scored quickly and consistently and do not require the amount or type of training necessary for those administering oral tests. The logistics of conducting an effective large-scale test that involves a significant listening and speaking component are often prohibitive. If one wanted to test a truly large population, how would all of the testers be trained? How would

consistency and accuracy be ensured? Written exams are less susceptible to these difficulties, and their results are often considered more objective measures. While people may argue about the validity of the results, the data itself will be consistent. Furthermore, the results can easily be compared among large populations. Finally, statistical analysis enables researchers to construct tests that include questions of different levels of difficulty. Oral data presents more difficulty for researchers. Will one evaluator have the same opinion as another with regard to a student's proficiency? Is there time for an interviewer to conduct a probing discussion which might provide revealing data? Skehan (1989) himself acknowledges the need for a wider view of what is meant by language performance.

CONCLUSION

The field of SLA is in need of much more extensive work in the area of intelligence and acquisition. Recent developments in related fields and a climate that is conducive to new inquiry make the situation promising. The developments in fields such as neuroscience appear to have great applicability. The capacity to evaluate what is going in the brain during a given cognitive task seems to be expanding daily. It is entirely reasonable to believe that disciplines like neuroscience and the various branches of psychology will make marked progress in their abilities to represent the connection between cognitive faculties and language. The sophistication and amount of new, pertinent information will continually increase. It is quite possible that qualitative jumps in understanding will be made under these auspicious circumstances.

It has also been shown that it is proper to regard intelligence as the correct term to characterize the innate, genetically endowed individual ability. The fixed nature of intelligence was established through twin studies, which showed just how significant genetic factors are in predicting L1 acquisition. The extraordinarily similar way in which identical twins learn L1 and the way this was connected to biological factors was confirmed by the fact that other siblings, including fraternal twins, exhibited a much less close correlation in L1 development. This fact renders invalid the argument that the similarity in development shown by the identical twins is due to environmental factors. These studies were then connected to L2 studies by speculating on what would happen if the twins had been studied in the same way as the participants in the Bristol Language Project, which demonstrates the connection between L1 and L2 acquisition. It was argued that identical twins would have the same results as those revealed in the Bristol Language Project. In other words, each identical twin pair would have achieved a level of L2 acquisition based on their rates of L1 attainment and the linguistic intellectual capacities evidenced by that attainment. This would demonstrate both the fixedness of intelligence and its role in L2 acquisition. However, as mentioned earlier, this remains speculative, however well founded it may be. Further empirical research is needed.

The argument was later made that efforts to label intelligence something else only serve to confuse matters. Those who regard innate capacity as aptitude fail to show how aptitude is fundamentally different from intelligence and what is indicated on an intelligence test. The concept of aptitude was thus shown to be empty. When the evidence of the significance of individual intelligence was considered in relation to individual second language acquisition, with the aptitude studies properly reconceived and integrated into the new interpretation, the impact was shown to be great. The evidence that higher IQ scores correlated with better performance on academic aspects of second language acquisition proved strong. It was also argued that the

claims that IQ is irrelevant to communicative second language tasks are somewhat dubious. Various questions were presented both about the abilities of the oral studies to ascertain their objectives and the theoretical barriers for implementing a valid study. As is true of SLA research in general, only further research can resolve these questions.

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