Revisiting problems with foreign language aptitude*

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Abstract

This study investigated three of the issues recently raised in connection with the traditional concept of foreign language aptitude: the relationship of foreign language aptitude and working memory and phonological short-term memory capacity, the role of foreign language aptitude in predicting success in the framework of focus-on-form foreign language instruction, and the stability of language aptitude and phonological short-term memory in the course of language learning. The participants of our research were 40 students of an English-Hungarian bilingual secondary school and 21 students in a regular Hungarian secondary school. Language aptitude was assessed both at the beginning and the end of the academic year. Our results support the existence of an effect of language learning experience on language aptitude. We also concluded that foreign language aptitude does not play a highly important role in communicative language teaching combined with focus-on-form instruction.

1. Introduction

The traditional construct of language aptitude has come under a lot of criticism. The most important problems raised in connection with this cognitive determinant of language learning outcomes include issues of construct validity, in other words problems related to the fact that language aptitude lacks an appropriate definition supported by theories of language learning (Dörnyei, 2005; Sawyer & Ranta, 2001), as well as the relevance of the traditional

components of language aptitude included in the Modern Language Aptitude Test (MLAT) (Carroll & Sapon, 1959) in 21st century language classrooms, where language learning means more than just the acquisition of lexis and grammar (for a review see Robinson, 2005; Sawyer & Ranta, 2001; Skehan, 2002). Additional issues that emerged in connection with foreign language aptitude involve the relation of language aptitude to intelligence and working memory capacity, and the effect of language learning experience on aptitude (for a review of these issues see Sawyer & Ranta, 2001). Despite the voices of criticism, language aptitude tests such as the MLAT are still widely used to screen students for admission and streaming in language learning programs.

Parallel to the growing concerns about the appropriacy of the traditional language aptitude test, new conceptualizations of language learning aptitude have been proposed, for instance Grigorenko, Sternberg and Ehrman's (2000) CANAL-FT, which regards language aptitude as the ability to cope with novel experience in language learning, and Robinson's (2001) aptitude complexes, which form a hierarchy of cognitive abilities relevant for second language acquisition (SLA).

The aim of our research was to test some of the problematic aspects of the traditional concepts of language aptitude and some of the new proposals concerning the definition of language aptitude. We concentrate on three issues: the effect of language learning experience on language aptitude test performance, the predictive power of language aptitude in a one-year long intensive language training program, which primarily uses a communicative approach with focus-on-form instruction, and the relationship of working memory capacity and language aptitude. Our research uses a quasi-experimental design in assessing the effect of language learning experience on language aptitude as measured by the Hungarian version of MLAT (HUNLAT), and we applied a range of proficiency measures, which test more than just the acquisition of grammatical rules. The participants of our study were 15-16 year old

students of an English-Hungarian bilingual secondary school enrolled in a year of intensive foreign language training program, and a group of students with similar demographic characteristics from a regular secondary school, where languages are taught in four 45-minute lessons per week. We assessed phonological short-term memory capacity and language aptitude both at the beginning and the end of the academic year. Students' verbal working memory capacity was measured on one occasion only at the end of the school-year. The language proficiency of the bilingual group was tested with a Cambridge First Certificate Exam at the end of the academic year. Our study used a correlational design to investigate the relationship of language aptitude, working memory and phonological short-term memory capacity and language learning success, whereas in order to test the effect of language learning experience on the performance on language aptitude and phonological short-term memory measures a quasi-experimental arrangement was used, with the bilingual group being the experimental and the students from the regular secondary school the control group.

In what follows, we will outline previous research in the field of language aptitude and working memory, describe the research methods we used and the results obtained. We will conclude with a discussion and interpretation of the findings.

2. Review of literature

Language aptitude is traditionally conceptualized as a stable ability that is not susceptible to training and is independent of previous language learning experience (Skehan, 1998). Carroll and Sapon (as most developers of language aptitude tests before and after them) followed the empirically-based psychometric approach to test development. Between 1953 and 1958 they administered a great variety of tests that seemed likely to predict

language learning success to about 5000 students. Based on the results, they selected the tasks which differentiated best between successful and unsuccessful language learners but did not correlate highly with each other (Carroll & Sapon, 1959). Such a pragmatic, assessment-based, and atheoretical approach is not without precedent in the research of cognitive abilities, in fact this is the approach most commonly adopted in the development of intelligence tests. Instruments devised in this manner may have appropriate psychometric qualities (by definition, in fact, since their development was based on measures of validity and reliability). Moreover, such instruments may be used to define the construct in question, by using complex statistical analyses to extract underlying factors. This was the approach followed by Carroll as well in defining components of language aptitude (see below). However, from a theoretical point of view, this process may be criticized for producing a construct which is, in fact, nothing more or less than what the test measures. This is a common critique of tests of intelligence, and according to Dörnyei (2005: 35) "the tacit understanding in the L2 research community has been that language aptitude is what language aptitude tests measure".

Carroll defined language aptitude as "some characteristic of an individual which controls, at a given point of time the rate of progress that he will make subsequently in learning a foreign language" (1974, quoted by Sawyer and Ranta, 2001: 310). Based on the results of factor analyses, Carroll (1981) identified four components of language aptitude: (1) *Phonetic coding ability,* which is "the ability to identify distinct sounds, to form association between those sounds and symbols representing them, and to retain these associations" (p. 105), (2) g*rammatical sensitivity*, meaning the ability "to recognize the grammatical functions of words (or other linguistic entities) in sentence structures" (p. 105), (3) *rote learning ability*, which was defined as "the ability to learn associations between sounds and meanings rapidly and efficiently, and to retain these associations" (p. 105), and (4) *inductive language learning*,

that is, the ability "to infer or induce the rules governing a set of language materials, given sample language materials that permit such inferences" (p. 105).

Correlation coefficients between various language aptitude tests and tests of foreign language proficiency range between 0.23 and 0.73 (Grigorenko et al., 2000). Ehrman and Oxford (1995) found that among individual differences it is language aptitude that correlates most closely with foreign language performance, explaining 25% of the variance. In a Hungarian context similar to that of our study, Nikolov and Ottó (2006) found that language aptitude was the best predictor of the achievement on proficiency tests at the end of the academic year in the case of beginner language learners (r=0.52 among students of English, r=0.39 among students of German). In the case of students who were not beginners when they started the preparatory language course, the best predictor proved to be language proficiency at the beginning of the training (r=0.78 and 0.74), and language aptitude was the second best predictor (r=0.44).

One of the basic assumptions behind the concept of language aptitude is that it is a relatively stable characteristic, an endowment that is not modified by training or affected by previous experience (Skehan, 1998). However, not all researchers agree with this view. McLaughlin (1990:173) claims that "aptitude should not be viewed as a static personality trait; novices can become experts with experience." Grigorenko et al. (2000: 401) assert that "language aptitude is a form of developing expertise rather than an entity fixed at birth." Research evidence concerning the stability of language aptitude is ambiguous. In an early study Politzer and Weiss (1969, cited by Skehan, 1989) attempted to improve achievement on language aptitude measures by training, but they could not provide convincing evidence that this was possible. Sawyer (1992) did not observe correlations between previous language learning experience and aptitude among students taking part in short intensive language courses. Harley and Hart (1997) did not find higher levels of aptitude among early immersion

students having 12 years of exposure to a foreign language compared to late immersion students with only 4 years of exposure. Other studies, however, provide evidence for an effect of experience on language aptitude. A study conducted by Eisenstein (1980) showed that both bilinguals and students with previous training in foreign languages showed higher levels of aptitude than students without previous language learning experience. She also found that polylinguals tended to outperform bilinguals and that bilinguals who received formal education in a second language had an advantage over those who did not, although these differences were not statistically significant. In an experimental study Sparks, Ganshow, Fluharty and Little (1995) reported that instruction in Latin resulted in an increase in language aptitude scores in the case of both learning-disabled and non-learning-disabled high school students.

It can be seen from the above that previous research does not provide conclusive evidence either for or against stability in language aptitude. Despite the lack of evidence, the assumption of stability is rarely called into question. In the words of Skehan (2002: 79), "the truth of this matter is that there is simply not enough evidence to argue for the stability of aptitude with any certainty, but for now, following Carroll, we will assume that aptitude does not change with the seasons!".

Robinson (2001, 2005) raised several concerns with the traditional concept of language aptitude, and he proposed that aptitude should be conceptualized as a complex and dynamic construct, comprising cognitive resources and primary abilities which combine into high-order abilities that are directly involved in various learning tasks. These abilities can in turn be grouped into aptitude complexes. Aptitude complexes play different roles under different conditions of exposure to input (incidental, implicit and explicit learning). The significance of Robinson's research is that he investigates the aptitude-treatment interaction, conceiving of language aptitude as a dynamic construct.

The relevance of the Carollian concept of language aptitude in the communicative classroom was first questioned by Krashen (1981). Since then the role of aptitude in various language learning settings and under different learning conditions has been explored by a number of studies. Reves (1983, cited in Skehan, 2002), who investigated Arabic learners studying English in a classroom setting and acquiring Hebrew in the target language environment, showed that aptitude plays a role in predicting success in both situations. Skehan (1989) also argued that aptitude might in fact be more important in naturalistic SLA than in an instructional setting. Harley and Hart (1997) found that for young immersion learners, aptitude had little power in predicting competence in L2, but for older ones, for whom accuracy and academic language proficiency was a more focal point of instruction than for younger students, aptitude correlated highly with most proficiency measures. Horwitz (1987) and Ehrman and Oxford (1995) investigating older age groups, which were primarily taught with communicative methods, also found that certain sub-tests of language aptitude were related to L2 performance. On the other hand, Ranta's (2002) research suggests that language analytic abilities play a relatively insignificant role in communicative classrooms. Likewise, Robinson (1997, 2002a) found that language aptitude did not influence incidental rule-learning under the meaning focussed condition.

A number of researchers have argued that working memory capacity might be a cognitive ability that is just as important in language learning as foreign language aptitude. Sawyer and Ranta (2001: 340) pointed out that "working memory capacity may be the key to elaborating the concept of language aptitude itself and to clarifying its relationship with the second language acquisition (SLA) process." Miyake and Friedman (1998) proposed the "working memory as language aptitude" hypothesis, claiming that working memory may be the central component of language aptitude. To our knowledge, it is only Robinson (2002a), who has tested the relation of working memory and foreign language aptitude. He found that

working memory as measured with a reading span test had a moderately strong correlation with language aptitude scores.

The most widely accepted conceptualization of short-term memory today is the working memory model developed by Baddeley and Hitch (1974; Baddeley, 1986). While previous theories of memory systems focused on the storage function of memory, the new model, as its name suggests, adapts a more dynamic approach. This conceptualization of working memory combines storage with the processing and manipulation of information, thus in this view working memory plays a far greater role in cognitive activities such as comprehension, reasoning and learning than previously assumed (Baddeley, 2003).

The most widely researched component of working memory is the phonological loop. This subsystem consists of a phonological store, which holds information for a few seconds, and an articulatory rehearsal process, which refreshes decaying information amongst other functions. The rehearsal process is analogous to subvocal speech and takes place in real-time, resulting in a limited span of immediate memory (after a certain number of items, the first one will fade before it can be rehearsed). Phonological loop capacity is often measured by tasks involving immediate serial recall of numbers (digit span) or words (Baddeley, 2003). One of the most widely used tests of phonological short-term memory capacity is the non-word repetition test, where participants have to repeat non-words of various length. Non-words are words that do not exist in the given language but conform to its phonotactic rules. Participants' short-term memory capacity may then be expressed in terms of the non-word span, which is the highest number of syllables the participant could repeat in at least 50% of the cases. Other tests of phonological short-term memory include alphabet span (Craik, 1986) and forward digit span (Botwinick & Storandt, 1974).

Reading and listening span (Daneman & Carpenter, 1980) as well as the backward digit span task are considered complex verbal memory tasks. The backward digit span task is also

part of the Wechsler-IV intelligence test for children (Gathercole & Alloway, in press) and is hypothesized to be strongly related to general fluid intelligence (see Engle, Kane & Tuholsky, 1999). The backward digit span and the reading and listening span tasks are frequently regarded as instruments testing more than just the phonological short-term memory: they are claimed to assess the capacity of complex verbal working memory including the functioning of the central-executive, which is responsible for regulating attention (Gathercole, 1999; Hale et al., 2002). We have to note, however, that there is also evidence, mainly from studies using factor analysis, that tests measuring phonological short-term memory capacity and instruments assessing complex verbal working memory capacity are in fact diagnostic tools that tap the same underlying construct (for a recent study on this issue see Colom et al., 2006). Complex working memory has been found to influence mathematical abilities (Logie et al., 1994, cited by Gathercole, 1999) as well as intellectual abilities such as following directions, note-taking, writing and reasoning (Engle et al., 1999). In a recent paper Gathercole and Alloway (in press) argue that working memory "acts a bottleneck for learning" (p.12).

Language learning is in this respect very similar to the acquisition of literacy and arithmetic skills and also requires that children maintain information in working memory while engaging in various cognitive activities. Phonological short-term memory was found to be related to the ability to acquire new words in L2 (Cheung, 1996; Papagno & Vallar, 1995; Service, 1992; Service & Kohonen, 1995; Speciale et al., 2004). Ellis and Sinclair (1996) presented experimental evidence that rehearsing foreign language material has beneficial effects on both comprehending and learning foreign language words, metalinguistic knowledge of grammar, accuracy in pronunciation and productive grammatical fluency and accuracy. O'Brien et al. (2006) showed that there was a link between phonological memory and oral production skills and that the nature of relationship between measures of

phonological short-term memory and various assessments of oral performance was different between proficient and less-proficient L2 speakers.

Research on complex working memory and language skills is less abundant than studies investigating the role of phonological short-term memory. Most of these studies use the reading span task, the validity of which as a measure of verbal working memory capacity is questionable (Waters & Caplan, 1996; Caplan & Waters, 1999). To our knowledge, no studies in the L2 field have used the backward digit span despite the fact that considerably fewer validity issues have been raised concerning this test than the reading span test (Hale et al., 2002). Harrington and Sawyer (1992) found that L2 reading span scores showed high correlations with performance on the grammar ($r=0.57$, $p<0.01$) and the reading and vocabulary ($r=0.54$, $p<0.01$) sections of the TOEFL exam. Miyake and Friedman (1998) obtained evidence for the causal role of working memory in certain aspects of second language proficiency (e.g. syntactic comprehension) using path analysis.

In our study we investigate three of the issues recently raised in connection with the traditional concept of foreign language aptitude: the relationship of foreign language aptitude and working memory capacity, the role of foreign language aptitude in predicting success in the framework of communicative language teaching combined with focus-on-form instruction and the stability of language aptitude in the course of language learning. As can be seen from the review of literature, all of these issues have been investigated in previous research, but never in the framework of a single study. Moreover, no studies examining the role of aptitude in communicative language teaching have used a comprehensive language testing instrument that measures attainment in productive and receptive skills as well as linguistic competence. Finally our study is novel in applying a quasi-experimental design to test the effect of language learning experience on language aptitude. We would like to point out here that in

our study the term language aptitude is used for the traditional Carollian concept of language aptitude as measured by the HUNLAT.

Our research questions were the following.

1. What is the relationship between language aptitude and attained competence in the four skills and linguistic knowledge at the end of an intensive course in English that used communicative methods of instruction combined with focus-on-form?
2. How are complex verbal working memory capacity, phonological short-term memory and language aptitude related?
3. Does language learning experience influence performance on the language aptitude test?
4. Does language language learning experience have an effect on phonological short-term memory capacity?

Our hypotheses were the following:

Hypothesis 1. There will be a moderately strong correlation between the measures of language aptitude and language proficiency.

Hypothesis 2. There will be a moderately strong correlation between language aptitude scores and working memory test scores.

Hypothesis 3. There will be a moderately strong correlation between language aptitude scores and phonological short-term memory test scores.

Hypothesis 4. There will be a significant difference between the gain in language aptitude test scores between students in the bilingual school and students of the regular school.

Hypothesis 5. There will be no significant difference between the gain in phonological short-term memory scores between students in the bilingual school and students of the regular school.

3. Method

3-1. Participants

The main research site was a Hungarian-English bilingual secondary school in Budapest. The participants were so-called zero-grade students, taking part in an intensive language training programme from September 2005 to June 2006. The aim of this programme is that students achieve a level of proficiency in English which enables them to study several school subjects in English in the following four years of secondary school. These students would be ninth graders in a regular secondary school, and their age was between 15 and 16 years.

Out of the 72 students enrolled in the zero-year programme, 59 students had either not learned English in primary school, or the level of proficiency they reached was assessed as elementary in a placement test, and therefore they started from beginner level (corresponding to A1 in the Common European Framework of Reference (Council of Europe, 2001)). According to the foreign language program co-ordinator of the school, students' level of proficiency in the other group not included in the study was at the A2 level (Council of Europe, 2001). In order to have a comparable sample with the students forming the control group students at the A1 level were selected for the study. One student was excluded from the study because his mother tongue was not Hungarian. HUNLAT tests were completed by 54 students on both occasions. 43 students from the experimental group completed all the tests on every occasion. Three participants were excluded from the analysis because of their outlying scores (the difference in their scores between the two testing sessions was larger than

two standard deviations). These outlying scores were indications of the possibility that students were either not paying enough attention or did not take the test seriously enough on one of the occasions. Therefore altogether 40 students' data in the experimental group could be analyzed in the present study.

The students studied English in five small groups, and they were taught by five teachers, including one native speaker teacher, who collaborated very closely. They had sixteen 45-minute English lessons per week (amounting to 576 hours of instruction by the end of the academic year), and four additional English for special purposes lessons (mathematics, physics, geography and history). The teaching method was predominantly communicative combined with focus-on-form instruction.

In order to distinguish the effects of intensive language learning from those of natural maturation, a control group consisting of students in a regular secondary school was also tested. In this school, 33 ninth-grade students (from the same class) took part in the research. 23 students completed all the tests. These students did not receive special instruction in foreign languages in their school, and they had four 45-minute lessons per week in a foreign language. The teaching method used in the case of these students was also predominantly communicative combined with focus-on-form instruction.

Two students were excluded from the analysis because of their outlying scores (the difference in their scores between the two testing sessions was larger than two standard deviations). In sum, 21 participants' data from the control group were submitted to analyses in the present study.

3-2. Instruments

Students in the bilingual school completed a language proficiency test, a backward digit span task, the non-word test and the language aptitude test in September and June. The control group took the aptitude test and the non-word test on two occasions.

The backward digit span task is widely recognized as a measure of complex working memory capacity, involving both the central executive and the phonological loop (Gathercole, 1999). The material for the test was adapted from the digit span test published by Racsmány et al. (2005). In this task participants hear sequences of random digits (with a one-second pause between the items) and have to repeat the numbers in reverse order. Sequences of 3 to 9 digits were presented in sets of four in an increasing order. If a participant successfully repeated two sequences from a set the other two were skipped. Backward digit span was calculated as the highest number of digits a participant could successfully repeat in at least 50% of the cases (at least two times out of four presentations).

The Hungarian version of the non-word span test was developed by Racsmány et al (2005). It consists of 36 non-words which conform to the phonotactic rules of Hungarian. The non-words are presented in a specific order, and participants have to repeat them one by one. Each non-word consists of one to nine syllables, and a set of four non-words corresponds to each number of syllables (the sets are not presented together). We recorded the test material with a digital voice recorder and presented it using portable CD players. Each student was tested separately in a quiet room by the authors of the article. On the basis of the participants' performance, their non-word span was calculated, which is the highest number of syllables the participant can repeat in 50% of the cases (at least two times).

The Standard Hungarian Language Aptitude Test (HUNLAT, Ottó, 2002) consists of four subtests described below.

1. Hidden Sounds

This test is a modified version of the 'Phonetic script' task of the MLAT and intends to measure phonetic coding ability. Participants listen to 54 consonant-vowel-consonant sequences and follow the transcription of these sequences in the test booklet. Afterwards they hear 20 similar sound sequences, and they have to indicate on the answer sheet which one of four possible transcriptions corresponds to the given sound sequence. There is also a 'none' option. The subtest takes about 10 minutes.

2. Language Analysis

This subtest, which was adapted from the Pimsleur's (1966) Language Aptitude Battery aims to measure inductive language learning ability. Participants are given a set of words and sentences in an artificial language along with their Hungarian translations. On the basis of this information, they have to translate 20 Hungarian sentences to the artificial language and choose the correct solution from four alternatives. Participants have 15 minutes for this subtest.

3. Words in Sentences

Participants have 10 minutes to solve 20 items, each consisting of two Hungarian sentences. One word is underlined in the first sentence. In the second sentence, five words are underlined of which participants have to choose the one that fulfils the same function as the underlined word in the first sentence. This task is based on a similar subtest of the MLAT and is assumed to measure grammatical sensitivity.

4. Vocabulary Learning

This subtest, which was adapted from the MLAT, measures rote learning ability. Participants have 5 minutes to study a list of 24 Swahili words and their Hungarian equivalents. Then they have 10 minutes to choose the Hungarian equivalent of 20 Swahili words from five alternatives.

The students' end-term exam was a Cambridge First Certificate Exam, which was conducted by the teachers of the school. The written paper consisted of reading and listening comprehension, composition, and a Use of English test. The reading and listening comprehension sections contained three texts each, accompanied by multiple-choice items and questions requiring short answers. The Use of English test measured students' knowledge of vocabulary and grammatical constructions. In the composition task students had to write in three different genres, which were evaluated on the basis of their content and accuracy. The oral exam consisted of an interview, a picture description task and a problem-solving task in pairs.

3-3. Procedures

The language aptitude test and the phonological short-term memory test were administered at the beginning (in September 2005) and at the end of the academic year (in June 2006) in both schools. The difference between the times of administration in the two schools was no more than two weeks on either occasion. In the bilingual school, the language aptitude test was administered by the teachers of the school with the aid of the CD recording. In the other school, the language aptitude test was administered by the first author.

Students from both schools took the phonological short-term memory test, but the backward digit span test was only performed by the students in the bilingual school. Students were tested individually by both authors in a quiet room in June. The test material was recorded and was presented using portable CD players.

The Cambridge First Certificate Exam was conducted by the teachers of the school. Students' performance both in the writing and speaking component was assessed independently by two teachers who did not teach the students during the school year. The

teachers participated in a rater-training session prior to the exam and final scores were agreed on by both teachers. We received the results of the exam including the scores achieved in the subtests from the teachers of the school.

4. Results

The students of the bilingual school excelled in their Cambridge First Certificate Exam at the end of their year of intensive English language learning. Only six of the 72 students failed the exam (they achieved less than 66% of the total score). Appendix 1 contains the means and standard deviations as well as the minimum and maximum scores for each paper and the total of the exam. The mean of the total points achieved is 161.82 (SD=15.21), which is 72.85% of the total score. The students of both schools achieved high scores on the HUNLAT. In the bilingual school, the mean of the HUNLAT Total was 53.41 at Time 1, and 60.82 at Time 2, whereas in the control group the mean values were 58.38 at Time 1 and 60.67 at Time 2. These results are higher than those obtained in the previous Hungarian survey of students participating in a preparatory foreign language training year (Nikolov & Ottó, 2006). In a study by Ottó and Nikolov (2003) first-year university students achieved similar results with a mean of 55.79 points (Appendix 2 and 3 summarize the descriptive statistics for HUNLAT).

Non-word repetition scores were very similar both across groups and at the two different testing occasions. The average number of syllables students could repeat in the experimental group at Time was 7.49 (SD = .64) and at Time 2 7.31 (SD = .73). The non-word span of students in the control group at Time was 7.67 (SD = .65) and at Time 2 7.57 (SD = .87). Backward digit span was only measured in the bilingual school in June 2006. The mean was 5.38 (SD=1.12), which indicates that participants were able to repeat about 5 numbers in

reverse order. The non-word span scores of our participants are higher than the national average of this age group as found by Racsmány and his colleagues (2005), whose participants aged between 12 and 16 scored 5.17 syllables. There is no Hungarian normative data available concerning the backward digit span task. Although the mean values for these tests indicate that the participants have very good cognitive abilities, the standard deviation figures and the distribution of the scores showed enough variation to be able to carry out correlational analyses.

In order to answer the first research question, we examined the correlations between language proficiency measures and language aptitude scores achieved at the beginning of the intensive language teaching program (Time 1) and at the end of the school-year (Time 2). The results are presented in Table 1.

The figures in Table 1 indicate that correlations between the total score on the language aptitude test at Time 1 and 2 and the language proficiency exam results are significant, but relatively low. The common variance of these two variables is approximately 10%. The results also reveal that the correlations are somewhat different at Time 1 and Time 2, although the strength of relationship between the total HUNLAT and proficiency score remains the same on both occasions. At Time 1 it is speaking test scores and the total proficiency test score that are related to the total number of points achieved on the language aptitude test, whereas at Time 2, it is reading, Use of English and the total test score that shows correlations with the total HUNLAT score. Among the sub-components of aptitude at Time 2, it is only Language analysis and Vocabulary learning scores that correlate with results on the reading test. At Time 1, we find considerably more significant correlations among the sub-components of HUNLAT and the various proficiency test components, the two strongest ones being the relationship between Language analysis and writing and Words in sentences and speaking.

INSERT TABLE 1 ABOUT HERE

In an attempt to answer our second research question, we correlated measures of working memory (backward digit span) and language aptitude at Time 1 and Time 2 (see Table 2) in the case of students studying in the intensive language teaching program (experimental group). Backward digit-span was moderately correlated with the total HUNLAT score both at Time 1 and Time 2. The Language analysis sub-test of HUNLAT at Time 1 was related to performance on the working memory test. We also examined the relationship of phonological short-term (non-word span) and language aptitude both at Time 1 and Time 2 in the case of the experimental group (the analysis was not carried out separately for the control group because the number of students in this group was not sufficient for correlational analysis). As can be seen in Table 3, non-word repetition scores showed no correlation with language aptitude results on any of the occasions for the experimental group. We obtained no significant results either when all the participants' non-word scores were correlated with HUNLAT scores. In order to investigate the differential effect of working memory and language aptitude in language learning success, we carried out regression analyses. We found that if these two variables are simultaneously entered into the equation, backward digit span is the sole predictor (R square = .21; $\beta = .46$, $p = .003$) and the HUNLAT score is not a significant predictor variable ($\beta = .22$, $p = .14$).

INSERT TABLES 2 AND 3 ABOUT HERE

In order to investigate the effect of language learning experience on performance in the language aptitude test, we compared the gains of the experimental group, which was the

group of learners receiving intensive foreign language instruction, and that of the control group comprising learners from the regular secondary school by means of independent samples t-test. As can be seen in Table 4, the experimental group improved significantly more during the one-year of intensive language learning program in terms of general language aptitude than the control group. We can also see a significant difference between the two groups in the gain in the Hidden sounds and Words in sentences component of the test. Cohen's d indicates a large effect for the total HUNLAT gain and improvement in the Hidden sounds test and a moderate effect for the Words in sentences sub-test. We also have to note that students from both schools scored significantly higher on HUNLAT in June than in September (experimental group t (df 39) = 7.64, $p < .001$; control group (df (19) = 2.01, $p < .05$). As shown in Table 4, there was no difference in the gains on the non-word repetition test between the groups, and the performance of the groups did not improve between Time 1 and Time 2 either (experimental group t (df 39) = 1.36, $p = .18$; control group (df (19) = .56, $p = .57$).

INSERT TABLE 4 ABOUT HERE

5. Discussion

Our first research question concerned the role of the traditional concept of language aptitude in predicting language proficiency attained in an intensive language learning program that uses communicative methods combined with focus on form instruction. In Hypothesis 1 we assumed that there would be a moderately strong correlation between language aptitude as measured by HUNLAT and achievement. Our hypothesis, however, was only partially supported, as we found a relatively weak relationship between overall proficiency scores and

the total score on HUNLAT. The correlation between the total proficiency and aptitude score is lower than the level of correlations found in the studies of Ehrman and Oxford (1995), and Harley and Hart (1997). This indicates that indeed Dörnyei (2005) and Robinson (2005) rightly raised the criticism concerning the traditional construct of language aptitude that it does not adequately describe the abilities students need to draw on when studying in communicative classrooms. Total language aptitude scores when measured at the onset of language learning were found to be correlated with speaking test scores, and at Time 2 with reading and Use of English scores. If we observe the relationships between the different subtests of the aptitude and proficiency measures, we find that the Language Analysis subtest of the HUNLAT correlates with the writing component and listening component of the proficiency test. This subtest measures inductive language learning ability, which seems to play an important role in discovering grammatical regularities in the input (see also Harley & Hart, 1997). It can be assumed that it is through the correlation with grammatical accuracy as a component of writing assessment that Language Analysis at Time 1 comes to play a relatively strong role in overall writing scores. We can also hypothesize that this is the case concerning the relationship of the Words in sentences and performance in the speaking test, where accuracy was also one of the components assessed. Our results indicate that if language aptitude is assessed at the onset of language learning, only the two tests of metalinguistic abilities (Language analysis and Words in sentences) seem to be important in influencing attainment in various skills. It can be seen very clearly from our results that if language aptitude as measured by HUNLAT had any relevance for our participants in the foreign language classroom, its role is mainly confined to predicting achievement in the attainment of grammar and vocabulary knowledge and the ability to use this knowledge in on-line performance.

The results also reveal that there is little difference between the correlation between the total scores of the proficiency test and that of HUNLAT when measured at the onset of the language learning program and when assessed simultaneously with language proficiency. If, however, the sub-components of HUNLAT are correlated with the various competencies measured by the proficiency exam at Time 1 and Time 2, different patterns of correlations emerge. This indicates that aptitude tests should ideally be administered before students start language learning and not be tested parallel with language proficiency as done in a number of previous research projects (e.g. Kiss & Nikolov, 2005).

The second question we investigated was the relationship of working memory and language aptitude, which question was directed at finding support for Miyake and Friedman's (1998) working memory as language aptitude hypothesis. Hypothesis 2 was supported as we found a moderate relationship between backward digit span scores and the total HUNLAT score both at Time 1 and Time 2. The HUNLAT and backward digit test results share approximately 13% of the variance, which indicates that these two constructs are related but are not interchangeable. The level of correlation found between the backward digit span and language aptitude total score closely approximates Robinson's (2002a) results despite the fact that he used a reading span task to assess working memory capacity. The pattern of correlations also reveals that the only significant relationship between working memory and components of aptitude is with the Language Analysis sub-test. This indicates that the ability to maintain and manipulate verbal information in working memory influences the efficiency with which students can deduce linguistic rules from the input in a language unknown to the students as measured by the Language Analysis sub-test of HUNLAT. This task is actually an explicit learning task with a rule-search condition, for which Robinson (2002a) only found an effect of working memory in the listening version of the grammaticality judgement task.

Our results also indicate that Miyake and Friedman rightly attribute a highly important role to working memory capacity in language learning as the regression analysis we carried out reveals that that there is a strong relationship between attainment in an intensive language course and working memory test scores (see also Kormos & Sáfár, in press), and that working memory is a better predictor of language learning success than the traditional construct of language aptitude. Our results tend to lend support to Robinson's conceptualization of language aptitude complexes, since they reveal that some components of language aptitude as measured by HUNLAT are related to working memory capacity, but they do not overlap. Our previous research (Kormos & Sáfár, in press) as well as the present study suggests that various aptitude components play a different role not only in different tasks but in the attainment of different skills such as speaking, listening reading and writing. Our findings also show that although phonological short-term memory capacity is generally known to play an important role in first language acquisition (Gathercole & Alloway, in press), it is a cognitive variable that is not related to foreign language aptitude. As our previous study with a similar population indicates, in the case of learners progressing from the beginner to the intermediate level, phonological short-term memory capacity has little effect on attainment in L2 (Kormos & Sáfár, in press).

Our third question addressed the issue of the stability of language aptitude over time. The results show that the performance of the participants on the HUNLAT both in the control and the treatment group was different at the two testing occasions. When comparing the differences between Time1 and Time2, we found that the change between the two occasions was significantly higher in the bilingual school in the case of the Hidden Sounds and the total HUNLAT score, which supports our fourth hypothesis. The results indicate a strong practice effect for both groups and an effect of intensive language instruction on the performance on the HUNLAT.

Research in the field of dyslexia reveals that phonological sensitivity, which is the ability measured by the Hidden sounds test, can be improved with the help of compensatory teaching (Nijakowska, in press). It seems that intensive language learning without considerable explicit training in phonological sensitivity can also contribute to the enhancement in non-learning disabled students' ability to recognize and memorize different sounds.

The t-test comparing the gains of the two groups indicated that students in the intensive language teaching program also improved in the Words in Sentences component of HUNLAT. If we examine this task, it becomes apparent that in this task students have to draw on their literacy skills. The recognition of the role different words play in sentences is explicitly taught in elementary schools; therefore this component of HUNLAT (and MLAT) does not measure an underlying cognitive ability but rather a literacy skill. Since in instructed SLA, it is highly important to understand the grammatical function of lexical items, it is understandable that the ability to identify grammatical functions develops in intensive language learning.

In sum, our results show that language learning exerts important influence on certain traditional components of language aptitude, which indicates that some of the constructs HUNLAT is purported to measure are not abilities but skills that can be trained. Although we were not able to measure improvement in the backward digit span test, our results concerning the stability of performance on the non-word repetition test indicate that phonological short-term memory capacity is not influenced by language learning experience (Hypothesis 5).

6. Conclusions

Our research investigated three issues recently raised in connection with the traditional conceptualization of foreign language aptitude: the role of aptitude in communicative language classrooms, the stability of language aptitude in the course of language learning and the relationship of working memory capacity and language learning outcomes. Our results reveal that as hypothesized by theoretical papers in this field (e.g. Dörnyei, 2005; Robinson, 2005; Sawyer & Ranta, 2001), the Carrollian concept of language aptitude needs to be revised considerably. In this study we found that if students are instructed with primarily communicative methods combined with focus on form, language aptitude as measured by HUNLAT has moderate power in predicting success in language learning. Its role is mainly confined to influencing the acquisition of grammar and vocabulary, and it has small predictive power on complex skills such as reading, listening, speaking and writing. The range of significant correlations between working memory capacity and language proficiency we obtained in a previous study (Kormos & Sáfár, in press) and the results of regression analysis reveal that working memory capacity is indeed a key underlying cognitive variable affecting both language aptitude and language learning success. The correlations between language aptitude and working memory and the different components of language proficiency also show that students need to draw on different abilities when acquiring various foreign language skills, which further extends Robinson's (2002b) ability differentiation hypothesis from tasks to linguistic sub-skills such as reading, writing, listening and speaking. Our results also support the hierarchical nature of cognitive abilities (Robinson, 2002b) as it seems that working memory and deductive skills are abilities of primary importance and other traditional components of aptitude play a secondary role.

The other main lesson that can be learnt from our study is that language aptitude as conceptualized by Carroll and Sapon (1959) is not an ability unaffected by experience. A major effect of intensive language learning could be detected on performance in the sub-test

of HUNLAT measuring phonological sensitivity, which also resulted in a significant increase in the overall language aptitude test score. The results indicate that this aptitude component is a skill rather than an underlying ability. This skill develops spontaneously during language learning, but as the results of studies with dyslexic language learners reveal (Nijakowska, in press), it can also be improved through systematic training.

One of the limitations of our study is the use of correlational design in investigating the relationship between attainment in L2 and language aptitude. Finding significant correlations is no proof for the direction of causality, nor does it reveal its very existence. As the results of our study show, it might well happen that high-proficiency students have more language learning experience and thus higher aptitude and do not necessarily perform well in an L2 simply because they score high on the aptitude test. The other limitation of this study concerns its generalizability. Participants had generally good cognitive abilities, and they participated in a highly intensive language training programme. These circumstances necessarily warrant future research with students who have lower levels of cognitive abilities. Further studies would also be needed to uncover the role of working memory capacity in performing various language learning tasks and in being able to benefit from the linguistic input and the output demands of these tasks.

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Appendix 1. Descriptive statistics for the Cambridge First Certificate Exam (n=40)

	Mean	SD
Reading (56)	45.92	4.93
Writing (40)	30.67	3.55
Use of English (75)	48.56	8.33
Listening (30)	21.74	2.72
Speaking (20)	14.92	2.44
Total (221)	161.82	15.21

Appendix 2. Descriptive statistics for the language aptitude test in the control group (n=21) at Time 1 and Time 2

		Mean	SD
HUNLAT Time 1	Hidden Sounds	14.81	2.37
	Language Analysis	16.19	1.88
	Words in Sentences	12.48	4.19
	Vocabulary Learning	14.90	3.53
	Total	58.38	8.48
HUNLAT Time 2	Hidden Sounds	15.33	2.95
	Language Analysis	17.05	1.46
	Words in Sentences	11.86	3.90
	Vocabulary Learning	16.43	3.60
	Total	60.67	8.32

Appendix 3. Descriptive statistics for the language aptitude test in the experimental group (n=40) at Time 1 and Time 2

		Mean	SD
HUNLAT Time 1	Hidden Sounds	12.77	3.51
	Language Analysis	15.41	2.11
	Words in Sentences	10.38	3.30
	Vocabulary Learning	14.85	3.74
	Total	53.41	7.39
HUNLAT Time 2	Hidden Sounds	15.15	2.67
	Language Analysis	16.97	.90
	Words in Sentences	11.87	3.78
	Vocabulary Learning	16.82	3.41
	Total	60.82	7.19

Table 1 Correlations of language proficiency measures and language aptitude at the beginning (T1) and end (T2) of the school year (n= 40)

	Hidden sounds T1	Language analysis T1	Words in sentences T1	Vocabulary learning T1	HUNLAT Total T1	Hidden sounds T2	Language analysis T2	Words in sentences T2	Vocabulary learning T2	HUNLAT Total T2
Reading	.05	.15	.36*	.17	.31	-.07	.38*	.26	.32*	.32*
Writing	-.06	.44**	-.04	.21	.18	.05	.02	.02	.14	.10
Use of E.	.09	.25	.21	.18	.30	.19	.18	.28	.29	.38*
Listening	.04	.34*	-.20	-.07	-.01	.02	.23	.08	.06	.11
Speaking	-.03	-.07	.44**	.28	.34*	-.01	.07	.19	.05	.06
Total prof.	.06	.34*	.26	.23	.36*	.08	.27	.29	.30	.36*

** Correlation is significant at the 0.01 level.

* Correlation is significant at the 0.05 level.

Table 2 Correlations language aptitude and working memory scores in the experimental group (n= 40)

	Hidden sounds T1	Language analysis T1	Words in sentences T1	Vocabulary learning T1	HUNLAT Total T1	Hidden sounds T2	Language analysis T2	Words in sentences T2	Vocabulary learning T2	HUNLAT Total T2
Backward digit	.31	.33*	.16	.08	.36*	.10	.17	.29	.27	.34*

* Correlation is significant at the 0.05 level.

Table 3 Correlations language aptitude and phonological short-term memory scores in the experimental group (n= 40)

	Hidden sounds T1	Language analysis T1	Words in sentences T1	Vocabulary learning T1	HUNLAT Total T1	Hidden sounds T2	Language analysis T2	Words in sentences T2	Vocabulary learning T2	HUNLAT Total T2
Non-word span	.14	.04	-.03	.24	.18	.20	-.02	-.13	.19	.08

Table 4 Comparison of the control (n= 21) and the experimental group (n= 40) in terms of gains in language aptitude scores

	Group	Mean	SD	t	Sig.	D
Hidden sounds	Experimental	2.38	3.06	2.38	.02	.66
	Control	.52	2.50			
Language analysis	Experimental	1.56	1.91	1.42	.16	.19
	Control	.85	1.65			
Words in sentences	Experimental	1.48	3.51	2.04	..04	.25
	Control	-.62	4.31			
Vocabulary learning	Experimental	1.97	4.11	.45	.65	.13
	Control	1.52	2.71			
HUNLAT Total	Experimental	7.41	6.05	3.34	.001	.93
	Control	2.28	4.84			
Non-word span	Experimental	-.17	.82	-.38	.70	.10
	Control	-.09	.76			

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