Cognitive development, aptitude and language learning in Greek young learners.

Alexiou, Thomai

Cognitive Development, Aptitude and Language Learning in Greek Young Learners

Thomaï Alexiou

A thesis submitted for the degree of
Philosophiae Doctor

University of Wales
Swansea

2005

ACKNOWLEDGEMENTS

This is by far the most difficult writing part of this PhD thesis. For how can I possibly acknowledge with simple words my gratitude towards my supervisor, Dr James Milton, who has been more than a mentor and an immense influence on me during these three years. I owe more debt to him than I could ever repay or tell as he is the one who gave me the opportunity to start this thesis and meeting him at a turning point in my life, took me under his wing and supported me in all ways possible. The production of this thesis is beyond any doubt the product of his invaluable help. I was blessed to have him next to me step by step not only as my supervisor but as a good friend. My admiration towards him is everlasting and my gratefulness never-ending.
Jim, σ'ευχαριστώ πάρα πολύ για όλα.

Heartfelt thanks to the owners of the English Institutes and Nursery schools as well as the teachers, for kindly allowing me to do the tests with their learners, hence giving me the opportunity to carry out this research. I would also like to thank the children whose enthusiasm kept me going and inspired me throughout the whole thesis.

Many friends stood by me all the way. My thanks therefore go to Marianna for always being here for me, Vaggelis for being all that he is, Thalia for the long phone talks, Christine for calling me at the most appropriate times, and Huang for his help, patience and invaluable friendship during this final year. I'm also grateful to my friend Nicola Hopkins for helping me with the final version of the test and creating the software under my, sometimes, too demanding instructions.

Special word of thanks to Helen, for being a loving sister and the fastest typist when I was desperate!

Last but never least, I would like to express my warmest thanks to my parents, Constantinos and Anastasia, whose support was once again unfailing. I thank my father who taught me how to think and my mother who showed me how to feel. I'm the luckiest person on earth for having you in my life. You are my world's treasure.

DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

STATEMENT 1

This thesis is the result of my own investigation except where otherwise stated.

Other sources are acknowledged by footnotes giving explicit references. A bibliography is appended.

STATEMENT 2

I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

SIGNED .. ..

DATE ....04/03/05...

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES AND CHARTS

Abstract

Current views of foreign language learning aptitude are adult orientated. Descriptions of aptitude are cast in terms of sophisticated language abilities and these are investigated by means of complex language tests. It is not possible within this framework to test, or even describe, aptitude in young children since their language capacities are still developing.

Recent studies support the idea that there is a link between the general cognitive skills that learners possess and their success in learning their second language. They can suggest, therefore, which separate elements of cognitive ability may be part of language learning aptitude in children.

A series of research concerning the relation between general cognitive skills and second language success has been conducted during the past three years. The studies are done in Greek schools and involve young learners of 5-9 years.

The results suggest that tests of general cognitive skills such as memory and analytic ability are very good predictors of foreign language learning success. In this, aptitude in young learners appears to be very similar to aptitude in adults. These cognitive skills appear to improve with age so it can be argued that in certain ways older learners are actually better language learners than children.

Yet, the question of a 'window of opportunity' and the age effect still remains open. As other researchers have supported comprehensible and continuous exposure, appropriate methodology and trained teachers are more promising than the onset time.

The study offers convincing evidence that the nature of language learning aptitude might not be fixed at least at that age and there is a possibility that at that stage it might actually be plastic. This does not mean that one could instruct everyone to be equally good at learning languages using the cognitive skills suggested here. It does imply, however, that practice and improvement on certain abilities that relate to language may well facilitate effective learning at least to some extent.

A test of cognitive skills that appear to relate to foreign language learning is devised at the end that could hopefully offer a valuable source for a child's learning profile at the very beginning of learning.

We can not teach directly a person.
What we can do is to facilitate his learning.
Carl Rogers

INTRODUCTION

One of the major puzzles in the second language acquisition field is the matter of differential success. Methodologists, teachers and researchers have attempted, in the course of years, several approaches, trialled numerous methods to achieve language mastery for their learners. However, it is clear that there is no 'recipe' or no perfect teaching method that can guarantee that. Furthermore, even mixture of several approaches has proved unhelpful or unsuccessful at times. Hence, the mystery of second language learning acquisition is inevitably and closely tied to individual differences.

Individual differences include variables such as learning styles/strategies, motivation, personality traits and aptitude. All these variables have been studied for young learners except for aptitude. Language learning aptitude is a subject that has received intermittent attention from researchers for almost 100 years but has, hitherto, been interested with foreign language learning among adults. One of the reasons this might be the case, is that teachers feel uncomfortable with any kind of 'differentiation' when it comes to second language learning for young learners.

It is undeniably true that all learners can learn a second language, however, the rate and ease of learning is another story. And no matter how hard teachers might try, language mastery is not the direct outcome of teaching in several cases. It seems plausible that even at the earliest stages learners are different and achieve different levels of performance. Simplifying a priori the success equally for everybody seriously ignores learning speed, adoptive comprehension and facility.

Recent changes in schools and curriculum design across the European Union, has involved the teaching of foreign language to learners at a significantly younger age. While learners at this young age are clearly different from adults, there appears to be no model of foreign language learning aptitude for this group as there is for adults.

Children are expected to be variable in language development as in many other aspects of learning. The differential approaches to mastery might unveil important things about learning, language, and the study of developmental process. It is promising therefore, to research or attempt to test aptitude at the earliest stage possible.

Aptitude to date is presented as language specific, separate from cognitive abilities. It is also regarded as a fixed ability and unchangeable quality across age. Researching aptitude in young learners, however, poses some serious questions on these claims. The aptitude tests currently in use are quite old and rather inappropriate for young children. This is because these tests are addressed to older learners and include sophisticated, complex language tasks. What is more, they do not take into consideration new insights on language learning process, individual styles or brain hemispherity.

I have been teaching young learners for four years and several observations and questions prompted me to embark on research in this area. These are questions that emerged in various situations, starting from when I was a student in the Department of Pre-School Education to the time I was trying to teach English in a loud classroom of restless young learners. They are also questions that parents, children, learners came to ask, and I asked myself, at different situations and for different reasons. I have often found a situation where a child is bright and with no apparent reason has difficulty in learning a second language. This, in the worst scenario, could result in negative attitude towards the language, fear or quitting which I tried to avoid as hard as I could.

I have also had children who were 'fast' learners and seemed to grasp the new language immediately, almost effortlessly. Still, in a mixed ability class, I tried to cater for them as well as 'slower' learners. I often noticed that the fast children might feel 'bored' quickly as the pace of learning has to be slower. Another observation was that I have tried numerous methods with the same children in the same class; however, the learning results at the end of the year were quite different among them.

Sometimes I thought learning styles are important and if I knew the individual ones I could place them in different classes and the teaching would be more effective. Other times, I felt that some of the children might not be cognitively 'ready' to start a second language. Thus, while it seems clear that young learners will vary in language learning, it is not clear exactly how they vary, nor is it clear what to do when they do vary in this way.

Therefore, the central aim of this thesis is to devise aptitude tests for young learners which might enable predictions for future learning, having in mind certain limitations such as motivation, environment, attitudes, and personality traits. The tests are in no terms intended to be completely deterministic, but rather indicative and convincing that aptitude indeed exists, and the knowledge of the nature of aptitude can be profoundly beneficial, especially at this age. Consequently, the function of the test would ideally be diagnostic rather than merely predictive.

It would be helpful if some evidence from the young language learner reveals the nature of aptitude at that stage, but most importantly, how learning takes place and what learning qualities predispose some learners to be progressively better, faster or more successful in learning the language than others. This kind of evidence can offer diagnosis of individual learning preferences and styles. Individual differences in development might suggest different possible learning sequences or strategies. These, in turn, can reveal more on second language development for young children, which will help tailoring the classroom environment and instruction. At all times, however, it should be borne in mind that these individual differences might mirror issues of performance variability, cognitive styles/preferences, learning strategies but not competence.

In an attempt to provide context for the sections that follow (aptitude and cognitive development for young learners) here are some general assumptions for young learners' foreign language acquisition. These assumptions and the implications emerging from them also shed more light on the importance of studying in this area.

Assumptions for young learners' foreign language acquisition

The mode is now fashionable to start a foreign language the earliest possible. This has several implications in teaching and learning. It is therefore necessary to know that children learn in different ways than adults, thus, different teaching approaches should be practiced. In the course of second language learning for young learners there have been assumptions that are hypothetical, antithetical or supported with different series of studies. This thesis aims to address these particular questions with young learners in mind when the results of all the experiments will be derived. Here are the main assumptions concerning foreign language learning in young children.

1. The earlier children start learning a foreign language, the better they will be at it.

The starting age question has been feverishly discussed especially during the last years. Some researchers support strongly that the earlier children begin to learn a second language, the better (e.g. Krashen, Long and Scarcella 1979) whereas other argue that older learners are better than younger learners (Stern, Burstall and Harley 1975). Several European studies have yielded similar outcomes (e.g. Florander and Jansen 1968).

Cook (1986:23) favours the early starting age and explains that 'The Critical Period Hypothesis advanced by Lenneberg suggested that the ability to learn languages naturally atrophied after the early teens (Lenneberg 1967) although more recently it has been shown that lateralization does not exactly happen during puberty but even before (see more about this issue at 1:7:5). The Monitor Model, too, sees a change as learners become able to monitor their output at about the same time, which is not always to the older learners' benefit (Krashen 1981). Younger learners seem to be better at listening (Munõz et al 2002) and pronunciation and even achieving native-like pronunciation (for example Oyama 1976). Interestingly, Tahta, Wood and Loewenthal (1981a in Larsen-Freeman and Long 1991:156) state that:

> ...the children's ability to replicate intonation in longer phrases remained steady in the five-to eight- year range, and then dropped rapidly between ages eight and eleven, plateauing again in the eleven to fifteen range.

It is undeniable that starting a language in Grade 1 gives children more exposure to the language than beginning in Grade 6, but exposure in itself does not seem to predict or ensure language acquisition.

An interesting article on the age subject is published in Guardian and offers convincing account of what children psychological gain when starting younger:

> Earlier teaching may not always bring a better exam performance, but it does produce children who are at ease with a foreign language and its culture, more likely to enjoy it, see the point of it, and continue with it. Cheater says there is also evidence that learning a foreign language helps children to become literate in their own tongue. Early teaching also produces 11-year-old boys who aren't embarrassed to death by the thought of uttering a foreign word in front of their mates (Cook 2002:2).

The most interesting finding concerns ultimate attainment,

> ...where the focus is not relative learning speed but absolute abilities or their decline and possibly categorical loss. In long-term studies, those comparing achievement after several years of foreign language study and or residence in the second language environment, younger starters consistently outperform older ones, and only quite young children seem to be capable of native like attainment even after many years of target language exposure. Learners starting later than about six often become communicatively fluent but typically finish with measurable accents in phonology and with progressively later start, the data are beginning to show 'accents' in other linguistic domains as well (Larsen-Freeman and Long 1991:157).

Cook (1986:29) says that children are better in the long-term, adults in the short-term and Larsen-Freeman and Long (1991:155) conclude by stating that 'younger adults outperform older adults even in short-term studies' (Seright 1985 cited in Larsen-Freeman and Long 1991). The modest way to go in this subject is probably not to assume that languages are just being "picked up" (Landers 1990:2).

None of this research implies or suggests that early language learning and exposure can be detrimental. The present study will not focus on the matter of starting age effect but will be rather interested in different levels of achievement and matters of acquisition at different ages. Therefore, it aims to examine how much learners have achieved with instruction at the ages of five, six and seven and reflect on the individual differences that appear to be influential in these stages. It is also of interest to find how learners are behaving in several cognitive abilities and presume learning model for each stage, differences among them, similarities and comparison to adults' learning models from data already available.

2. Children learn foreign languages easily and quickly.

It has been claimed that children's brains are more flexible (Lenneberg 1967). Recently it has been argued that there is a 'window of opportunity' for languages (similar to the critical period hypothesis) when certain cognitive skills and language acquisition are more easily attained (Zafrana 2001).

Experiments have shown that there are indeed a lot of biological factors at work in language learning. In young learners, both hemispheres of the brain are responsible for the language function, while at puberty it is only the left hemisphere that takes over, which makes language acquisition and learning more difficult. This process is called lateralization and it may be responsible for learning differences between children and adults (Thanasoulas 2002).

Hyltenstam and Abrahamsson (2000:152) have more recently argued that 'younger learners acquire second language automatically from mere exposure, while older learners have to make conscious and laboured efforts'. Although this is generally accepted, research has revealed that merely increased exposure to English does not always mean speed in the acquisition of foreign languages (Cummins 1981; Ramirez, Yuen and Ramey 1991). However, input is vital and Munõz et al uses an excellent metaphor to describe this when she states:

> It would be an irresponsibility to leave all the difficulties of language learning to the assumed capacity of young learners to absorb like sponges, because sponges without water cannot absorb (Munoz et al 2002:11).

Spolsky (1989:97) cites Macnamara (1973), who argues that children learn better than adults because 'they try harder at communicating with their peers'. This might be true especially since young learners are, by nature, motivated to speak or learn any new code. As Munõz et al write (2002) 'Young children have intrinsic motivation, older have extrinsic motivation'. Yet, in different cultural backgrounds (Japan or China) shy and embarrassment are very common personality traits to be catered for even very young learners.

Tabors (1987) and Meyer (1989) say children will learn the new language quickly and easily benefiting from the child's ability to 'just pick languages up' (Landers 1990:8). This ability is believed to relate to a critical development stage when the brain is more flexible and capable of learning than is the older. This study will try to combine cognitive and linguistic status and offer more realistic expectations for teachers at these age levels. It purports also to offer convincing evidence that children do *not* learn foreign languages in the same way and at the same rate as may have been alleged.

3. Girls are generally better language learners than boys

It is a common assumption that girls at least at the beginning show stronger language abilities although data from different studies have often been contradicted. Cook (1986) cites studies where girls are better at language learning according to Asher and Garcia (1969) but the opposite show results by Gomes da Costa et al (1975) or Snow and Hoefnagel-Hoehle (1977). According to other studies, boys appear to be better in visuo-spatial abilities whereas girls outperform boys in verbal memory skills (Vecchi et al 2001). In this study, data from gender will be gathered and achievement both in cognitive skills and language achievement will be compared to contribute some more light on the argument.

4. Social factors affect foreign language success

Some researchers and many more educationalists claim that different rates and achievement of foreign language acquisition may reflect social factors (Newport 1990). Basil Bernstein (1960), sociologist, believes that 'differences in average levels of academic achievements depends on home background (language used).

This is most commonly known as the 'linguistic deprivation velocity'' (cited in Wood 1988:6/7).

In a very interesting paper by McLaughlin et al (1995:2) it is stated that:

> Mainstream children are accustomed to a deductive, analytic style of talking, whereas many culturally diverse children are accustomed to an inductive style. U.S. schools emphasize language functions and styles that predominate in mainstream families. Language is used to communicate meaning, convey information, control social behaviour, and solve problems, and children are rewarded for clear and logical thinking. Children who use language in a different manner often experience frustration.

Social class also influences learning styles. In urban, literate, and technologically advanced societies, middle-class parents teach their children through language. Traditionally, most teaching in less technologically advanced, non-urbanized cultures is carried out nonverbally, through observation, supervised participation, and self-initiated repetition (Rogoff 1990 cited in McLaughlin 2000). There is none of the information testing through questions that characterizes the teaching-learning process in urban and suburban middle-class homes (McLaughlin 2000:3).

This is a commonly accepted assumption, so it will be interesting to gather some data from different schools in this study. Data will be taken from public nursery schools, private nursery schools and foreign language schools to see whether there are differences in learning goals and achievements and to compare data on more levels and from several perspectives.

In the following section, language learning aptitude is thoroughly discussed to provide a background and set the scene of what the purpose of the studies will be.

CHAPTER ONE: FOREIGN LANGUAGE LEARNING APTITUDE

This chapter starts with an overview of language learning aptitude and offers a background of how researchers in the course of years understand the term. Following that, an examination of past and most recent aptitude tests along with their insights and weaknesses is provided. The main issues of aptitude and the limitations of the concept are then thoroughly discussed. At the end of the chapter, there is an attempt to show the importance of aptitude and its implications especially where young learners are concerned.

1:1. Overview

Language learning aptitude is a subject that has received intermittent attention from researchers for about 100 years but has, hitherto, been interested almost entirely with foreign language learning among adults.

The first attempts of developing aptitude tests start in 1920's and 1930's when linguists like Vander Beke (1925), Luria and Orleans (1928) and Hunt et al (1929) developed 'prognosis' tests (all cited in Sparks and Ganschow 2001). They were devised to determine good performance in foreign language learning situations and to discover benefits from foreign language instruction. Some time later, Symonds (1930) argued that there were three types of aptitude, namely ability in native language, general intelligence and 'quick learning tests in the new language' and much later, Kaulfers (1939) related aptitude to IQ and performance (cited in Sparks and Ganschow 2001:91).

After the Second World War better testing methods were wanted, possibly because the earlier tests tested for a more traditional idea of what a language consisted of, which then was the translation and reading of texts in classical languages. Learning modern foreign languages for communication became the vogue and so there was a need for a different type of aptitude test. Language is not a single unitary thing, it is a highly complex mixture of knowledge and skills and a multi-factored process. A language aptitude test has to be clear, therefore, as to what type of language performance it is testing for. Aptitude tests, interestingly, seemed to be quite vague and uninformative about this.

In 1958 Carroll and Sapon introduced a series of aptitude tests, known as MLAT (Modern Language Aptitude Test). These tests assume that language learning is seen as taking place explicitly in an academic environment, in schools and generally more formal settings. For 50 years, the Modern Language Aptitude Test has been used as a standard aptitude test aimed at adult learners. One of the important innovations, which this test introduced, was the idea that aptitude consisted of a number of general characteristics. A version for younger learners, MLAT-E (Modern Language Aptitude Test-Elementary) for learners aged 8 to 10 was also produced in 1967 but did not appear to enjoy the same prominence and acceptance as the adult version. Later, Pimsleur (1966) developed a new battery of tests, the PLAB (Pimsleur Language Aptitude Battery) where he attempted to discover the relationship between aptitude and IQ-a quite different approach to Carroll and Sapon who concluded this connection did not exist. Years later, Esser and Kossling (1986), took a cognitive approach in aptitude testing and performed a study with students that revealed very positive results, but unfortunately their study has not been followed up so far. Finally, Meara, Milton and Lorenzo-Dus devised LAT (Language Aptitude Tests), an updated and computerized set of aptitude test that is commercially available and has proved to predict well (Meara et al 2001).

This was a broad overview of the historical background in aptitude tests. What has been shown here confirms that the tests already in use are generally appropriate for academic classroom settings. The historical background confirms further that aptitude tests for young learners are non-existent for no apparent reason and there is a gap in research to predict or attempt to explain language learning in very young learners. In the next section, a more detailed review of aptitude and the most important aptitude batteries is offered to show how aptitude is viewed to date and what criteria have been currently used in testing.

1:2. Language Learning Aptitude: A hotly debated issue

Language learning aptitude (hereafter, aptitude) is a hotly debated and quite complicated concept. In dictionaries 'it is a natural tendency and inclination; an ability, capacity or talent; a quickness to learn or understand' (Oxford 1990:68). This definition alone is inadequate, simplistic and rather uninformative. While considerable work has been done to pin down ways of testing aptitude, there is still much discussion about what really constitutes the nature of aptitude. Aptitude implies an individual difference in language learning and refers to the natural ability to acquire language at a fast and easy rate. It is a common place that all people can learn languages, yet not everyone learns a foreign language at the same speed. Moreover, aptitude is an innate predisposition to be able to learn a language well without the need of motivation or other environmental factors (McDonough 1981).

Carroll (1981:84) reviews foreign language aptitude in the following manner:

> ...Corresponding to the notion that in approaching a particular learning task or program, the individual may be thought of as possessing some current state of capability of learning that task-if the individual is motivated, and has the opportunity of doing so. The capability of learning the task is thought to depend on some combination of more or less enduring cognitive characteristics of the individual (cited in Parry and Child 1990:31).

It is similarly argued that language learning aptitude is 'the ability to learn and understand a foreign language as a function of the amount of time required to learn it, the desire of the individual to learn, and perseverance in the learning task' (Parry 1984 cited in Oxford 1990:68). Carroll (1973:5) states that foreign language aptitude is 'the rate at which persons at the secondary school, university and adult level will successfully master a foreign language'. This view again, insinuates that everyone can acquire a foreign language. The difference between the learners lies on the rate, the amount of time or ease of mastering it (Johnson 2001).

In short, foreign language learning aptitude refers to the ability to learn foreign languages at a fast and easy rate. This definition though, implies that "good" language learners are those who need little less teaching, as they are able to catch on and remember straight away in a classroom, or to those who gain a satisfactory level of communicative competence in direct interaction with native speakers comparatively quickly and easily. It implies the ability to profit from good teaching, effective training program and a well-designed curriculum. Consequently, "bad" learners are those who can not benefit so much from the teacher's efforts or those whose learning needs are not yet met (Johnson 2001). However, Carroll reflects (1981:86), that there is no hard evidence that foreign language is dependent upon past experiences, and suggests that foreign language learning ability 'is relatively fixed over long periods of an individual's life span, and relatively hard to modify in any significant way'.

There is a need to distinguish aptitude from achievement and proficiency. Achievement and proficiency trial 'how well one has done'. An aptitude test examines 'how well one would do' (Johnson 2001:123). A sound predictive element is involved in the case of aptitude tests. Achievement asserts that a person can attain certain specified capabilities of actual performance when these abilities are the outcomes of the learning task or program for which the person's aptitude is assessed.

It is necessary therefore, to assess the person's aptitude before learning is started, and then to measure the person's degree of achievement in the foreign language after his having been exposed to the learning curriculum for a particular time (Carroll 1981:84). The idea is, that prior to a learning task, there should be no significant association between an aptitude test and the achievement test that is to measure the outcomes of the learning program, 'but after learning, the correlation between the aptitude test given prior to learning and the achievement test given after learning should become significant' (Carroll 1981:85).

Oxford (1990:69) takes a different approach and defines aptitude 'as the ability to develop the four aspects of communicative competence: grammatical, sociolinguistic, discourse and strategic competence'. According to Canale and Swain (1980 and Canale 1983 cited in Oxford 1990:69) grammatical competence is concerned with the degree to which the linguistic code is mastered; sociolinguistic is the extent to which grammatical forms can be used in social contexts to demonstrate specific communicative functions and to reflect style, register, etc; discourse concerns the ability to combine ideas to attain cohesion in form and coherence in thought; strategic refers to the ability to 'improvise and use language creatively and whether such linguistic capacity has favourable consequences for long term language development as opposed to merely solving temporary problems' (Skehan1989:48). The claim here is that 'no theory of aptitude or any actual measure of aptitude should be considered adequate unless it somehow predicts communicative competence in a broad sense' (Oxford 1990:69).

Sasaki (1996:9) defines aptitude as a 'set of cognitive abilities related to both foreign language learning success and to the process itself' while Sternberg defines aptitude as 'sources of individual differences in intelligent behaviour' (Sternberg 1984:281 cited in Sasaki 1992:8).

The concept of language learning aptitude has gained many opponents as well as adherents. Neufeld (1974) argues against aptitude as he believes that all people can learn a second language (and yes this is the case, Carroll is careful to emphasise this) but 'he is missing the point that aptitude is intended to explain differences in achievement rather than the fact of learning' (Spolsky 1989:105). Valette (1971:69) dismisses aptitude by saying:

> The argument of aptitude is the most pernicious, and even though the 'special language gift' myth and its corollary the 'language block' have never been corroborated by research, many students, administrators, teachers keep pretending they still exist. It's a fine 'out' for all concerned, for Johnny's failure to learn is then neither the teacher's fault, nor the school's fault: his failure was inevitable. Our excuses are obviously not valid. But where shall we look for a remedy to our widespread failure to teach foreign languages?

It is easy to put the blame on the teachers and load them with the entire responsibility for their students' success and at the same time provide an easy way out for non-achieving students. These views are sincerely held, and are a warning against the dangers of educational determinism, but fail to do justice to the complexity of language learning and the input of the student to the process. There are students that show great performance in other subjects yet have difficulty in learning a foreign language. There are others that undoubtedly show special ability in languages, even in the face of the teaching. It is impossible to offer just one model or method and claim that it is going to work for everybody. If pivotal cognitive variables like aptitude continue to be disregarded then this will be both to the learners and teachers' detriment.

Valette and other linguists claim that 'were language teachers to expect all students to master a second language, we might well experience great success' (Valette 1971:69). This idea surely does not conflict with the theory of aptitude at all; all learners will certainly do better under these circumstances than under conditions of anticipated failure. But even in ideal learning circumstances, some learners do better than others. It is certainly in the interests of all concerned that this variation is understood.

The latter points bring to light the necessity of understanding individual differences and variations in second language learning, hence aptitude. This is of overriding importance when one considers young learners since there is no model available for this age. It is striking especially because knowing and understanding young learners learning can be vital for future action. Diagnostic testing at languages more particularly might save energy and time and could promise effectiveness in both teaching and learning. Spolsky (1989:108) believes that when stating 'rather than saying that aptitude is irrelevant in natural learning, I would propose that its effects are most to be noted in early stages of learning'. This proposal gives the impetus for this thesis and justifies once again the need of researching aptitude at a young age.

1:3. Testing aptitude

One of the problems inherent in any consideration of language learning aptitude is that this quality, whatever it is, is not directly accessible. Rather it is a theoretical construct that has to be inferred from tests of other qualities. Usually this has involved using tests of language itself from which to infer language learning aptitude. Thus, testees are often given a small language learning task and if they do well they are supposed to have high aptitude and are likely to do well in the much larger task of learning a whole language over a very long period of time. The problem here is that tests of aptitude designed in this way are self-referential. People who are good at learning languages, they have high aptitude so they are good at learning languages. This may be satisfactory from a point of view predicting language learning success but the argument is circular and can manifest very little about the nature of aptitude itself. Tests constructed in this way, it can be argued, cannot prove whether aptitude is connected to or separate from other elements of intelligence or ability because they never test these qualities. It cannot give much to, for example, teachers or syllabus designers by way of insight into the nature of learning, which will help them create better, more appropriate, more effective teaching materials.

Some researchers object to the term "language aptitude testing" because of its restrictively cognitive implications. There is a suggestion to change this to a more 'encompassing term, such as "assessing the predictors of language learning success" so that it would include a range of other predictors: 'cognitive, attitudinal, motivational, personality-related, and demographic variables (sex, age, experience, ethnicity), as well as learning styles and strategies' (Oxford 1990:109).

In a similar vein, Gardner regards that conceptual framework which includes not only aptitude but also styles and strategies, should be developed and included in aptitude tests. These objections notwithstanding, the need for further research and testing in the field of aptitude is widely recognised. To quote Oxford:

> Many research instruments are used without adequate proof of reliability and validity, or without any clear theoretical basis. It is not surprising, then, that major conflicts sometimes exist in the research results. Despite these problems, it is important to continue pursuing research on language learning styles, strategies, and aptitude. Greater understanding of these phenomena will help improve language instruction and increase students' chances of becoming proficient (Oxford 1990:114).

Therefore, valid and reliable testing instruments are both interesting and necessary especially at the very beginning of second language learning. These can be attained by preliminary work, like Carroll, seeking connections and correlations between test of aptitude and subsequent test of success in language learning.

1:4. Examination of recent papers

1:4:1. A review of the Modern Language Aptitude Test -MLAT (1958)

For over 40 years the MLAT has been the premier, if not the dominant, test of foreign language learning ability. The creation of this test can be characterized as epoch-making, considering the fact that it survived virtually intact and unchallenged for more than 40 years. MLAT is addressed to adolescents and adults and consists of five subtests. The standard test takes 65 minutes to administer but there is also a short form of 30 minutes available. Previous factor analysis study conducted by Carroll himself unveiled seven components of foreign language aptitude which were interpreted as: 'Verbal Knowledge, Linguistic Interest, Associative Memory, Sound-Symbol Association, Inductive Language Ability, Grammatical Sensitivity or Syntactical Fluency, and Speed of Association' (Petersen and Al-Haik 1976:370). From these he used four components and created with the linguist Stanley Sapon a test that could measure several qualities in an effective and valid way. One of the important innovations, which this test introduced, is the idea that aptitude consisted of a number of general characteristics. These are:

1. **Phonetic coding ability** refers to some auditory alertness and is defined as 'the ability to identify and store in long term memory, new language sounds and strings of sounds' (Carroll 1971:4, cited in Parry and Child 1990:33). His support of this oral component is reflected on his view that:

> Phonetic coding ability is necessary because the individual must not only learn the identities of the new phonemes of that language, but must also recognize and remember the phonetic sequences represented by the morphemes, words, and intonation contours of a given language (Carroll 1971:4, cited in Parry and Child 1990:33).

Carroll also defines phonemic coding ability as 'the ability to code auditory phonetic material in such a way that this material can be recognized, identified, and remembered over something longer than a few seconds' (Carroll 1963 cited in James 1969). This is important because 'individuals lower in this ability will have trouble not only in remembering phonetic material, words, forms, etc., but also mimicking speech sounds' (Carroll 1965:128/129 cited in Johnson 2001:124). In other words, it is the 'ability to identify distinct sounds, to form connections between those sounds and symbols representing them, and to preserve these associations' (Carroll 1981:105). The original *modus operandi* was to present an individual with exposure to two or three nonsense syllables and then engage the person in a distracting cognitive activity, irrelevant to the initial task for ten seconds. After the completion of the distracting task, the person was asked to repeat the nonsense syllables and his ability to do so in the wake of a cognitively distracting task is related to that person's success in learning a foreign language. Carroll (1971 cited in Parry and Child 1990:33) claimed that success in coping with such distractions apparently depends on success in remembering the identities of the sounds.

Two techniques were eventually used to test this quality: A spoken number recognition task Part 1, Number Learning (which using an artificial language could be testing inductive learning ability to some lesser degree), and a spoken syllable recognition task Part 2, Phonetic Script (underline the word you hear).

2. Grammatical sensitivity is the ability to recognize the grammatical functions of words (or other linguistic entities) in sentence structures (Sasaki 1996:8). Grammatical sensitivity is alleged to be an important predictor of learning success. It is concerned with the 'individual's ability to demonstrate an awareness of the syntactic patterning of sentences in a language and of the grammatical functions of individual elements in a sentence' (Carroll 1971:5 cited in Parry and Child 1990:33). This part measures sensitivity to grammatical structure, and may be expected to have particular relevance to the student's ability to handle the grammatical aspects of a foreign language.

This is measured by MLAT, Part 4, Words in Sentences. A test of first language is included where students are required to spot words fulfilling similar syntactic functions in different sentences. This most highly correlated with tests of reasoning ability and general intelligence.

3. Rote learning ability for foreign language materials is 'the ability of an individual to learn a large number of semantic-symbol and/or sound-symbol associations in relatively short period of time' (Parry and Child 1990:33). Alternatively, it is 'the ability to learn associations between sounds and meanings rapidly and efficiently, and to retain these associations' (Sasaki 1996:8). It is measured to a lesser degree by MLAT, Part 1, Number Learning, but also to a high degree by MLAT, Part 5, Paired Associates.

4. Inductive language-learning ability is defined as 'the ability to infer linguistic forms, rules, and patterns from new linguistic content itself with a minimum of supervision or guidance' (Carroll 1966 cited in Parry and Child 1990:34). In short, it is the ability to infer or induce the rules governing a set of language materials, given samples of language materials that permit such inferences (Carroll 1962 cited in Carroll 1981:105).

The best method for measuring inductive ability is to 'present materials in an artificial language in such a way that individual learners call upon this ability in the learning of a foreign language; even if the teaching emphasized the formal presentation of grammar rules, learners must still work out the application of the rules for language learning to take place' (Parry and Child 1990:34). This component is vaguely and weakly tested in the MLAT in Part 1 the Number Learning.

Hence, there are five tests altogether: Part 1 Number learning which tests memory, Part 2 phonetic script which tests sound symbol association ability, Part 3 Spelling Clues again testing sound symbol association, Part 4 Words in Sentences which tests grammatical sensitivity and finally Part 5 which tests rote memory. Carroll and Sapon acquired quite good predictive scores and good reliability. In addition, the test appears to have a good construct and content validity as can be expected in a test of aptitude. Its approximate correlation with grades in foreign language courses proved to be about 0.50.

The test is an insightful and important attempt to answer the question of what elements constitute the nature of aptitude. In its time it can be seen as innovative since it formalised the idea that aptitude consisted of a number of general characteristics and defined what these elements are, in a fashion that is still largely accepted. To-date, there are a number of points ensued some of which are discussed below.

First of all, there were hardly any actual cognitive elements tested in MLAT. Yet, it is a common place today in the consideration of testing aptitude to acknowledge the presence of several cognitive factors in order to provide a valid learner's profile. The emphasis in pivotal linguistic aspects such as phonetic ability, spelling, and grammatical sensitivity gives the test a diachronic dimension that is yet lacking in a more cognitive approach of learning. This could possibly mean very little at the test's time of development but it forms clearly a basic disadvantage today. Psycholinguists have dived into vertigo of cognitive trends like learning style and strategies, personality traits and factors like motivation, variables that can not be simply ignored (Gardner 1990). They are based on the grounds that learning is far too complex a phenomenon to be reduced to simplistic research designs, which aim to identify learning/inherent factors that have direct impact on learning. Consequently, a linguistic again, but more cognitive-orientated, approach to this area of testing to satisfy modern learning theories would be desirable.

Carroll states, 'Foreign language aptitude as measured by MLAT, seems to consist of some special cognitive talent or group of talents that is largely independent of intelligence, and operates independently of the motivations and attitudes of the learner' (Carroll 1981:94). It seems quite dubious that Carroll and Sapon's test was not dependent on intelligence at all. Wesche at al (1982) used MLAT and Thurstone and Thurstone's (1963) PMA (Primary Mental Abilities Test) to study the relationship between aptitude and intelligence. A high correlation emerged among the variables of the two tests (Sasaki 1996). Similarly, Pimsleur (1966) has tied general intelligence with the idea of aptitude in his own test. His LAB showed good correlation with MLAT, suggesting strongly that IQ was involved in Carroll's test as well. Given that language learning ability is validated by success both in academic and naturalistic language learning environments, it would be extraordinary if a correlation of this kind was not found.

An additional question is that of the scale of importance between these four elements. Could it be possible that a learner with aptitude might score very high in one sub-test and very low in another yet gain the score needed to be a "successful" learner? There are quite different qualities measured here. Do all of these count to the same degree?

For example, would someone who is really good in the grammatical sensitivity test and quite mediocre in the memory be the same in ability as one who is mediocre in grammatical sensitivity and really good in memory? MLAT assumes that they are but common sense and other tests (e.g. Meara et al 2001) imply that they are not. What are the consequences or the conclusions derived from such a performance and how would a great difference in-between the same test, be explained or interpreted? The predictiveness in this case might be more problematic. Differences between people who achieve the same total by different routes, is not even touched on. Carroll (1990:20) himself expresses his own uncertainty of predictiveness especially regarding the memory test. He states: 'I have never been as confident about its validity as I have been about that of MLAT-II, Phonetic script, and MLAT –IV, Words in Sentences' and goes on by suggesting that in a future test, variety of memory tests studied in cognitive psychology should be included. Latest theory is that different levels of ability in these areas may indicate different learning styles (Skehan 1989:35-36).

While examining the test and testing parts like Spelling Clues or Words in Sentences one wonders whether this test could be addressed to learners of non-Indo-European languages. The predictive differentiation on the grounds of language typologies and structures is most certainly expected (Parry and Child 1990). In the manual (Carroll and Sapon 2000:3) the test is applicable 'in connection with modern spoken languages and ancient languages such as Latin or Greek'. This is to be reconsidered bearing in mind the fact that someone taking up Chinese will not be encountered with the same reading and spelling habits and rules of someone else taking up German. This factor has not been touched upon not even in hindsight. One of the limitations of Carroll and Sapon's test is actually its Anglo-centricity. The format of the test makes it very difficult to construct, with strict equivalence, in other languages. So results can not be generalised to all learners.

Interestingly enough, the inductive learning ability, although forming a pivotal aptitude element to Carroll's mind, was actually omitted from MLAT. Carroll (1981:109) himself stated that it was at the time 'long and difficult to administer' yet provides no guidance on how this could be implemented in a future research and suggests no amendment of the existent battery. On the other hand, the explanation provided for the inductive learning ability is not far from what he understood by the notion of grammatical sensitivity. One might think that the two are inter-related if not the same. Some more direction on the distinction of the two would have been very useful.

Given the number of aptitude elements identified in Carroll's primary studies, one question comes immediately and inevitably in mind: How did he choose to test the four specific elements and neglected all the others? In some of his papers presented after the test he states that he could list more than 50 factors of aptitude and all of them would be confirmable. In the 'kit of references tests for cognitive factors' (French et al 1963) he acknowledges 25 to be very important and connected with aptitude. One would probably consider that the ones used proved to be more practical to be administered but more background on the actual causes could yield fruitful theoretical aspects.

Carroll charts his own development by suggesting minor modifications to the test. More specifically he stated that:

> ...the Number Learning section contains an unfortunate correspondence between the numbers and the alphabetical order of their names. Part II, Phonetic script, typically has a negatively skewed distribution, a fact that suggests that the test is too easy for the majority of the subjects, and thus is not sufficiently discriminating in upper levels of ability. The instructions for Part III, Spelling Clues are not clear to some subjects and fail to emphasize sufficiently the speeded nature of the test' (Carroll 1990:13).

These obviously deal with minor practicalities and are not actually major amendments or changes for he sees no need for this. As for his comment on the distribution, a gateway test will not discriminate between learners at all levels but merely identify those with a particular ability.

All these suggest that a major rethink of Carroll's views on aptitude would seem in order. It is rather strange that later possible substitutes such as DLAB or Pimsleur's tests have not supplanted it.

The test is an insightful and dynamic tool, most importantly because it introduced a number of general characteristics for aptitude. These are phonetic coding ability, grammatical sensitivity, rote learning ability and inductive learning ability. Carroll and Sapon with this test have shown the way to research in this field and the test undoubtedly forms a strong starting point for any aptitude study.

However, there are evidently too many real and practical problems for a direct replication given young learners' needs. The obvious one is the linguistic complexity and demands of this test that not even E-MLAT has escaped. Very young learners have limited linguistic input and skills to handle such complex tasks and some of these tests would be impossible for them to do even in the first language, let alone the second. Young learners can not be administered these kind of tests, as they are not able to write at this age. They also need more playful activities in order to participate and these activities should not last long as their attention span is short and they get restless very quickly. The ideas offered by Carroll and Sapon will be kept in mind, however, but the testing methods and tasks will inevitably have to be altered and widely modified to suit the target group.

1:4:2. Pimsleur Language Aptitude Battery (PLAB 1966)

PLAB consists of six parts, namely grade point average, interest, vocabulary, language analysis, sound discrimination, sound symbol correspondence. These six parts are constructed to pin down the three components of language aptitude that Pimsleur argues to exist.

The first is Verbal Intelligence, by which is meant familiarity with words in the mother tongue (tested by the vocabulary part) and also the ability to manipulate verbal material analytically (tested in Part four, Language Analysis). The second factor is Motivation for learning a foreign language, for which the test of interest is designed. The third factor is Auditory ability and is measured in two different aspects by Parts 5 and 6: Sound discrimination and Sound-Symbol association. Auditory ability was found in Pimsleur, Sundland and McIntyre 1963's investigation to be the factor that distinguished students who achieved normally from those who were under-achievers. That is because at times it 'can be responsible for differences in people's ability to learn foreign language which cannot be explained by intelligence or motivation' (Davies 1968:102). Inductive language ability, namely being able to induce rules governing given stimulus material, especially those presented by materials in foreign language is emphasized in LAB.

Pimsleur regarded verbal intelligence important, therefore having two tests of this factor in his battery, whereas Carroll although acknowledging the significance of Spelling Clues in his MLAT claims it is not a useful predictor of language success. Pimsleur's idea is that aptitude entails three main components, 'the first is verbal intelligence by which is meant both familiarity with the words and the ability to reason analytically about verbal materials, the second is motivation to learn the language and the third is called auditory ability' (Pimsleur 1962 :182 cited in Krashen 1981:159). His conclusion after his study is that:

> ...there does exist a 'talent' for learning foreign languages-that is, a special factor beyond intelligence and indus-triousness which accounts for how well an individual succeeds in a language course. Our evidence indicates this special factor is auditory ability, which may be defined as the ability to receive and process information through the ear (Pimsleur 1964:135 cited in James 1969:11).

It becomes apparent that cognitive factors, as in IQ tests, can and should be included in aptitude tests. In turn, this is very important especially when it comes to researching young learners bearing in mind all their language restrictions.

1:4:3. Other tests

Oxford Language Aptitude test, a highly speeded test for adults, takes 60 minutes to administer. There are three subtests; first, meanings of words in sentences are inferred through segmentation, then direct translation to and from the artificial language getting progressively more difficult and then a modified version of Words in Sentences but much more difficult.

VORD, the original form of the test contains 32 items. The first ten items are designed to test nominal morphology; the second ten test verbal morphology; and the remaining twelve, phrase and sentence-level syntax. The items are intended to be progressively more difficult. The combined object of these tasks is to measure analytic skill -especially- with the use of an artificial language (i.e. the ability to internalize and use grammar rules), rather than memory or other factors selected by Carroll for the MLAT. There are limited and inconsistent conclusions, however, as to how strongly VORD's subtests correlate with MLAT. Still, VORD and MLAT's Phonetic Script (subtest 2) and Spelling Clues (subtest 3) combined proved to predict strongly reading and speaking proficiency (Parry and Child 1990).

DLAB (Defence Language Aptitude Battery) was developed in 1976 by Petersen and Al-Haik and involved visual as well as auditory tests mostly aiming at the learning of rules of an artificial language. Their results reached 0.4 to 0.6 slightly higher than MLAT and PLAB. They found, however, that the test could not predict success in different languages or different types of language courses (Carroll 1981:95).

One of the latest aptitude tests devised is the Canal-F Theory and Test (Sternberg et al 1999; Grigorenko et al 2000; Sternberg and Grigorenko 2002). CANAL-FT stands for Cognitive Ability for Novelty in Acquisition of Language (Foreign Test), and centralises the ability to deal with ambiguity or novelty in foreign acquisition (Ehrman and Oxford 1995). This ability is part of Sternberg's triarchic theory of human intelligence (Sternberg 1997;1998) and is regarded as 'naturalistic', 'dynamic', 'multifunctional' and 'simulation based'. The test assesses five cognitive processes namely selective encoding, accidental encoding, selective comparison, selective transfer and selective combination. This test appears to have external validity against MLAT and certain relevance to other intelligence tests.

1:4:4. EMLAT (1967)

This modified version, MLAT-E (1967), is appropriate for younger learners. MLAT-E is addressed at young learners aged 8 to 10 and is designed for Grades 3 to 6. It consists of four subtests and takes approximately one hour and fifteen minutes to administer (which, by the way, is too long for young learners). The earlier Modern Language Aptitude Test included tests of phonetic coding ability, grammatical sensitivity, rote memory ability and vaguely inductive learning ability. From these, Carroll and Sapon chose to modify three of these tests to suit the youngsters and introduced a new part in MLAT-E.

Sound-symbol association ability is measured along with knowledge of English vocabulary in Part 1, Hidden Words, and is very similar to the former Spelling Clues introduced in MLAT. Learners are asked to recognize a word they see spelled out incompletely or misspelled and match it with the correct definition offered in four alternative definitions. The definition can be a synonym, a description of the word or of the group it belongs to (e.g. =for apple- a kind of fruit).

Grammatical sensitivity is measured as in MLAT in Part 2, Matching Words. It is concerned with the 'individual's ability to demonstrate an awareness of the syntactic patterning of sentences in a language and of the grammatical functions of individual elements in a sentence' (Carroll 1971:5 cited in Parry and Child 1990:33). Here again a test of L1 is included where subjects are required to spot words fulfilling similar syntactic functions in different sentences.

The ability to hear speech sounds is measured in Part 3, Finding Rhymes and it is a new idea introduced in MLAT-E. Learners should carefully select from a set of four prompts the one that rhymes with the model one.

Rote learning ability or else memory is tested in Part 4, Number Learning that resembles part one in MLAT. It is the ability to learn associations between sounds and meanings rapidly and efficiently, and to retain these associations (Sasaki 1996:8). Learners are taught for a short time some numbers in an artificial language and they are then tested on their retention.

There are four subtests altogether measuring four different abilities. Hidden words have 30 questions, Matching words 30, Finding Rhymes 45 and finally Number Learning 25 questions. There is a total score of 130 points. According to the statistics presented in the Manual, the tests appear to predict reasonably well overall with correlations of about 0.5 with scores from course tests in Spanish and French classes.

This test addresses some of the problems inherent in answering the question of the nature of aptitude in young learners. It is a brave attempt to check whether aptitude exists in young learners and if this can be measured at this age. However, there are certain aspects that deserve closer investigation and cause problems with the reliability of the test, aspects that might explain the very limited use of this test in comparison to MLAT and other aptitude tests.

The first problem is the actual approach. It is often suggested that language learning between adults and young learners differs immensely. Such a theory ought to imply that when devising a test for young learners all these differences would be taken into consideration. Yet, hardly any actual cognitive elements are tested again although cognitive development is one of the key elements in language development and learning (Piaget 1926; Vygotsky 1978). The emphasis in pivotal linguistic aspects such as spelling, grammatical sensitivity serves the linguistic aspect of what the test examines.

However, psycholinguists have placed great emphasis on cognitive concepts like learning style and strategies, personality traits and factors like motivation, variables that can not be simply ignored (Gardner 1990). A cognitive approach provides a better illustration of how languages are learned and is more appropriate especially when younger learners are being tested. It is an approach, which appears peculiar to Carroll, namely that language aptitude is a set of cognitive skills that are separate from all other cognitive skills. Other investigators from Symonds (1930) to Pimsleur (1966) do not have this approach and design equal, or even more predictive tests, which are based on general cognitive skills. However, this approach simply cannot work with learners as young as five or six because it requires language sophistication they do not possess.

Furthermore, the nature of aptitude suggests the possibility of a link with the sort of more general cognitive skills, which psychologists investigate in the development of young children. Word association skill, for example, is identified as a pre-reading skill (Vale and Freunteen 1995:4). The skill of rote memory, identified by Carroll as one of the variables relevant to language learning, appears identical to the general cognitive skill identified in child psychology (Flavell et al 1997). Current models of the mental lexicon would support the idea that the learning of, for example, words, is not unconnected from memory for images. Concrete words, which are imaginable, are renowned for being easier to learn than abstract and non-imaginable words (Gairns and Redman, 1986:92). There are lexical learning techniques, such as the Hookword and Linkword systems, which try to take advantage of links between visual memory and word retention (for example Gruneburg 1995). It seems more likely that memory is a general skill which involves the ability to recall many different things including words, than that there are two separate memory systems, one for words and another for other things.

The same might be argued for grammatical sensitivity. At least one other aptitude test (Meara, quoted in Soars and Soars 1989:6/7) specifically identifies these qualities with the ability to recognize patterns and take advantage of them in learning. Pattern recognition is a general cognitive skill identified elsewhere in the literature (Esser and Kossling 1986:97-98). The notion of grammatical ability is actually so general that it is possible to see elements of several cognitive sub-skills in it: the ability to recognize patterns, the ability to recognize order and sequence (word order is important for meaning in a language like English), the ability to recognize the presence and absence items in a list or group (case endings carry important morphemic information in many languages) and so on. The notion that language learning aptitude may be a product of a set of general cognitive abilities rather than language specific abilities appears very attractive in that it gives a degree of detail in the nature of aptitude not seen before.

Therefore, a more cognitive orientated approach would have benefited both learners and teachers/researchers. The nature of the test appears unnecessarily restricted by the determination to make it a language test, when more widely drawn, cognitively-based tests might well have worked better among learners of this age.

On the other hand, sub-test one, the Hidden Words appears quite difficult. All the items appear challenging even if some words are more difficult recognize than others for learners of this age. For example, 'rivr', 'ansr', 'midl', 'ruf', 'hrd', 'kfmrt' is more approachable than 'oshn', 'silns', 'rsnt', 'tn'. And even if the learners immediately recognize the word, is not enough as they should be familiar with the synonyms, perhaps antonyms or words that describe the model word. Hence, the aim of the task is dubious. On the one hand, learners might be able to recognize the word but if their vocabulary is limited they will show ignorance of the word. This test would appear not to test Carroll's elements of aptitude but rather L1 lexical size. This is interesting since Skehan, amongst others, suggests that this quality may well be predictive of language learning aptitude, but it is not within the model of aptitude provided by Carroll. There is some evidence from the statistics included in the Manual that this test did not perform entirely as the others did. Inter-test correlation show that in 7 out of 8 groups this measure correlated less well than the other tests correlated with each other. This could be because it is testing a different characteristic but it may be that the test simply discriminated less well among learners of different abilities.

More generally, one has to wonder how useful this task would be for someone trying to learn Greek, German or Italian, languages that are spelled in the same way they are pronounced. It is a feature of Carroll's tests (Carroll and Sapon 2000:3) that he believes that these qualities will predict the learning of all foreign languages but where the language learning task does not require new sound discriminations or new sound symbol correspondences, will these things still predict learning? It may be that these tests will predict the learning of some languages better than others depending on the language starting point of the learner.

In Part 2, Matching words, the speaker in the cassette explains the function of subject, verb, object and adjective in a sentence. Then in some questions, one can see:

The kind POLICEMAN helps all the children.
My brother Frank sent the President a letter.

My father DRINKS hot coffee every morning.
Tom ran fast and caught the ball (transitive/intransitive function of verb is not explained so learners can either chose ran or caught).

When winter comes the BIRDS fly south.
Do men still believe the world is flat?

In hindsight, perhaps this subtest examines apart from the grammatical sensitivity, the inductive learning ability. As there is no direct rule offered but rather a general explanation of how words function in sentences so the learner is left with the examples (parts) and is expected to recognize the function for the sentence (general grammatical rule). The learner is actually expected to make up a lot of the rules in this way.

Part 3, Finding Rhymes is genuinely difficult and there is no rationale offered for using the specific quality for the test. In the pre-testing phase of MLAT rhyming was a quality they investigated as a possible indicator of language learning ability but discarded. There appears to be no explanation at the level of theory as to why this quality should explain and predict language learning success when their own empirical investigations appear to have ruled out a connection. Thinking in linguistic terms as Carroll does, there is no overt direct relationship of hearing the sounds and rhyming to language learning.

This test ought to form a powerful and authoritative resource for further studies now that the rising tide of early language learning is influencing dramatically methodology teaching. It ought to be useful because all its limitations or ellipsis will guide the way to the development of new tests and enrich researchers' ideas on its construction. It is the only test that appears to exist for learners below the age of puberty and there is nothing in the cannon with which to compare it, favourably or otherwise.

From the testing point of view the question arises as to whether this type of linguistic test is more appropriate than a rather cognitive orientated one. It seems quite likely that more modern and rather better tests might be produced following this approach. And that is the main purpose of this thesis.

1:4:5. Esser and Kossling's study of cognitive prerequisites in aptitude (1986)

Esser and Kossling's general hypothesis is closely related to Skehan's as they consider foreign language acquisition as a process of information processing (Esser and Kossling 1986:95). They suggest that the origins of many already established language specific dimensions of aptitude can be linked functionally to universal cognitive tenets and processes of information processing. Their hypothesis is also that at 'a high level of abstraction of foreign language acquisition can be understood as the acquisition of a system of sign-image units and rules for their formulation and structure' (Esser and Kossling 1986:96). Esser and Kossling (1986) believe that in order to establish the status of the disposition towards foreign language learning, language aptitude can be taken out of a narrowly linguistic environment and considered in terms of more general cognitive skills and abilities. According to their view, one possible method for this is to create a sign system equivalent to the target language and get testees to learn it. The results of the experiment could provide predictions about the functioning of specific processes underlying the acquisition of a natural language and about the ability to acquire a sign system in general, independently of a particular target language. With this view in mind they designed and applied the following psychometric method:

1. The process of paired associate learning (retain sign pairs)
2. The process of semantic integration (recognize old and new structures)
3. The process of inductive rule acquisition (discover underlying principles of organization of an iconic language).
4. The process of analogy formation (set of shapes and see the number of steps needed to transform one into the other) (Esser and Kossling 1986:96).

Esser and Kossling, like Carroll and Sapon, include a paired associates test but one which involves pictures only. They imply that the ability being tested here is one of being able to link two of anything - words, images, shapes, pictures or sounds - and not just one word with a translation. There is a clear assumption that this linking skill is a general ability and not the language specific ability which Carroll and Sapon describe. The other elements of their test similarly use images and not words.

Esser and Kossling's results suggest their interpretation may well be correct. Their correlations are strikingly impressive. Vocabulary knowledge correlates at 0.82 with the paired associates test and at 0.71 with the semantic integration test. Grammar knowledge shows a significant correlation of 0.79 with the miniature artificial language test and a very strong correlation of 0.72 with the analogy formation tests. It is then supported that the:

> ...basic ideas underlying the concept of foreign language aptitude, that is an approach which searches for cognitive prerequisites at a somewhat "deeper" level than previously tried allows us to predict learner's aptitude for foreign language acquisition in a valid and reliable way (Esser and Kossling 1986:100).

The approach they have chosen is more suitable for the target group of this study. The relevance shown here of the picture tests are immediately relevant in the construction of a test for use with young learners. This test is also a better model for a replication compared to any of the previous tests including the EMLAT.

1:4:6. LAT (2001)

LAT designed by Meara, Milton and Lorenzo-Dus (2001) is a modern tool in testing aptitude for adults. It is a user friendly, computerised version, nicely paced, updated with all the theories behind language learning aptitude and consists of five subtests. LAT_A tests the ability to remember unfamiliar sounds, LAT_B examines the ability of remembering paired associates when seen in writing, LAT_C tests the capacity to infer or discover language rules from an untaught language and is close to the grammatical sensitivity concept. These first tests seem to work reasonably well and offer a good distinction among learners. LAT_D tests the auditory ability; hence the ability to retain sounds but it does not work very well as it requires systematic decision and there is a tendency from people to give up fairly quickly. Lastly LAT_E tests the capacity to form connections between new sounds and symbols, so it examines the symbol sound association. This is a heavily analytic task that works well and offers wide variation between the test takers. They also did analyses looking for significantly different scores from two sub-groups of successful and unsuccessful learners who were otherwise as similar as possible. Good learners were those who had A levels in foreign languages and were taking degrees in the subject, unsuccessful learners were those who were taking degrees but had a grade C or worse in GCSE (usually) in French. The scores were normalised so good learners tend to score over 70% on each test. In tests with armed forces personnel it performed comparatively with MLAT but was, as intended, much more convenient to administer.

At the end of the test, a learner's profile is created where the learner can see his/her own strengths and weaknesses. The analyses provided in the handbook actually shy away from the bald good/bad learner distinction in favour of an interpretation of the profile in terms of what would optimise learning. However, the analytical and linguistic loaded nature of the tasks makes it again inappropriate to replicate for young learners.

These are the main aptitude tests that have influenced research in this field. It seems that from these, Esser and Kossling's model of aptitude and their study is the best to replicate as it deals with tasks that are appropriate to very young learners. Their study also includes cognitive elements, which studies like Pimsleur suggest should predict. Furthermore, this study is multi-componential, therefore, quite similar and in the tradition of Carroll and Sapon's ideas. There seems good reason to believe that a study like Esser and Kossling's (modified, of course, where needed) will work if anything does.

In the next section Skehan's updated ideas on individual differences and aptitude testing are discussed to compliment the theory of cognitive skills and the hypothesis of testing these to reveal the nature of aptitude. After that, other components from several researchers are viewed to end, at least for the present, the discussion on aptitude's characteristics.

1:5 More ideas on aptitude

1:5:1. Skehan's ideas on individual differences

Skehan has offered much insight into foreign language learning aptitude in the recent years. His basic claim is that aptitude has a componential structure and that 'it is more appropriate to think of aptitude profiles, conveying the idea that rather than think of individual learners as more or less talented, one should think of them as having strengths and weaknesses' (Skehan 1998:5). Profiles rally for a re-conceptualisation of aptitude in information-processing terms so current models of intellectual functioning can be related to concepts of aptitude (Skehan 2002: abstract).

The three stages of the process are input, central processing and output. According to Skehan's updated theory of aptitude, it consists of three major components: auditory, linguistic and memory ability. The auditory ability is identical to Carroll's phonemic coding ability. The linguistic ability combines inductive and grammatical sensitivity as he thinks that they are strongly related and come within the linguistic abilities heading. The memory ability involves the learner's capacity to absorb new material and the ability to retrieve efficiently from this memory system during language processing. The memory system is regarded as simply associative, as it was in Carroll's earlier test form (Skehan 1992:155). In a paper he describes this idea more explicitly:

> ...phonemic coding ability is important in processing input, in coping with auditory material in real time, with its coding and analysis so that it may be passed on to subsequent stages of information processing ...linguistic ability concerns a central stage of info processing the capacity to infer rules of language and to make linguistic generalisations or extrapolations...memory is concerned as well with acquisition of new info and is also concerned with retrieval, with the way elements are stored, ...in such a way that they can be retrieved efficiently in real time to handle natural conversational demands (Skehan 1992:156).

Hence, phonemic coding ability is a component that facilitates input, linguistic ability is involved with central processing whereas memory aids output. Skehan is careful to state that Sasaki's (1991) results implying that aptitude is best situated within cognitive abilities is only achieved at the cost of accepting weak involvement for measures of memory and phonemic coding ability. Similarly, Wesche et al (1982) have shown that cognitive aspects of aptitude have connection with general cognitive abilities but this is less valid for memory and phonetic coding (Skehan 1992:157).

Then Skehan claims (1999) that phonetic coding ability determines the extend to which learners can use oral and linguistic input. Grammatical analysis and memory, the two other central aptitude factors 'only come in to play once phonetic coding has occurred' (Reynolds 2002:1). In this view, Skehan concludes that:

> Aptitude and cognitive abilities appear to be closest to one another when one is dealing with central cognitive factors but be more distinct when one is concerned with how input is handled in the first place (phonetic coding ability) and with how a memory system operates (paired associates) (Skehan 1992:157).

Earlier (1980,1982) he had conducted a research study with British armed forces personnel groups studying Arabic intensively for ten weeks. They were given a battery of aptitude tests at the beginning and a battery of communicatively oriented end of course tests. There were tests of short term memory span, response integration (memory for material with very unfamiliar structure), memory for texts and organised materials and memory for visual patterns and found that response integration gave a significant correlation with the performance test of 0.50 (Skehan 1998:193). In his conclusion he states:

> To sum up, then, two main points are being made about foreign language aptitude. First, such aptitude, as presently conceived, is a hybrid, combining both a language processing ability as well as the capacity to handle de-contextualised material. Aptitude tests are effective predictors because both these component abilities are important for language learning success. Further, the origin of both types of ability can be traced to a relatively early period in life. Second, the analysis of aptitude presented here is general enough to be relevant not simply to formal learning situations, but also to a more communicatively orientated classrooms as well as 'acquisition' settings (Skehan 1985:17 cited in Larsen-Freeman and Long 1991:171).

Bearing all these in mind, memory and analytic skills are seen as part of cognitive testing process. This theory is even more relevant to researching young learners' language learning than the one offered by Carroll.

1:5:2. Other components

Ellis (1996) argues that 'short term memory capacity is one of the best predictors of both eventual vocabulary and grammar achievement' (Schmitt 2000:129) although 'it is well known in the psychological literature on verbal learning that rote learning ability is not related to intelligence to any substantial degree' (James 1969:12). Sasaki (1996:119) in her conclusion found that the aptitude factor strongly affected language analysis and sound symbol association, which in turn, implies that aptitude represented primarily the inductive language learning ability measured by language analysis and the phonetic coding ability measured by sound symbol association but not greatly of the rote learning ability which was measured by paired associates. Carroll himself had his doubts on the memory test and concluded that episodic memory is just one form of memory and more types should be used and tested (Carroll 1990:22).

Phonological short-term memory span is where individual differ in their ability to repeat phonological sequences.

> This ability to repeat verbal sequences (new phone numbers or nonwords) immediately after hearing them, is a good predictor of learner's facility to acquire vocabulary and syntax in first, second and foreign language learning (Ellis 1996 cited in Robinson 2001:48).

Ellis (1997) reviews several interesting outcomes emerging from studies in the area. Firstly, that phonological short-term memory (STM) span predicts vocabulary acquisition both in first and second language. Secondly, that interfering with phonological STM by means of articulatory suppression disrupts vocabulary learning. Thirdly, it was found that repetition and productive rehearsal of novel words promotes their long-term consolidation and retention. Furthermore, it became obvious that phonological short-term memory predicts syntax acquisition in the first and second language. Finally, it was evident that phonological rehearsal of L2 utterances results in superior performance in receptive skills in terms of learning to comprehend and translate L2 words and phrases, explicit pre-linguistic knowledge of the detailed content of grammatical regularities, acquisition of the L2 forms of words and phrases, accuracy in L2 pronunciation, and grammatical fluency and accuracy (Ellis and Sinclair 1996 cited in Ellis 1997). For all these, it appears that this might be a promising quality to try out with very young learners.

Consequently, phonological short-term memory seems to be an important factor in aptitude, yet, there is evidence that phonemic awareness, the other factor underlying phonetic coding ability, is probably not a factor in aptitude. Many studies have shown the susceptibility of phonemic awareness to training (eg. Sparks and Ganschow 1993, Lundberg, Frost and Petersen 1988, all cited in Sparks and Ganschow 2001). Research has generally embraced the notion that training has no effect on factors that load on aptitude (Carroll 1981 and Skehan 1989). With this view, aptitude should exist before any training or experience and should not be susceptible to such outside influences (Reynolds 2002:5). However, 'aptitude is usually defined as the ability to succeed in learning a foreign language given appropriate training and experience' (Sasaki 1996:7). In the case of phonetic discrimination, James (1969) notes that:

> ...phonetic discrimination *per se* is not an important predictor of FL success. A test of the ability to perceive phonetic distinctions by requiring the listener to distinguish between similar sounds presented as "foreign syllables" was included in earlier versions of the MLAT Battery but was later abandoned because: its validity coefficients were consistently low in comparison to those of other tests, and the conclusion was reached that phonetic discrimination ability is not crucial in FL learning. Most normal people have enough discrimination ability to serve them in learning a FL, and in any case, it is more a matter of *learning* the discrimination over a period of time than any fundamental lack of auditory discrimination which can readily be tested in an aptitude battery (Carroll, 1965:96 cited in James 1969:11).

Therefore, he concludes, 'the popular notion of "having a good ear for languages" is an ability that does not depend so much on one's "ear" but on the brain's capacity to code and store for later recall auditory information of a phonetic type' (James 1969:12).

In another paper Carroll named some factors that would not normally be related to language abilities even if they involved language processes. These factors he claimed are:

> Space (the ability to perceive and mentally operate on visually presented spatial configurations), Number (the ability to make rapid and accurate arithmetical computations), associative memory (the ability to learn and remember a series of arbitrary associations) and recognition memory (the ability to recognise which of a series of stimuli have been previously presented) (Carroll 1979:19).

In the same paper he acknowledged that factors entailing some kinds of verbal reasoning processes are of great importance. Those are 'induction, deduction or syllogistic reasoning, quantitative reasoning, classification and numerical estimation'. He then argued that:

> ...the tests of these factors contain verbal material but these factors are independent of the two or three factors that could properly be identified as types of language abilities, that is, abilities reflecting differential acquisition of language, or differential facility in language use (Carroll 1979:19).

It would be interesting to see if these assumptions are correct especially since these are more general cognitive characteristics that can be tested with young learners.

When commenting on Thurstone's and Thurstone's (1963) Primary Mental Abilities, he distinguishes, verbal factor, word fluency and rhythm and sound grouping as clear language abilities (Carroll 1979:20/21). Among these tests, reasoning was most highly correlated (0.65) with the MLAT total score (Sasaki 1996: 23).

Verbal fluency factors that concern the ability to name and write in a limited time, as many ideas as possible on a given topic or semantic category are seemingly not significant contributions to prediction (Carroll 1990:23). Similarly, high verbal ability (as measured by vocabulary and reading composition tests) is not a good predictor of early language success (Carroll 1990:24).

The Linguistic Coding Differences Hypothesis (LCDH) was introduced by Sparks and Ganschow (2001) where they speculate that:

a. native language skills serve as a foundation for learning FL, b. difficulties with one component of language (phonology/orthography) are likely to have a negative effect on both L1 and L2 and c. there are innate differences individual in Ss' ability to use the language (Sparks and Ganschow 2001:97).

Findings indicate that the development of word decoding and reading comprehension is similar in L1 and L2 and that foreign language word recognition plays a significant role in reading comprehension (Koda 1992, 1996).

Service (1992) found that phonological orthographic tests (pseudo word repetition and writing) combined with the ability to comprehend syntactic-semantic structures predicted English Learning. Cheung (1996) and Service and Kohonen (1995) in two studies showed that phonological memory (pseudo word repetition) was important for learning fl vocabulary (cited in Sparks and Ganschow 2001:99). Other findings suggest that phonological awareness transfers across alphabetic languages and that it may be a general rather than language specific cognitive mechanism (Cisero and Royer 1995 cited in Sparks and Ganschow 2001:99).

1:5:3. Summary of components

If there could be a separation between components of aptitude tested so far, it is possible to view the purely linguistic components and the cognitive ones. The purely linguistic components of aptitude involve grammatical sensitivity, phonetic coding ability, short-term phonological memory, auditory ability, sound-symbol association. The cognitive components include inductive learning ability, rote memory, associative memory, semantic integration (recognition memory), reasoning, classification, analogy formation, numerical estimation, spatial ability, rhythm and sound grouping.

There is not a total unanimity either on the actual components forming aptitude or the extent to which each of them exerts influence on language learning, however, these are the most salient elements researched in the field of aptitude.

1:6. Main issues on aptitude

A current model of aptitude is described below. In the broadest terms, there is general agreement about what constitutes the nature of this quality and it can be summarized as follows:

Assumption 1

Language learning aptitude is a special skill that is separate from other skills. It may, apparently, be different from intelligence or IQ or any other special skill. According to Lenneberg's (1964) study, intelligence does not effect significantly first language acquisition but has a key role in later school life, where it predicts the development of fluent writing skills. Wesche et al's (1982) results lend credence to the hypothesis that 'aptitude and intelligence share a more abstract level of general cognitive ability' (Sasaki 1996:24). Results support Bachman's hypothesis (1990) that general factor of SLP (Second Language Proficiency) is related but not identical to general cognitive abilities. The results 'disconfirm the strong version of Oller's (1981, 1983a, 1983b, 1983c) hypothesis that general language ability is the essence of general intelligence or general cognitive abilities' (Sasaki 1996:135). It was interestingly argued that:

> ...foreign language aptitude is not exactly the same as 'intelligence' not even 'verbal intelligence' for foreign language aptitude measures do not share the same patterns of correlations with foreign language achievement as intelligence and academic ability measures have; yet there is an overlap between their factors and components (Carroll 1981:86).

Pimsleur's results attempt to nail down aptitude elements and their relation to intelligence.

> While aptitude and intelligence may overlap, it is the former which provides a more precise assessment of language processing ability and the ability to handle de-contextualised language and is therefore a more powerful predictor of language learning success than intelligence (Larsen-Freeman and Long 1991:172).

The particular contribution which Carroll and Sapon introduced to the field was that this special skill is comprised of several clearly identifiable sub-elements or sub-skills, which combine to create aptitude. While they considered their sub-elements of aptitude as cognitive abilities, they do not link these abilities with general cognitive abilities. Had they done so, this would imply cross-over with other types of aptitude or ability. Even where researchers can demonstrate a close correlation between other abilities and language learning success, as in Pimsleur's work with IQ scores, (1968), language learning still appears to be viewed as a distinct and separate ability. At least part of this view must be based on the results of Carroll and Sapon's (1958) where *MLAT* and IQ scores are compared. Unlike other studies, they find no significant correlation. Aptitude is also assumed to be independent of other factors such as motivation, personality type, the opportunity to learn or the learning environment, which may also affect success in language learning. This point will be discussed further.

Assumption 2

As Carroll points out (1981:85), aptitude is an innate language learning skill. It is a "gift", or what is often called in English an "ear" for languages and is the ability to learn a foreign language at a fast and easy rate. It is a commonplace that all people can learn languages, yet not everyone is able to learn a language at the same speed. People who can learn quickly and easily have this aptitude, or have high aptitude, and people who cannot, have no aptitude or low aptitude. The idea is that people either have this quality or they do not, it is innate. Because language learning aptitude is innate, it is fairly constant and fixed over time.

Assumption 3

Language learning aptitude is not language specific; it indicates a learner's capacity to do well in learning any language. It is a skill that is not influenced by the language background of the learner or the language, which is being learned. Hence, a learner with high aptitude will do better at learning any language than a learner who has low aptitude, all other things being equal.

Recasting a model of aptitude with young learners in mind involves challenging elements of each of these three points. It poses questions whether the language learning skill is really separate from other abilities and what these abilities really are, whether aptitude is something that is really fixed, and whether this special aptitude really does apply equally in all language learning situations. If aptitude is indeed comprised of a number of general cognitive elements, then other possibilities emerge. One is that these abilities, and therefore aptitude, are not a fixed quality in young children. Cognitive and linguistic skills develop and children grow older and mature, so it would be sensible to assume that the nature of aptitude will change as well. Since there is very little work on exactly what the relevant changes are, and how they relate to language learning, the nature of aptitude at young ages is open to speculation.

Most importantly, none of the ideas and tests concerning aptitude touch on very young learners including the idea that they may be significantly different from older learners and be resurrecting first language strategies which are apparently equal and innate over all learners.

1:7. Other factors and limitations of aptitude

As Sparks and Ganschow (Sparks and Ganschow 2001:95) review, there are two reasons that justify research and thought about individual difference in relation to foreign language aptitude. First is the fact that aptitude is considered to be largely influenced by affective variables. Second, reconsideration of aptitude as a cognitive construct impacts greatly on language variables in the learners' facility with language and their skill with the phonological/orthographic rule system of language.

According to these, a first hypothesis is that foreign language learners can modify some personality factors with the help of appropriate instruction and that learning can benefit from matching instruction or change of strategies in the foreign language students' learning styles. The second hypothesis is that innate differences in basic language abilities exist among learners so there are firm limitations in the degree to which specialised instruction will improve aptitude and foreign language learning.

Personal variables have been generally classified as cognitive and affective factors, where cognitive abilities include intelligence, language learning aptitude, working memory and speed of language processing. Affective factors are concerned with anxiety, motivation and emotion (Robinson 2002:2). Gardner describes (1990:179) affective variables as 'those emotional or pre-dispositional characteristics of individuals that influence their perceptions and impressions of the language learning context'. Either way it seems that knowing about these in the context of very young learners would be better than the state of ignorance especially since there is not a solid accepted model of second language learning in young learners.

1:7:1. Motivation

Motivation includes energy, willingness to learn, perseverance, interest, enjoyment of lessons, incentives and benefits of knowing the language (Mc Donough 1981:149). There are two types of motivation that are thought to impact on success in second language learning, namely integrative and instrumental motivation. Learners are integratively motivated when they desire to identify with another ethno-linguistic group, its culture, language and people so as to 'integrate' more within the target language society (Johnson 2001:129). Learners are instrumentally motivated when the learning of a foreign language pertains to utilitarian purposes such as furthering a career, improving social status or meeting an educational requirement (Larsen-Freeman and Long 1991:173).

Tremblay and Gardner's study (1995) showed significant relationships among motivational constructs and foreign language achievement while they concluded that there are possibly 'new indices of motivation like goal specificity, persistence, and attention that are causally related to each other' and also to measures of achievement at least in French (Sparks and Ganschow 2001:96). Gardner and his colleagues have suggested that attitudes and motivation are relatively independent of foreign language aptitude and they showed positive correlations with strong foreign language achievement (1990). Yet Au (1988) criticised Gardner's theory for its failure to establish a causal link between motivation and foreign language learning.

However, motivation raises the interesting 'chicken and egg' issue of cause and effect. 'Motivation may lead to success; but success can also lead to motivation-and it might be difficult to figure out which of the two is happening' (Johnson 2001:132). Brustall et al's studies (1974) reached the conclusion that high motivation is the result of success, not vice versa. The idea that success leads to motivation is referred to as the 'Resultative Hypothesis' (Johnson 2001:132).

In a similar vein, Strong (1984) claims that motivation does not necessarily promote acquisition but rather results from it: those who meet success in second language become more motivated to study (Larsen-Freeman and Long 1991:175). In the case of children in particular, motivation appears to be no major problem as children are curious by nature and love mystery/the unknown. Teachers interviewed and questioned in a preliminary study in this thesis (see more in chapter three), said that children are 'eager to learn and to please' and that they are not intimidated by the new language. Moreover, Genesse and Hamayan (1980 cited in Larsen-Freeman and Long 1991:176) showed that 'there is no immediate relationship between attitude factors and the proficiency of 6 year old Anglophone Canadians'. Therefore, attitudinal factors seem to have little influence on second language acquisition by children, possibly because attitudes are not fully developed in young learners.

1:7:2. Personality traits

Self-esteem, extroversion in several studies, anxiety, risk taking, voluntary class participation, sensitivity to rejection, empathy, inhibition, tolerance of ambiguity involve personality traits or characteristics that have been studied to see whether they factor in language learning. Naiman et al (1975) report that both introversion and extroversion are regarded by the teachers, as characteristics of successful students. Kawcyznski (1951) claims that the nature of the language course would determine whether extraverted students outperformed introverted or vice versa. Lalonde and Gardner's (1984) study failed to find a significant correlation between social participation and indices of second language achievement (all cited in Gardner 1990:187).

Gardner showed on reviewed studies on anxiety that measures of anxiety involving the learning of a foreign language correlate negatively with measures of foreign language achievement. As foreign language increases, anxiety decreases. Sparks and Ganshow criticised self-report instruments of foreign language anxiety because most of the items are also measuring receptive language, expressive language and verbal memory skills or reading skills (Sparks and Ganshow 1991; Sparks and Ganschow and Javorsky 2000 cited in Sparks and Ganschow 2001). In addition, researchers have reported that foreign language anxiety interferes with language learning because it reduces the ability to concentrate on the target language and is likely to impede memory proficiency (MacIntyre and Gardner 1991, 1994 cited in Sparks and Ganschow 2001:96).

Much research has focused on reflection-impulsivity, and more accurately on two factors, response speed (or response latency) and response accuracy. Parry's results (1984) indicate that reflection rather than impulsivity is predictive of foreign language proficiency. Ehrman and Oxford (1988) admitted that a strong concern for accurate or perfect language performance can lead to destructive anxiety, which, in turn, can diminish performance.

Meredith (1976) and Messer (1976 cited in Oxford 1990) have demonstrated 'the effectiveness of an imposed latency period, for example, a brief pause that forces impulsive subjects to slow down before giving a response, and that also gives reflective subjects time to formulate and mentally test their answers' (Oxford 1990:85). Ehrman (1990) showed though that personality instruments were not good predictors of foreign language learning success while many studies' results on personality traits still remain inconclusive.

1:7:3. Learning styles

Learning style is 'the learner's preferred mode of dealing with new information (Oxford 1990:68). The dimensions or learner traits included are:

> ...cognitive style (preferred or habitual patterns of mental functioning), patterns of attitudes or interests that influence a person's attention in a learning situation, a disposition to seek learning environments compatible with one's cognitive style, attitudes and interests and to avoid incompatible learning environments and a disposition to use learning tools (learning strategies) and avoid others (Lawrence 1984 in Oxford 1990:69).

The MBTI style dimension on the Myers-Briggs Type Indicator (MBTI) is based on Carl Jung's original typology of characteristics such as extraversion-introversion, sensing-intuition, thinking-feeling, and judging-perceiving thus revealing the "psychological type" of the learners. As Oxford (1990:87) puts it:

> Extraverts are energized through interaction with others, and they are focused on the external world, whereas introverts are energized by solitary activities, and they are focused on the internal world. Sensing types are practical, factual, and oriented toward sensory data; intuitives look for the big picture and are aware of abstract relationships and future possibilities.

On the other hand, thinkers decide according to analysis and objectivity, while feelers decide on the grounds of human interaction, values, and feelings. Judgers insist on closure and organization, while perceivers want to have options open and are not very concerned with structure. The theory behind the MBTI argues that every person is a combination of these four dimensions, with a preference for one of the two poles of each dimension (Myers and McCaulley 1985 cited in Oxford 1990:88).

There is also the cognitive style dimension listed by Kolb (1984) that became very popular because of Kolb's Learning Style Inventory and distinguishes: 'reflective observation (watching) versus active experimentation (doing), and concrete experience (feeling) versus abstract conceptualization (thinking)' (Oxford 1990:81).

Style is often viewed as a construct of aptitude, or at least a major predictor of language learning success. Yet, it is unfeasible to make any rigid statements regarding language learning style and aptitude, although interesting suggestions emerge from the research. First, Bialystok and Froehlich's (1978) study gave a moderate connection between field independence and language learning aptitude. Witkin (cited in McDonough 1981:136) describes the field independent learner as 'an analytical, in contrast to global, way of perceiving which entails a tendency to experience items as discrete from their backgrounds and reflects ability to overcome the influence of an embedding context'. Hence some individuals seem more able to than others to extract things from the context in with they are met, and to see them as separate entities. It is consequently believed that being highly field dependent is not a good characteristic for language learners.

Moreover, Parry (1984) found that individuals with a high aptitude for foreign languages were usually sharpeners, field independent, accurate in responding, cognitively multifaceted to a mild degree, and flexible in cognitive control. Sharpeners have superior performance on long-term memory tasks. His study found that of all the style dimensions examined, the levelling-sharpening dimension was surprisingly the most predictive of foreign language proficiency. The reality is that language learners of a wide variety of psychological types are successful in foreign language settings. In any case, 'discussing which psychological type makes the most successful language learner is less helpful than looking for specific clues or indications about why individuals do or do not succeed' (Ehrman 1990:131).

It is true that certain style dimensions appear more predictive of proficiency than others, but more research in this area is needed as there is a difficulty in measuring the learning styles and some research results are contradictive, contributing more on the convolution of this matter. These approaches, although useful to bear in mind, ignore the nature if language itself which is largely and highly complex rather than a question of values and feelings. If this approach has any truth, then the nature of the learning task would give analytic style learners an advantage. One of the points of aptitude testing as Skehan suggests is to identify these learning styles so that this knowledge can be exploited for the benefit of the learners in the way Wesche (1981) suggests is possible.

1:7:4. Learning strategies

Learners' actions to improve their own learning are known as learning strategies and usually reflect the learner's style (Oxford 1990:68). Schmitt (2000:135/136) distinguishes the determination strategies (guessing from structural knowledge of a language), social strategies, (consolidate vocabulary knowledge with other people), memory strategies (mnemonics, involve relating the word with previous learned knowledge), cognitive strategies (repetition, vocabulary notebooks, using mechanical means to study vocabulary), meta-cognitive strategies (conscious overview of the learning process, improving access to input, testing, deciding on the most efficient methods to study).

Naiman et al (1975) introduced six strategies of successful language learners:

> ...selecting language situations that allow one's preferences to be used; actively involving oneself in language learning; seeing language as both a rule

system and a means of communication; extending and revising one's understanding of the language; learning to think in the language; an addressing the affective demands of language learning (Oxford 1990:92).

It is supported that attitudes strongly affect language learning in general; hence they have an impact on the choice of strategies. Oxford's (1990:72-75) strategy system introduces:

a) Direct strategies 'working with the language itself'
1. memory strategies for remembering and retrieving new information
2. cognitive strategies for understanding and producing language
3. compensation strategies for using the language despite knowledge gaps

b) Indirect strategies 'for general management of learning'
4. meta-cognitive strategies for co-coordinating the learning process
5. affective strategies for regulating emotions
6. social strategies for learning through interaction with others.
(also in Johnson 2001:154)

Findings of the few studies relating strategies and aptitude are inconsistent mainly because the researchers have not managed to adopt a conceptual framework in order to link all these variables. Bialystok (1981) in her investigation of high school language learners examined aptitude but concluded that it is not as influential as attitude in affecting the strategies chosen by students although Politzer (1983) have found aptitude to be more important. Politzer then proposed that 'intelligence might relate to both strategy use and language achievement' (cited in Oxford 1990:108). Chesterfield and Barrows Chesterfield (1985 cited in Larsen-Freeman and Long 1991:199) have demonstrated that learners' strategies do change over time, which then raises questions about the predictability of strategies or styles.

Oxford acknowledged that there is a lack of consensus among researchers about how to measure and use the categories of learning strategies while Sparks and Ganschow (2001:93) agree that research shows positive but modestly significant correlations between these instruments and foreign language proficiency.

Finally, Sparks reported that (1995) neither cognitive style nor learning strategies have been shown to be related specifically to the learning of a language and Skehan (1991) claimed that there is little or no evidence to suggest that strategies or style training improve foreign language learning. This is probably because as in the first language: 'individual differences might reflect something like cognitive styles, matters of performance variability but not competence' (Nelson 1981:172).

1:7:5. Brain hemispherity

The functions of brain and generally neuroscience has always been a debatable area of research. Its importance, however, can not be ignored. As Yule (1985:127) recalls:

> Freud subtly employed 'steam engine' metaphor to account for certain aspects of the brain's activity, by talking of the effects of 'repression', 'building up pressure', to the point of sudden 'release'. In an even earlier age, Aristotle's metaphor was of the brain as a cold sponge, which functioned to keep the blood cool.

Brain hemispherity (or else laterality), in particular, is a very interesting and contentious research area for language learning. The left hemisphere is hypothesised to be the logical hemisphere and is responsible for verbal, analytical, literal, linear and mathematical tasks. It also seems to control movements on the right side of the body. The right hemisphere is the intuitive hemisphere and is responsible for non-verbal, holistic, spatial, musical, metaphoric, imaginative, artistic, emotional, sexual, spiritual, and dreaming tasks. It controls movements of the left side of the body. All of the above holds true for right-handed people. With left handed people the hemispheres are often but not always reversed (Revell 1992:9).

This is further analysed by Leaver (1986 cited in Oxford 1990:81) who explained that left-brain processors are better language learners at higher proficiency levels, as it requires greater control and analysis. Likewise, right-brain processors are better language learners at lower proficiency levels, because the focal point is on intonation and rhythms. She also revealed that students who are called integrated (hemispherically balanced) performed well at language learning. Yet, various difficulties in measurement are evident this research area. Rossman (2000) sustains that certain cognitive abilities (abilities to differentiate, deductive reasoning, categorisation) have to be activated within certain time windows so that they can optimally be realised neurobiologically.

There is a lot of controversy on the issue of the neurology of language acquisition. Much of it is concerned with 'the development of cerebral dominance in childhood and its relation to language acquisition, both in first and second language' (Krashen 1981:72). The history of this issue begins with Lenneberg (1967), who hypothesized that the development of cerebral dominance was complete and established by around puberty. According to Lenneberg, the end of the development of cerebral dominance coincided with the close of a 'critical period' for language acquisition when foreign accents are easily assimilated and that automatic acquisition (of second language) happens from mere exposure just before puberty (Lenneberg 1967:176).

It is now accepted that both hemispheres may process language, but in different ways. 'The left hemisphere seems to process language through analysis and abstraction, while the right hemisphere appears to recognize words as auditory or visual patterns through gestalt-like template matching' (Willing 1988 cited in Oxford 1990:81). More recently however, a more updated account has been offered of localization of different components of language on different areas of the brain as a function of onset age or proficiency or even use (the work by Paradis, Fabbro and Abutalebi, etc.). This issue becomes important because understanding the 'geographic' differences of language learning in children and adults may impact teachers, pedagogues and foreign language instruction in general.

Whatever the case, there has not been any hard evidence that brain hemispherity plays a key role in foreign language acquisition and since researchers have still a vague idea of what is really happening in the individual's brain, only assumptions can be made on such a matter and any strong claims would be doctrine.

There is a vast array of possible variables that can have idiosyncratic effects on proficiency and the many possible common predictors of proficiency and as Gardner

(1990:182) claims 'one very quickly gets the impression that a particularly high level of prediction is unattainable'.

This was a summary of the most commonly discussed variables in language learning among with their connection to aptitude. The hypothesis in this thesis remains that aptitude although affected by some of these is clearly a separate quality. However, variables as such will be considered in retrospect after the experimental work to review their status and possible implications. Areas such as motivation, personality traits or neuroscience do not form the main interest of this thesis. The most interesting issues to be examined in the study of aptitude involve learning styles and strategies.

1:8. Importance of aptitude

There is no single best method but it is the amalgam of specific method types with specific aptitude profiles, which creates optimal learning conditions, and Wesche (1981) showed that matched students did disproportionally better. Skehan argues that aptitude research should not 'remain at an unrevealing, monolithic level but that profile based info could be vital for the design of effective interventionist techniques so 'start from where the learners are' (Skehan 1998:199). The analysis of aptitude and cognitive styles suggest that a profile approach to characterise learners is more productive, as the number of profiles is relatively small and the adaptations of instructional approaches feasible.

Aptitude tests my be useful in academic context for placing and counselling students, and for understanding and appropriately tailoring instruction to the aptitudes, motivations, and learning styles of individuals and groups (Stansfield 1989 cited in Stansfield 2000:2).

What is more, early identification is crucial:

> ...before they have lost so much ground that they can not any longer catch up, and before they have developed such a complex towards foreign languages that even the best teacher cannot break through it. We need a diagnostic test. We need to know just what abilities are required for learning a language well, before we can predict who will do it. This explains why we analyse aptitude

> so thoroughly-because the more we discover regarding aptitude the better we can understand individual differences among pupils learning languages, and the more chance we have of turning these differences to advantage (Davies 1968:99/100).

Besides, Wesche (1981:119/120) verifies that 'there is indisputable evidence linking performance on language aptitude tests with classroom achievement in a new language' therefore, its impact would be too important to ignore. Finally, 'matching Ss language aptitude profiles with particular methodological approaches might ameliorate the negative consequences of working with groups of Ss with heterogeneous aptitude profiles' (Larsen-Freeman and Long 1991:207/208).

1:9. Young learners' aptitude

This section on young learners' aptitude starts with the remarkable observation of Wong Fillmore (1979):

> The issue of individual variation is rarely discussed in studies of childhood second language acquisition, this despite the fact that even the most casual observations of the language performance of any group of children in the process of learning a second language naturalistically or otherwise would reveal considerable variation in the rate and ease at which they are managing the learning of it and in how well they are able to use the language they are learning. But ...because researchers are more interested in discovering, what is universal about the acquisition process than in knowing whether the process might vary in individuals, the question is never discussed or even raised (Fillmore 1979:205).

Twenty-five years later, not much has changed on the subject. Yet it is true that individual differences exist between second language learners and as Selinker has written, 'a theory of second language learning that does not provide a central place for individual differences among learners can not be acceptable' (cited in Larsen-Freeman and Long 1991:153).

As Carroll reflects (1981:86), although there is no hard evidence that foreign language is dependent upon past experiences, it is suggested that 'foreign language is relatively fixed over long periods of an individual's life span, and relatively hard to modify in any significant way' (Skehan 1989:39). Developmental factors, though, do actually influence progress and achievement and can consequently affect an individual's aptitude. The question of fixedness of aptitude need not be a maxim but most moderately a hypothesis. If language learning aptitude is a set of cognitive skills then these in turn can and *do* develop in young children and will probably be influenced by practice so aptitude need not be fixed for all learners. There is a strong element implicit in this theory, which needs delicate handling by linguists if it is to be adapted to its maximum potential.

In a variety of experimental studies Gathercole and her partners (1992) demonstrate that young learners are particularly dependent on memory and that success in language learning can vary according to variation in short-term memory in particular. It appears that not only are young learners inherently different here but environmental factors may influence the degree to which youngsters are able to harness the skills that come from this type of memory. Young learners who read a lot, for example, and who sub-vocalize develop more extensive short-term memories and are better at L1 vocabulary learning and a variety of other language related abilities in later learning. Gathercole et al (1992) also imply that the impact of memory ability on learning diminishes with age as, presumably, other influences such as the growth of analytic skills develop.

While the separation of language learning skills from other abilities is the prevalent view of aptitude at the moment, it is not the only possible view. It is possible to view aptitude in a different light where language learning aptitude is tied to other more general skills. This view seems to have been common before and after MLAT was produced. With young learners in mind, this view becomes rather more attractive than it has been hitherto. The developmental processes which youngsters undergo in growing up are often cast in terms of such general cognitive skills. There are a number of reasons for reassessing the possibility of general learning qualities underlying language learning aptitude, rather than sticking to a rigid separation of language from every other possible skill.

Firstly, the current tests are so complex, products of their linguistic content that they are quite beyond many language learners who must, nonetheless, possess language learning aptitude. The whole theoretical construct of separate language aptitude is called into question where groups of learners who clearly possess this aptitude equally clearly do not possess the quality being tested to indicate aptitude, in this case sophisticated language skills. Young learners are a case in point. Young learners can be very successful language learners (if constant and enough input is offered), and so must possess aptitude, but could not handle the complexity of the language tasks used to measure aptitude. The tasks are failing to recognise aptitude where it exists. The same might be argued about non-literate language learners. Such people can and do learn foreign languages successfully but the nature of the test itself, which requires a high degree of sophistication in written language, does not allow this aptitude to be accessed. Language learning aptitude must be something different from the very adult and literate view of language ability presented by the type of tests contained in MLAT. If both these types of learners, young learners and non-literate learners can have aptitude then aptitude must be something more general than this since it cannot involve a fully developed language system or literacy.

Secondly, while Carroll and Sapon's MLAT failed to elicit correlations with other, broader, cognitive qualities, there are plenty of other experimenters in this field who have found such a link. Aptitude tests both before and after MLAT have included, for example, IQ measures (Kaulfers 1931; Pimsleur 1968). These measures are relevant to this discussion because they include not merely linguistic assessments but also attempt to assess mathematical abilities, the ability to appreciate spatial relationships, and other, non-linguistic, elements of intelligence. It would be strange, if aptitude was so specific to language itself, if these non-linguistic tests were to predict language learning success. But they do and often better than the linguistic based aptitude tests (Sparks and Ganschow 2001:91). Only the studies included in the MLAT manual appear to rule out this connection since no significant correlations could be found between IQ and MLAT scores. While correlations of this kind do not prove that aptitude is comprised of non-linguistic abilities, they support the idea that it might be.

Thirdly, there is some published research, which explicitly investigates the link between general cognitive skills and language learning success in youngsters. Esser and Kossling (1986), for example, attempted to replicate the tasks contained in aptitude tests using signs and images rather than language. They are deliberately testing general cognitive skills and comparing scores on these tests with language learning success. Their correlations are outstandingly high (around 0.7 and 0.8) and far better than those obtained between MLAT and language learning success-that typically range between 0.4 and 0.6 (Carroll and Sapon 1958:12-15). A model of language learning aptitude based on these general cognitive skills appears more than plausible, therefore, and allows types of learners, young learners or non-literate learners to be included in the model of aptitude where previously they were excluded. It is an approach which also may be useful in opening up the debate on the nature of the sub-elements which constitute language learning aptitude, which appears to have lain dormant for nearly fifty years.

Linking aptitude with general cognitive skills may have further implications. Aptitude may even be a quality that is plastic at this age. It is a common belief that certain types of practice and activity can promote cognitive development beyond a level where it would naturally be. Providing stimuli and appropriate incentives and many kinds of mental callisthenics can enhance skills and ameliorate cognitive deficiencies to a certain degree. Thus, memory games and mnemonic techniques, it is argued, augment memory capability. Categorisation, classification, or association games and activities promote other relevant capacities (Anderson 2000). This ought to suggest that teachers can actually train a young learner at this age, who might otherwise be a poor language learner, into being a better learner by enhancing their cognitive abilities. This is something expressly not envisaged in traditional views of aptitude.

A model of language learning aptitude where aptitude is completely fixed seems inappropriate when very young learners are concerned and a set of tests which youngsters of this age can address is a requirement to try to assess what changes and developments learners undergo at this age. As Sparks and Ganschow (2001:100) suggest, testing of young learners to provide normative data seems an essential first step.

There are now signs, however, that the time is right for a revival of interest. As Humes-Bartlo (1989:42) comments:

> Individual differences in style of SLA have been studied (Fillmore 1979) but variation in children's ability to learn a SL has not been closely investigated, despite the important ramifications for bilingual education. The relative ease or difficulty which a particular child may have in learning a second language may be predictable on the basis of his or her profile of cognitive strengths and weaknesses.... Children with similar cognitive profiles may learn a second language more easily using a particular style of language instruction.

Accordingly, it might be

> ...tempting to believe that such children with outstanding ability are easy to identify and don't need extra help because they can get on by themselves. The evidence from a number of studies suggests that this is not the case; that some gifted children use their ability to hide their gifts and that not all of them are known to their teachers (Dean 1983:181).

For all the apparent reasons stated above and the challenges and implications stemming from them, researching aptitude in young learners seems a fertile area to study. Hopefully, it will provide interesting information on the nature of aptitude, and will shed light on cognitive skills in young learners and their potent relation to second language acquisition.

CHAPTER TWO

COGNITIVE AND INTELLECTUAL DEVELOPMENT IN YOUNG LEARNERS

2:1. Cognitive development in young learners

According to Rosser (1994: preface) 'cognitive development concerns the processes of intellectual maturation from infancy to adolescence…it concerns the evolution of knowledge and thought….the origins of mind'. Development, alone, involves continuous progress while demonstrating variability across age (Rosser 1994:8) and cognitive development includes the cognitive structures involved in this process.

There have been attempts in the history of cognitive development to attach specific abilities and elements of development to particular ages in children. However, the times have changed and the only undeniable argument is that educationalists, researchers and academics should not be rigid in this matter. Development, as its term already implies, is continuous, language is continuous as well, and hence only approximate figures and characteristics can be indicated.

In considering the background to testing language learning aptitude, it is essential to consider current views of general cognitive development even if these can only be generalized and non-specific to age. Therefore, some general past and current ideas are given here describing what children are assumed to have accomplished in their early stages of cognitive and intellectual development. As attaching ages to stages of development is dangerous (Foster-Cohen 1999:138) this is by no means invariant or valid for every child, as the development of individual children is constant and the social and learning background varies from child to child.

Many educationalists like Montessori, Ericson and others have influenced greatly different pedagogies. The father of cognitive development, undeniably though, is the Swiss biologist Jean Piaget and his influence is, after 50 years, still considerable. His main interest was the study of human adaptive mental capacities. His major contribution is that he offered an outline of cognitive development for children at different ages. His "stages" in logical development are well known around the world and have greatly influenced education, the school curriculum, research and academic thought. The stages are successive and represent corresponding systems of thought. According to Piaget, these are:

1. The sensory-motor period: birth-2 years

Sensory-motor cognition is action-based and depends solely on physical interaction. This stage's main characteristics are object permanence (when an object is out of sight according to the perception of the child, it ceases to exist) and egocentricity (failure to decentre).

2. The pre-operational thought period: 2-7 years

This period has two sub-stages:

a. The period of pre-conceptual thinking 2-4 years

At this stage only rudimentary concept formation is achieved. The most important characteristics are language, imagination and symbolic play. As Pellegrini and Galda (2000:65) explain 'symbolic play is defined as having one thing, for example, a stick, representing something else, for example, a horse'. At this stage thinking is perception-based, undimensional and irreversibility is not mastered (Smith 2000:232). 'Reversibility means that once something is thought it can be 'unthought', that is an operation once performed can be mentally undone' (Hergenhahn 1982:278).

b. The period of intuitive thought: 4-7 years

At this stage, the child seems to solve problems intuitively. Again there is failure of the child to develop conservation (for example, the same quantity of fluid is perceived to be different in a child's mind when in a long or a short glass). This is because, 'maturation provides the necessary sensory apparatus and brain structures but it takes experience to develop the ability' (Hergenhahn 1982:280). However, during this time, the child starts to develop the ability to form logical categories, distinguish relations, and to handle arithmetical concepts (Paraskevopoulos 1983). It is of interest to know what kind of knowledge learners have especially during 5-7 years as this is the target age period of this thesis. It is necessary to bear all this information in mind when devising the experiments (playful activities in this case) for the needs of the research.

3. The period of concrete operations: 7-11 or 12 years

The early use of operations depends upon those events children can experience directly so children can think about the things that they can see (Hergenhahn 1982:278). Piaget calls them concrete operations. By this time, conservation is accomplished. The child is able to handle classes, seriations and concrete but not yet abstract problems.

4. The period of formal operations: 11 or 12-14 or 15 years

This is the stage of scientific reasoning when hypothetical situations can be dealt logically and are independent of physical experience. 'Piaget's "formal operations" theory relates to adults' more mature cognitive capacities as opposed to the "unconscious automatic kind of learning" that characterizes young learners' less mature cognitive system'(Genessee, 1977:148, cited in Papaefthymiou-Lytra 1993:85). This is the reason that adults are expected to be more successful in dealing with the abstract nature of language than young learners.

Two main processes underlie cognitive development according to Piaget. First, assimilation which is 'the process of interpreting experience (individual instances of general concepts) in terms of current cognitive schemes' (Goswami 1998:259). This is an adaptive process that mostly concerns preservations and structures and responding to the environment. Accommodation is 'the effort to fit the behaviour of the organism to the environment' (Donaldson 1978:132), or else 'the process of adapting cognitive schemes for viewing the world (general concepts) to fit reality' (Goswami 1998:259). Accommodation is concerned with variability, growth and change, so the two processes are not contradictory but complimentary (Donaldson 1978:132). According to Piaget's theory, children who encounter a new experience 'they both accommodate their existing thinking to it and assimilate aspects of the experience' (Pollard 1997:121). Moreover, Goswami notes that for Piaget:

> The ultimate goal of the organism is cognitive equilibrium. However, as every cognitive equilibrium is only partial, every existing equilibrium must evolve towards a higher form of equilibrium – towards a more adequate form of knowing. This process of evolution drives cognitive development. When one

> cognitive scheme becomes inadequate for making sense of the world, it is replaced by another (Goswami 1998:259).

Equilibrium, therefore, aims to maximal adaptation and the 'gradual decreasing dependence on the physical environment and the increased utilization of cognitive structures is called interiorization' (Hergenhan 1982:277).

The age of interest in this study is 5-7 and concerns the period of pre-operational thought, when presumably some skills are premature or just developing but what mainly characterizes their thought is perception and action. As Smith (2000:230) comments:

> To Piaget, the preschool years is a period of transition in cognitive development (1952b). Young children gradually leave behind the very early thought processes of infancy, which were tied to the concrete world. They can now think beyond objects or people that are immediately before them and are able to reflect on things they can not see, hear, touch or act upon. They can imagine objects or people that are not present, contemplate future events, and recall past ones. On the other hand, preschoolers do not use logic as adults do....their reasoning is hampered by several mental limitations. They still rely too heavily on their senses in their thinking.

During this period, children are supposed to deal with problems intuitively, thus their analytic skills are implied to be severely limited. They have also difficulties with conservation and reversibility but they are able to handle logical categories, relations and arithmetical concepts. It is generally accepted though that these 'stages' are going down and children seem to be much more efficient and quick at learning and experiencing as more stimuli (including TV, radio, computer games) are offered today.

To Piaget's mind, children are supposed to construct their own knowledge by actually acting upon objects in space and time, while play, as well as practical experimentation, have a vital role in this process (Cameron 2001; Andrews et al 2000:9). Piaget's theory of logical development has offered much to cognitivists and linguists and his work is still very influential. However, his study has not given any explanation, analysis or attention to the development of memory, transfer of learning and the development of conceptual knowledge (Goswami 1998:278-279), or neuroscience perspectives (such as brain function). Last but not least, his theory makes no reference to the primary analytic skills that children might have mastered or might be demonstrating. During the research, it would be of interest to see whether children even at that early stage are able to deal with language analytically.

Vygotsky is the Russian psychologist who worked around the same time period, only to have finally won recognition 50 years later. He is the first theorist of cognitive development to emphasise the role of social behaviour for children's development and to 'to place social interaction as its heart' (Resnick and Le Gall 1997:148). He thinks that children's development, if helped by the older ones (scaffolding) can take them beyond their zone of proximal development (ZPD) and that interaction with other people (parents, teachers, brothers-sisters and peers) is of vital importance for their development. He views intelligence as a social construction and the acquisition of tools and practices and he also disagrees with Piaget on the matter of egocentrism. His theory is that children do not merely talk to themselves, but that this is a transitive period, 'they are thinking aloud' and this egocentric speech is nothing less than the adults' esoteric (inner/internal/silent) speech (Paraskevopoulos 1983:73).

2:2. Intellectual development in very young learners

This section is again an attempt to touch upon certain intellectual skills, which children at different age levels are 'supposed' to have achieved in their first language. It is important, however, in this case again, to regard with similar caution any assumptions or conceptions. This is merely a description of a general frame and could not be strictly followed, as its aim is to give a broad idea of what is believed nowadays that happens generally at this age. However, again this kind of knowledge is of vital importance when devising research activities for young learners.

5-6 years: From the age of three to five, children learn in their native language more than 50 words per month, which is 600 annually. They are alleged to understand approximately 13,000 words and use 5-8 words in a sentence. Children are able at this stage to abstract the common element/characteristic and to generalize new cases (Paraskevopoulos 1983:68). Their ability to speak and express themselves develops rapidly. When they play, they use the words and language they learn in school. They can talk to each other about themselves and their families.

They start to understand time and days of the week, know basic colours by heart, are able to memorize addresses and phone numbers and they also understand the structure of even more complex stories. They are able to remember stories, can repeat or create a story. They can place objects in order from shortest to tallest, they can tell right from left and they understand and use comparative terms like short, shorter, shortest, sort objects more easily by colour or shape than by size. Children at this period can deal with classification (for example, 'cats, dogs, elephants are all animals' but prefer thematic from taxonomical categories), identify some letters of the alphabet and a few numbers, understand quantity words like 'more' 'less', and 'same' and 'different' and can count up to 10 objects. Children at this age understand time expressions like before and after, yesterday, today and tomorrow, positional expressions like above, and below although they might confuse these expressions in their own speech. They have good attention span (although quite short), favour projects, role-plays and drawing. They also enjoy silly rhymes, riddles, and jokes and hands-on things (Oesterreich 1995:4).

6- 8 years: Recent evidence shows that (Landers 1990:5) six year olds have a vocabulary range from 8000 to 12,000 words while it is estimated that by the age of twenty they will have 70,000+ words.

At this age children normally have some phonological awareness.

> Phonological awareness is the explicit knowledge of the sounds of language that enables children to break down words into components sounds, put individual sounds together to form words, and order and sequence the sounds of words (Adams 1990 cited in Bergen and Mauer 2000:45).

They have also developed print awareness, namely 'knowledge about prints and books and the understanding that sounds can be represented by printed or written symbols' (Blackman 1984 cited in Bergen and Mauer 2000:45). Children can, therefore, reverse printed letters, their speaking and listening vocabulary doubles, reading presents an exciting (usually) challenge and they seem to persist more on problem solving activities. They also have a considerably longer attention span, and enjoy group work (Oesterreich 1995:4).

It becomes clear after all these that 'diagnosis of cognitive level is broadly predictive of cognitive performance' (Rosser 1994:120). Therefore, a child that has mastered mental representation is expected to be able to answer the question 'do dogs have tails?' without actually having to see a dog. Also:

> ...a preoperational child could conceivably think that a plane becomes smaller as it takes off and a child up to 6 or 7 is envisioned as preconceptual (and are bound by perception and context), from 7-12 conceptual and logical within most realistic situations (rely on knowledge of classes and relations) (Rosser 1994:120).

Early years see rapid developments in children's ability particularly in the areas of language and cognition. These developments parallel and rely on equally astounding cognitive developments- 'the abilities to plan, to remember, to categorize taxonomically, to learn intentionally, to entertain a variety of perspectives, to understand complex and abstract phenomena, to analyse problems and solve them' (Landers 1990:1).

Chomsky (cited in Cook 1986:73) regards language as a 'separate organ with its own internal structure and obeys its own laws of growth'. But language combines other things like 'performance and this is subject to constraints upon memory, attention, physical processes such as breathing that have nothing to do with the speaker's knowledge of the language' (Cook 1986:74). Spolsky illustrates this beautifully:

Just as language development is tied to physical development in specific ways, such as the influence of the development of the nervous system on phonology, so the use of certain language abilities depends on the availability of certain general cognitive abilities (Spolsky 1989:101).

Language and cognition are not separate. This is because the cognitive approach is related to thinking and all the mental processes that this involves (Glassman 2001: 151). Thinking, in turn, is directly related to language as learning refers to 'the process of gathering information and organizing it into mental schemata' (Glassman 2001: 156). As Rosser (1994:287) puts it: 'Cognition can be simplified or reduced to a set of more elementary processes, capacities, or components which is then variously combined in the service of intellectual activity'.

Therefore, one should expect that general cognitive abilities (i.e. memory, certain analytic skills, etc) would have a considerable impact on both first and second language ability.

2:3. Cognitive skills

Cognitive skills are 'any mental skills that are used in the process of acquiring knowledge' (NCREL 2002). The Mid-continent Research for Education and Learning (1998) concludes that reading and writing especially rely on a specific set of cognitive skills (like attention, symbolic thinking, representation). However, one can equally conclude that without specific cognitive skills it would be difficult to do a listening or a speaking task as well.

Literacy involves the integration of many cognitive skills, which explains the fact that literacy attainment correlates with many cognitive measures. In addition, strengths and limitations in various cognitive skills can be used to predict those children who are likely to experience difficulties in literacy development. Several psychologists now investigate the role of different cognitive abilities with difficulties encountered in early reading and writing (Singleton 2002).

Although it is very difficult to include all possible cognitive skills in the course of young children's and adults' development, a list and description of the most common and important ones is presented below.

1. Memory

Memory, 'the retention of veridical (accurate) representations of encoded information is one of the most important of elementary processes of cognition' (Perlmutter 1988 cited in Rosser 1994: 287). Memory is broadly divided in three major stages: encoding (i.e. process of information for retention), storage (retention of information in memory) and recall/retrieval, namely the immediate and active retrieval of information stored (Glassman 2001:159).

Memory is not a unitary thing but includes a variety of different types that belong to the big 'family' of memory. The two important components of memory store are short-term memory and long-term memory.

Short-term memory (STM, known also as working memory) refers to 'the component of memory which handles retention over relatively brief intervals of up to approximately 15 seconds' (Glassman 2001:158). It is a quick and very adaptive component but has very limited storage capacity (Schmitt 2000:131). Baddeley and Hitch (1974) argued that the model of working memory consists of 'a central executive served by two short term stores, the 'phonological loop; which holds auditory and speech based information and the visuo-spatial sketchpad which holds visual images' (cited in Groome at al 1999:101). Long-term memory (LTM) is the 'component of memory which is concerned with retention over relatively long periods (hours, days, weeks or longer)' (Glassman 2001:158). This has an apparently infinite storage capacity although it is quite slow.

Some types of memory that could possibly influence language learning are described below. Visual memory refers to the ability to store and hold visual images or visual material (pictures, shapes, images). It is not easy, however, to strictly distinguish between sensory, representational or pictorial memory (Craik and Lockhart 1996:211). Visuo-spatial working memory (VSWM) is identified as 'the system involved in short-term retention and processing of visuo-spatial material' (Vecchi et al 2001:29). Phonological memory refers to the ability to maintain phonological of words, sentences or sounds of non-sense words.

There are other types of memory. *Declarative* memory is said to be the 'memory for facts events, the lists, rules, principles, etc. Two types of declarative memory are the s*emantic* memory which refers to information we have about the world in general and *episodic* memory which is for specific events or episodes that occurred at a particular time and place, stored with an autobiographical reference (Tulving 1972 cited in Rosser 1994:287; Groome et al 1999:121). *Procedural* memory is the memory for how to do things such as ride a bike, type or execute a tennis serve. However, there will be no work on episodic memory in this thesis, as it seems remote to language processes.

A useful distinction emerges here between explicit and implicit memory. Explicit memory involves conscious recollection; implicit memory involves the cognitive use of previous experiences without conscious recognition. An example of explicit memory would be remembering what you had for lunch or remembering friends' birthdays. In contrast to explicit memory, implicit memory occurs 'when prior learning impacts a current task but does not involve making a conscious effort to recall the earlier experience' (Simpson 2002:1). Every day activities require unconscious recollection of prior experience, for example driving a car means unconsciously remembering the skills of driving and the rules of the road.

Cognitive psychologists suggest that memory enhances with development up to some optimal point whereas some data show that older is often better when it comes to memory performance (Kail 1990 cited in Rosser 1994:286). However, there are others who argue that actually memory achievement and the processing capacity of explicit memory diminishes with age as analytical skills develop (Gathercole et al 1992; Fay et al 2003). It seems reasonable to suggest that explicit memory develops with age, however, at the age of three implicit memory is still superior to explicit memory (Munõz, personal communication).

This is really interesting from the aptitude point of view since this memory ability is seen as a component of aptitude (as in Carroll, Meara et al, etc). But aptitude testing is unclear on the nature of memory that contributes to language learning. Carroll identifies paired associate memory for words specifically, while Esser and Kossling (1986) successfully use shapes. Whatever the case, this ought to be a really important area for investigation of aptitude in young learners given the importance of memory in young learners' cognitive development.

2. Spatial ability

Rosser (1994:77) defines spatial cognition as 'the spatial representation of spatial information'. This representation according to Piaget can be practical (reaching, getting around, directing body) or perceptual (guiding spatial behaviour). In other words, spatial ability refers to perception about space and one's position. Although there seems to be no direct impact of this ability on language learning, orientation and spatial skills have been found to be symptoms of early dyslexia and learning difficulties. In addition, Carroll himself (1990:24) states that factors of special ability might be useful in prediction of aptitude even if they are not immediately regarded as relevant in learning languages. Therefore, it would be potentially interesting to see if there is any connection to language aptitude as well.

3. Classification

Mature categorisation relies on three main components of knowledge; intention and extension of class, which implies the knowledge that 'a membership in one class precludes simultaneous membership in a mutually exclusive class' (Rosser 1994:123), so an object can not be both circle and diamond. There is thirdly, the knowledge that groups can be arranged into class hierarchies, so a big tortoise and a small tortoise are subordinates of tortoise, which in turn subordinates to reptiles which form part of the super-ordinate group of 'living things'. Consequently, certain deductions are permitted. Interestingly, this is similar to the sort of semantic integration task that Esser and Kossling (1986) link to language learning. Furthermore, grouping and categorising are important in second language learning especially when it comes to parts of speech and grammar inferencing rules as well as thematic concepts of words. Categorisation is important 'with even quite young learners, as has been demonstrated by work on learner training (Ellis 1991) and on young children's metalinguistic abilities' (Cameron 1993:13).

4. Logical reasoning

This is divided in two separate abilities, namely deductive and inductive ability. Rosser (1994:231/232) gives an example: 'If one accepts the truth of the premise, 'All dogs are black', then he knows that any dog he encounters must also be black. The conclusion follows from the premise by necessity; if the premise is true, then the conclusion has to be true'. This is an example of deductive reasoning. A case of inductive reasoning would be 'if the person has encountered mostly black dogs, again he might conclude that the next dog he meets will also be black, but that conclusion is only probably true' (Rosser 1994:232). Educationalists use these terms often in the learning process and refer to deductive ability as the ability to deduct certain parts from the whole, and inductive ability, the ability to envisage (analyse) the whole from parts. Carroll himself views these types of ability as important in aptitude although not necessarily as general cognitive abilities. Possible testing in logical reasoning would include picture cards that when put in sequence make a story.

5. Attention

Glassman (2001:158) states that 'attention is the process of selectively focusing on particular stimulus elements typically those deemed most significant'. It is evident that in the process of any learning, language learning included, concentration and attention span are indispensable. This, however, is a conscious process. It is widely accepted that young learners have a very short attention span and this is why teachers always have to devise different activities even on the same subject and pace them quite quickly. This is to keep their interest and engage them in activities that require at least some attention. Although generally an important skill, this would be quite difficult to measure and surely at this age (when children are restless by nature) it does not seem fair to relate it to aptitude.

6. Perception

There have been numerous attempts in time, to separate perceiving from thinking or else perception from cognition. As Glassman (2001:154) comments:

> Perception was used to refer to the receiving of sensory inputs, while cognition is referred to mental processes. For example, perceiving involves recognizing a stimulus – and recognition of something as familiar requires making use of memory (a cognitive process).

However, it is not clear why the two are separated and other psychologists think that perception is included in cognitive skills as one of the most important. This also links to Carroll's sound discrimination and Pimsleur's ideas on auditory discrimination. To make things clearer for future reference, in this thesis visual and phonetic perception will be examined as cognitive skills. This is because both of them are clearly cognitive nevertheless demanding certain perceptive skills and could potentially relate to language learning aptitude. Perceiving and distinguish between phonetic sounds is important when learning a language and visual perception closely relates to Esser and Kossling's learning and recognition list without the memory element on it. Phonetic perception is needed for listening and speaking tasks while visual perception is a requirement also for reading, writing and spelling.

7. Problem solving

Bullock report (1975:53) regards problem solving as 'the capacity to reflect, to weigh decisions, and to choose among alternatives'. This is most commonly needed in the learning of sciences like maths, physics. In its nature this ability demands perceptual and conceptual understanding, and is regarded as more complex. Inductive and deductive abilities also represent types of problem solving skills and will be examined for the purpose of this thesis as mentioned before.

These are some of the main cognitive skills that relate, one way or another, to language learning hence might pose possible questions on their relation to second language learning. Undoubtedly, the list is not intended to be comprehensive but to offer a broad idea of the skills that form the interests of this research.

2:4. Language acquisition in young learners

This part focuses on first and second or foreign language acquisition• in very young learners.

There is a need, first, to clarify what language acquisition, language learning and language development mean. Language learning refers to a conscious process of

• Second language refers normally to the second most popular language spoken in a country (French in Canada for example) whereas foreign language is a language that is not usually spoken in a country. However, these two terms are currently being used to mean the same thing. For practical reasons, hereafter, learning a second or a foreign language in this thesis is meant learning any language other than the native language of a country.

building up grammar and vocabulary of a language and involves 'learning the rules' of a language'. As Vygotsky (1978:83) puts it: 'The mind is not a complex network of general abilities, but a set of specific capabilities… Learning is the acquisition of many specialized abilities for thinking'.

Language development concerns 'the historical process by which language develops in a child' (Cook 1986:74). Acquisition is the steady development of *ability* in a language (Yule 1985:151). It implies 'an abstract idealised model of how the child acquires language itself' (Cook 1986:74). Although striking similarities in speed and route of development, of transitional structures used, and of error types, have been noted, there is also a considerable variation in first language development (Wells 1986 cited in Skehan 1992:171/172). Dale (1976:14/15 cited in Carroll 1981:86) has shown that considerable differences among children emerge in the rate of acquiring their first language.

Cognitive psychologists support that language is not different or separate from other areas of development. It is assumed that language and acquisition of language involve basically the same information processes like other cognitive activities (Rossman 2000). If this is so, one might expect good connections between general cognitive skill tests in young learners – better, perhaps, than what Pimsleur got with IQ tests. Other linguists maintain that 'there is a language specific ability or faculty, distinct from other cognitive abilities' (Spolsky 1989:100). Spolsky in particular, argues that this language specific ability is 'consistent with other aspects of the cognitive system, because it interacts with and makes use of them'. Jackendoff claims that there is a:

> Cognitive Constraint: there must be levels of mental representation at which information conveyed by language is compatible with info from other peripheral systems such as vision, nonverbal audition, smell, kinaesthesia, and so forth. If there were no such levels it would be impossible to use language to report sensory input (Jackendoff 1983:16 cited in Spolsky 1989:100).

Ellis (1997:44) argues that:

> ...rather language is cut of the same cloth as other cognitive processes, but it is special in terms of its cognitive content. Learners' language comes not directly from their genes, but rather from the structure of adult language, from the structure of their cognitive and social cognitive skills, and from the constraints on communication inherent in expressing non-linear cognition into lithe linear channel provided by the human vocal-auditory apparatus (Bates, Thal and Marchman, 1991).

Children are the best examples of language learners because of their spontaneous nature of language acquisition (McDonough 1981:95). It would seem sensible to study how they perform the task to see if any features can be generalized to language learning at later stages. In this case, if second language learning reiterates first language learning, it would be wise to offer descriptions of both processes and draw emerging comparisons (McDonough 1981:94).

This study aims at unveiling the importance and the relation or interaction between language and cognition. Perhaps language is not one specific ability or process (only its development can be assumed as a process) but a set of different linguistic skills and cognitive abilities which influence language learning and processing. If viewed in this light, it opens large possibilities of researching which cognitive skills are prerequisites for second language learning. These cognitive skills in turn, might give indications of 'how ready' or even 'cognitively mature' a child is before starting a second language. Last but not least, these skills could compliment linguistic skills and, combined, contribute to discovering much about the nature of language learning aptitude.

2:4:1. First language acquisition

There is a commonly held belief that success in child language learning is a result of the resurrection of first language learning processes. Therefore, it is important to describe first language acquisition on its own merit before relating it to the second. Regarding first language, Holt states that:

> We do not need to 'motivate, children into learning by wheedling, bribing or bullying...We do not need to keep picking away at their minds to make sure

> they are learning. What we need to do, and all we need to do, is bring as much of the world as we can into the school and the classroom; give children as much guidance as they need and ask for; listen respectfully when they feel like talking; and then get out of the way. We can trust them to do the rest (Holt 1967:173).

There are three main theories for the first language acquisition. The first one is behaviourism (with Skinner being the main advocator) and involves learning and language learning as a result of learners imitating what they see, hear or experience. According to Skinner's theory of language development, language is founded in experience and learned through operant conditioning. However, it is noticeable that children utter things they have not heard especially while trying to discover grammatical rules in a language.

The second theory is introduced by Chomsky, who argues that children are equipped with a universal grammar and are biologically programmed to develop language through a creative process of discovering. This, however, has to be done under certain conditions (interaction and age play important role in acquiring a language, i.e. the wolf child example). Chomsky is a nativist. For him, children have an inborn capacity to learn their native language and:

> To help them succeed in this amazing task, they can easily differentiate similar sounds of their indigenous language; by 6 months babies know the fundamental sounds of their native language. At about 9 or 10 months infants focus on the language (or languages) spoken around them and loose the ability to immediately differentiate sounds that are part of another language (Hoyt 1999).

Chomsky states that children make use of a Language Acquisition Device (LAD) to understand complex syntax and to speak. This explains why the language learning process that comes so easily to children is difficult for adults. LAD is seen as a special neurological system in the human brain that facilitates language development. This, however, has to be done under certain conditions (interaction and age play important role in acquiring a language, i.e. the wolf child example).

The third theory is known as interactionism and involves a necessary condition for the development of the linguistic skills. This is, that children are 'on the receiving end of speech directed specifically at them' (Andrews et al 2000:4). According to this theory, children need to interact with people who address language directly to the children. As a result, age is an important variable in first language acquisition (Andrews et al 2000).

The most recent theory of language learning is constructivism. According to this theory, learners construct their own conceptualisations and find solutions to problems, mastering autonomy and independence. Therefore,

> ...learning is the result of individual mental construction, whereby the learner learns by dint of matching new against given information and establishing meaningful connections, rather than by internalising mere factoids to be regurgitated later on. In constructivist thinking, learning is inescapably affected by the context and the beliefs and attitudes of the learner (Thanasoulas 2002).

Moreover, according to constructivism, learners are seen as active agents who 'engage in their own knowledge construction by integrating new information into their schema, and by associating and representing it into a meaningful way' (Hsiao 2005:2).

The phonological (sound) system of the first language is based on certain rules. Very young children can segment, sort, and classify phonetic categories. Their fist production of language is bubbling. The first sound system children produce is based on words (relatively short) and are analysed into their components at the age of 2-4. The process of phonological development follows no invariant sequence, and can show regressions at the same time as the system becomes more complex.

Gestures form the first signs of verbal communication at around nine months and the first words are uttered at about one year of age. Vocabulary after the 18 months develops rapidly and especially during the third year are the most dramatic ones

(Paraskevopoulos 1983:68). Around that time children articulation and pronunciation meet great progress too and by the age of 8 the phonetic development is almost complete.

No coherent evidence of the way children relate words to concepts are available but symbolic function is thought to be a prerequisite for this process. Children appear to learn words in many different ways. They regularly use one word for many obviously unconnected objects.

In a first language, incidental learning is probably the fundamental means of acquiring vocabulary. This is supported because parents or teachers do not 'teach' or expose to their children most of the vocabulary that they use, although they sometimes make their speech simpler in order to facilitate communication or comprehension (motherese, caretaker or caregiver talk). Still, it is found that the children acquire quite easily a massive amount of input, and they enter school at age 5 with a vocabulary of around four to five thousand word families. It is claimed that children are exposed to their native language even before they are born as research has revealed that 'embryos become accustomed to the prosody (rhythm, flow and stress of a language) of their mother's speech while still in the womb' (Schmitt 2000:122).

There seems to be a gradual learning for the vast majority of the new words that is the result of extended repetition in various contexts. Experts believe that learners typically need about ten to twelve exposures to one word overtime in order to learn it well. They observe that native speakers can learn as many as fifteen words per day from the ages two to seven and therefore conclude the direct instruction of vocabulary can not possibly account for the vast growth of students' knowledge of vocabulary (Coady and Huckin 1997:225).

Researchers have tried to understand the relationship between language and thought and what precedes. Is it the word or the thought that comes first? Vygotsky argues that a child cannot abstract all the concepts that are coded by language without the word. To his view the word acts as a coat hanger on which the child hangs a concept. This is probably how later the child organises his thoughts and forms categories. In his very influential work 'Thought and Language' he imagines thought as a cloud shedding as tower of words (Vygotsky 1962 cited in Slobin 1971:101).

For Piaget language relies on certain non-verbal psychological growth and the concept must precede the word, because the advance of intelligence precedes language. Consequently, Piaget's view on thought is the outcome of internalized actions that rely on the level of progress of the child's non-verbal cognitive and perceptual abilities. Language is not necessary thought but the development of operational thought is necessary for the acquisition of language. This is true at least for the beginning of language acquisition. In the case of late development language has an influence on the development of cognitive structures such as the ability to differentiate, categorise, rule finding ability deductive reasoning. Some of these have to be activated within certain time windows so that they can ideally /optimally be realised neurobiologically (Rossman 2000).

According to Nelson children acquire language that is already equipped with action-related concepts. 'The Functional Core Model (FCM) essentially proposed that the child came to language with a store of familiar concepts of people and objects that were organized around the child's experience with these things' (Bruner 1983:35).

What happens with grammar and syntax though? One the one hand, innatists like Chomsky, Lenneberg, Mc Neil, Menyuk support the idea that children come to learning with the help of innate mechanisms. More specifically, as has been mentioned, Chomsky proposes that the acquisition of the structure of language depends on a Language Acquisition Device (LAD). According to this theory, the Language acquisition Device is equipped with a Universal Grammar.

Slobin proposes that 'a child is equipped , probably innately, with a set of 'language definitional universals', which embody in a very general way the basic similarities between all languages' (cited in Mc Donough 1981:100). Vygotsky verifies that each person is born with a set of elemental cognitive functions such as the ability to attend, perceive and remember (Hergenhahn 1982).

Behaviourists like Skinner, Bloomfield, Sapon, Jenkins, Palermo on the other hand, support that grammar and other forms of language development depend on the environment, the input offered and types of behaviours that the child might identify. Bandura argued that Children learn how to act by watching people model different behaviours. The behaviouristic theory suggests mainly that people learn by building up associations between their experience, thinking and behaviour and so the more positive the experience, the more likely learning will take place (Andrews et al 2000). Nelson (1981:183) claims that:

> The child does not build up language by analyzing its parts in terms of lexicon, syntax, phonology, and pragmatics. Rather, the child acquires the language according to contextually determined parts. The context of language use will determine the function of presented utterances, their relationship to non-linguistic conditions, the form of sentences, and their relative analyticity in presented form. The child will accumulate knowledge based on these various exposures. He or she will subject accumulated knowledge (examples) to analysis to determine first units and then contributory rules (Fillmore, 1979; Peters, Note 4).

Aitchison's explanation (1987 cited in Schmitt 2000:18) of the process of meaning acquisition in first language entails three basic stages. These are labelling (the child labels a concept with a word), categorization (the child classifies concepts and forms word groups, network building (the child builds connections between related words). Preschoolers:

> ..use words and labels and acquire new words and new labels at an incredibly rapid rate. If labels and words are interconnected with the classes and categories it does not make obvious sense to propose that children would be accomplished in one domain (language) and naive in another (concepts) as presently cognitive development as domain general knowledge acquisition (Rosser 1994:126).

However, as Rosser comments (1994:126) the younger children perform in a remarkably different fashion, notable for its deficiencies, idiosyncrasies, and the absence of explicit formulations.

> Young children appeal to semantic properties of the words rather than to their sounds to make decisions about how the word should be written, claiming that train, a big thing, needs more letters than caterpillar, a small thing (Rosser 1994:67).

At this early stage individual learning styles and preferences are revealed. What makes a child use the one or the other is possibly genetic.

The two main ones are the analytic (children analyse the language in its components) and the holistic or gestalt style (imitation and use of whole phrases). Another one is the communicative type (interaction). Bates (1979 cited in Nelson 1981:179) assumes that 'these three factors may be related to competencies associated differentially with the two hemispheres of the brain, the analytic mode with the left and the wholistic patterning with the right'.

Consequently, some children are supposed to be 'referential' and their early vocabulary includes mainly object names, some verbs, proper names and adjectives and some children are 'expressive' and they have all these categories but also a variety of imitated social routines or formulae (gestalt phrases) such as 'thank you', 'stop it' and 'don't do it' (Foster-Cohen 1999:132; Nelson 1981:172).

As Nelson remarks, 'the now conventional view of language acquisition is that it rests on the cognitive achievements of the sensory motor period as outlined by Piaget' (Nelson 1981:167). Symbolic presentation and the imagination of objects seems to be a prerequisite for language acquisition (the imaginary picture is an archaic form of meaning), otherwise there is no development to thinking (Rossman 2000). Piaget's approach regards language acquisition as a mere extension of pre-linguistic experience with the world, and basic processing mechanisms like assimilation and accommodation, however, these do not explain complexities of language structures and the success in basic word order (Foster-Cohen 1999:167).

There is an established belief that generalisations about patterns of first language acquisition are permitted independent of the language. Research shows that 'there are common features in the development of a first language that cut across differences between the languages being acquired' (Tough 1991: 215-216 cited in Andrews et al 2000:7).

The important difference this process shows is that first language learning is implicit rather than explicit. Formal analytic skills, and deliberate intention are not part of first language process but they might be characteristics of second language learning. From a teaching point of view it is of more than academic interest to know whether learning at this young age is explicit or implicit as this can set the grounds of more effective teaching and learning of the second language.

2:4:2. Second/ Foreign language acquisition

Individual variation in second language acquisition rate, such as aptitude and motivation, and several other individual differences have been investigated in second language acquisition but not in first language acquisition. However, it might actually prove interesting (Foster-Cohen 1999). The Bristol Language Project (Skehan 1986a, 1989) showed that 'the more intelligent children making faster progress learning their first language, and then making faster progress in learning a foreign language' (Skehan 1992:153). Furthermore, Carroll actually thinks that aptitude is a residue of first language learning (1973) and Skehan (1986a) showed that native language ability correlated highly with their skill in learning a foreign language (Sparks and Ganschow 2001:94).

Cook (1986:73) thinks that foreign language learning has a special interest of its own because 'potentially it is immune to cognitive development'. According to Foster-Cohen (1999:162) this is not really the case as learning a foreign language is qualitatively different and 'engages problem solving and general learning strategies that could as easily be applied to the learning of mathematics or music'. Learning a foreign language indeed involves psychologically different processes to those of first language acquisition. Wood (1988:5) mentions that 'Piaget's theory, offers a detailed and specific account of universal stages in human development which provided a possible explanation as to when and how a child is ready to learn or develop specific forms of knowledge and understanding' but where children are involved there is no clear account of what happens with foreign language learning.

Bley Vroman (1989) argues that the striking differences in first and second language development and the relative uniformity of learning rate and a ultimate success in first but not second language acquisition prove that the 'two acquisition processes then are fundamentally different' (cited in Sawyer and Randa 2001:319).

Cook suggests however, that in foreign language acquisition, the language-cognition relationship is much closer than with first language acquisition (in Skehan 1992:185). While acquiring the first language, children, apart from the language code, learn many more things such as associating things, interaction, organization of social relationships, methods of categorizing the world and so forth. Consequently, to some degree they do not need to master all these when learning a foreign language but simply the new language code (Mc Donough 1981:34).

In addition, Thanasoulas (2002) suggests that cognitive and learning styles, already acquired through first language exert direct influence on foreign language learning. Foreign language learning is different from first language acquisition because they already have the experience of acquiring first language and are more cognitively mature. They also do not need to learn new concepts or how things exist and operate, they have a coherent set of concepts and semantic features so obviously, they re-label the known concept with the new word. As a result, Cook (1986:78) claims that it is quite difficult to separate cognitive development from linguistic development.

Gregory and Fillmore (1976:159/160) have suggested that children in a natural environment will go through three stages in acquiring a foreign language. First, they establish social relationships with foreign language speakers and hence rely heavily on both non-verbal communication and fixed verbal formulae. Then, they begin to generate meaning by using new combinations of the formulaic words. After that, they concentrate on the correctness of language form itself.

But what happens in a non-natural environment or else in more formal settings? Gathercole at al (1992:887) state that:

> Although studies of word learning in children have documented the remarkable facility of preschool children to acquire new vocabulary (Carey 1978; Dickinson 1984; Dollaghan 1985) the factors underpinning the large individual differences in young children's abilities to learn new words are as yet little understood.

Daneman and Case (1981:129) support that:

> Words are not necessarily learnt in a linear manner, with only incremental advancement and no backsliding....forgetting (of material) is a natural fact of learning. We should view partial vocabulary knowledge as being in a state of flux, with both learning and forgetting occurring until the word is mastered and 'fixed' in memory.

It is true that there is not one unique way in which children learn words. It appears that they often use one word for many and unconnected objects because its meaning is somehow interpreted in a specific way in their minds. Service and Craik (1993) have shown in their study that children were superior on all of the new word learning tasks in comparison to older groups. They also appear to depend less on their phonological representations than on their semantic associative ones, and this is particularly interesting as children are supposed not to be very analytical (cited in Coady and Huckin 1997:284).

Whatever the case, children are remarkably quick in remembering and understanding new words and one reason for this might be that:

> ...children are very clever in understanding the structure of the classroom, the daily schedule, and what is expected of them. These nonverbal understandings help them ultimately to learn the language that accompanies the activities (Landers 1990:8).

Where acquisition of grammar is concerned, Spolsky (1989:91) refers to claims that:

> All or crucial parts of second language learning are dependent on some innate pre-programmed mechanism, identical or similar to the LAD proposed for first language learning. A second claim is that this mechanism is differentially available, according to the age (Critical Period Hypothesis) or according to the natures of affect or input conditions.

Further on that, Larsen-Freeman and Long (1991:163) report that:

> Several researchers including Rosansky (1975), Felix (1981b), and Krashen (1982b) have implicated cognitive development, particularly attainment of Piaget's formal operations stage, as negatively affecting SLA. Piaget's formal operations' stage involves the ability think abstractly. The argument is that child SLA and adult SLA might actually involve different processes; the former utilising a LAD as in L1 acquisition, the latter employing general problem-solving abilities. While the ability to think abstractly might give adults a tremendous advantage in solving problems, the claim is that the trade-off is an inability to make use of the LAD for SLA.

This is another evidence of the widespread notion that young learners possess no analytic skills at this age period. However, when languages are learned in formal settings as in classroom for young learners, it will be interesting to observe whether language learning remains implicit.

Again, here, it is implied that foreign language acquisition is simply a residue of the first language requiring minimal conscious efforts. Interestingly, however, Pankhurst and Sharwood in Smith (1985: Editorial), claim that:

> ...the fundamental goal of understanding how a second language is acquired, of understanding how the language acquisition skills interact with other cognitive skills in the unique situation where the learner has the advantage or the disadvantage of a relative degree of conceptual maturity, and a fully

implemented realisation of Universal Grammar in his first language (Gass and Schachter 1989:3).

Sarah Phillips (1993:5) assumes that:

> The younger the children are the more holistic learners they will be. Younger learners respond to language according to what it does or what they can do with it rather than treating it as an intellectual game or abstract system. So, they respond to the meaning underlying the language used and do not worry about individual words and sentences but they also do not make the analytical links, the older do.

Even in that case, Genesee's conclusions (in Spolsky1989: 104) are important: Just as all children with exceptions in pathological cases, are able to develop functional control of their first language, so it is reasonable to assume that all children can acquire a second language. This is true, yet, interestingly, Cameron notes that:

> ...by the age of five, individual differences in language domains will be established and so, for example, some children will find it easier to learn vocabulary than others, or children with more developed conversational skills may transfer these to the new language more easily than others...it seems likely that a second or foreign language ZPD may not be global, but that different aspects of language will have different ZPDs (Cameron 2001:13).

It becomes therefore apparent there are many questions and much value in studying individual differences in second language learning and the whole process of acquiring or learning a second language. As Sparks and Ganschow (2001:101) notes 'with foreign language learning problems the cognitive difference is likely to be language related because foreign language learning is a language related task'.

2:4:2:1. Krashen's theory of second language acquisition

Krashen has carefully studied second language acquisition and distinguished five hypotheses related to it.

1) Acquisition-Learning Hypothesis

According to Krashen's theory, there are two independent ways of developing abilities in the second language. Thus, he introduces *acquisition* as the subconscious process which seems and sounds identical in all ways to the process children employ in acquiring the first language and *learning* which is considered as the conscious process that results in 'knowing about' the language. So, acquisition is the 'natural' way, paralleling first language development in children.

Acquisition refers to an unconscious process that involves the naturalistic development of language proficiency through understanding language and through using language for meaningful communication. Learning, by contrast, refers to a process in which conscious rules about a language are developed and it is a product of formal instruction. (Richards and Rodgers 1986: 131). Language acquisition occurs subconsciously while participating in natural conversations or communications where the focus is on meaning. The learning of a language occurs separately where grammar, vocabulary, and other rules about the target language are explicitly taught. There is a focus on analyzing errors and correcting them.

Krashen advocates that learners acquire language rules in a fairly predictable order and the competence to product utterances in the second language stems from the subconsciously acquired knowledge. Consequently, for Krashen it is virtually certain that language is attained in only one way and that is by receiving 'comprehensible input'. Hence Krashen is eager to provide a panacea for its significance and claims that it is the essential environmental ingredient in second language assimilation and acquisition of the second language. Here, once again, second language learning is regarded as implicit.

2) Natural Order Hypothesis

The Natural Order hypothesis suggests that the acquisition (and not learning) of grammatical structures follows a predictable 'natural order'. This order is deemed to be independent of the learners' age, L1 background and conditions of exposure.

According to Krashen (1994), natural order patterns of second language acquisition do not follow those of the first language acquisition patterns but they are patterns to second language development. Interestingly though, the second language acquisition patterns of a child are seen as very similar to the second language learning patterns of an adult (Nolan 2001).

3) Monitor Hypothesis

According to this Hypothesis, there is a 'monitor' which functions to help the learners to filter their language. Krashen (1994) explains that in order to use a monitor well, three factors must be met: (1) time; (2) focus on form; and (3) knowledge of the rules. Krashen also suggests that there is individual variation among language learners regarding 'monitor' use. There are those who use it constantly (over-users), others who have not learned how to use the monitor or choose not to use it (under-users) and learners in between those groups (optimal users). Optimal users use the Monitor appropriately and constructively (Nolan 2001).

4) Input Hypothesis

According to this hypothesis, learners improve and progress along the 'natural order' when they receive second language 'input' that is one step beyond their current stage of linguistic competence (Nolan 2001). Krashen suggests that natural communicative input is the key to designing a syllabus. The Input Hypothesis forms the idea represented by i+1; 'where the i represents the "distance between actual language development" and i+1 represents "the potential language development' (Richard-Amato, 1996: 42 cited in Nolan 2001).

There are three basic elements related to this hypothesis.

> First, language is acquired, and not learned, by the learner receiving comprehensible input that has arrangements or structures just beyond the learner's current level of mastery (i+1). Next, speech should be allowed to emerge on its own. There is usually a silent period and "speech will come when the acquirer feels ready. The readiness state arrives at different times for different people" (Krashen, 1994, p.55). It should not be taught directly and a

period of grammatically incorrect speech is typical. Finally, the input should not deliberately contain grammatically programmed structures (Nolan 2001:1)

Krashen (1980:11) believes that children progress by understanding language that is little beyond them. This claim invokes Piaget's (1929) principle that what is optimal for learning is some level of novelty, which is only slightly beyond the child's present level of development. This hypothesis is also similar to Vygotsky's concept of 'zone of proximal development' although the role of scaffolding is only insinuated. Bialystok instead argues that disparities between teaching and learning strategies will greatly reduce the potential benefit of instruction (cited in Larsen-Freeman and Long 1991:212). Asher (1981) states that children can talk when they are ready and they become ready when they have acquired a rather intricate map of how the language works.

5) Affective Filter Hypothesis

In this hypothesis, the learner's emotional state or attitudes is viewed as an adjustable filter that freely passes, hinders or blocks input essential to acquisition. A low affective filter is desirable, since it impedes or blocks less of this necessary input. However, silent period (i.e. child's reluctance to speak) is seen as a normal phenomenon and not a pathological one (Schmitt 2000). Even in first language children have a silent period where they listen to language input before they begin to speak. When they produce it, much of it takes the form of preformulated speech (memorized strings of language). So teachers are recommended to allow adequate exposure to the second language before requiring the children to speak (Spolsky 1989).

Krashen (1985) argues that simple codes such as the caretaker speech in foreign language acquisition provide ideal input for learners, for they are easily comprehensible, simplified to the learners' needs.

These hypotheses have obvious implications for language teaching. In sum, these are:

a. As much comprehensible input as possible must be presented. Bullock report (1975:58) 'When you give your child a bath, bathe him in language' (health visitor's advice). TV can be beneficial as 'it exposes children to a variety of accents, idioms, register, which they would not hear otherwise. Infants engage in a space travel game show and know words rocket, countdown, capsule, etc' (Bullock report 1975:61/62). Language can be learned only if there is input of the proper sort-for the child second language learner, this second language as it is used in social situations which make sense and in which the learner is himself involved (Fillmore et al 1979:205).

b. Whatever helps comprehension is important. Visual aids are useful, as is exposure to a wide range of vocabulary rather than study of syntactic structure.

c. The focus in the classroom should be on listening and reading; speaking should be allowed to 'emerge'.

d. In order to lower the affective filter, student work should centre on meaningful communication rather than on form; input should be interesting and so contribute to a relaxed classroom atmosphere. (Richards and Rogers 1986:133/134).

2:4:2:2.Behaviouristic theory

Behaviourists have placed great emphasis on the role of environment as it offers incentives for imitation and also significant reinforcement for response. This reinforcement can either be negative or positive which can have serious impact on the children language acquisition. Whatever the case, the idea that language learning is a matter of imitation, generalisation, and analysis is yet empirical and has widely been challenged. Therefore, it is accepted that:

> ...a proportion of a child's language acquisition time is spend in creating for himself a rule system which enables him not only to make errors such as over regularisation, but also to construct novel sentences which he has heard no one produce, and which are nevertheless consistent with the rest of his language (Mc Donough 1981:97).

Carr (2001:6) quotes Skinner's words (1954:94 in Shepard 1991): 'The whole process of becoming competent in any field must be divided into a very large number of very small steps, and reinforcement must be contingent upon the accomplishment of each step'. However, Shepard asks (cited in Carr 2001:7):

> What if learning is not linear and is not acquired by assembling bits of simpler learning? Guy Claxton and I have called this model of learning 'calculated education' in which 'the intelligence of the child is decomposed into its LEGO-like ingredients, and the teacher aims to stick them together, piece by piece (Carr and Claxton 1989:133).

Keith Crnic and Gontran Lamberty (1994:96 cited in Carr 2001:6), reviewing two decades of research on 'school readiness', commented:

> While there have been attempts to identify individuals developmental or skill correlates of readiness, we currently have no theory or credible empirical base from which to judge what the most critical skills for readiness may be. In this respect, assessing a number of pre-academic cognitive, linguistic, and motor skills may be of interest but of limited assistance in determining the critical readiness issues.

This is an interesting claim; however, assessing cognitive and linguistic skills even if limited assistance is offered in the readiness issues, it is better than the current state of complete ignorance.

These are tenets for the teaching of young learners. The general belief is that foreign language learning is implicit, unconscious and an outcome of the resurrection of the first language. Analytic skills seem to play no major role in this process. This might be the right approach, however, the nature of foreign language acquisition in young learners might be challenged now, when analytic and cognitive skills will be tested to see their interference or relation to foreign language learning.

2:5. Methods of teaching a foreign language to young learners

In this section, an overview of suggested methodology for teaching young learners is provided. There are two main reasons for this. One is that successful teaching methods are likely to give an idea as to the way children may learn and therefore, provide suggestions of how to test for aptitude. The second is that an outcome of a successful set of tests should be diagnostic in which case it should point to which teaching techniques would best suit which learners.

Gregory and Kelly (1992:158) suggest that heuristic approaches to learning that emphasize the importance of cooperation are successful for learning a second language (Fillmore 1983; Krashen 1981), developing an understanding of cultural and linguistic variety and promoting higher level thinking (Barnes 1976;Wells 1986; Vygotsky 1978 cited in Gregory and Kelly 1992).

Below are some of the most favoured teaching techniques and methodologies that are used in teaching new words to younger children:

1. Picture cards and flashcards for vocabulary presentation and practise.
2. Use of mime and gesture to describe or introduce a word.
3. Story cards. Children reconstruct each cartoon story after viewing it on video or invent a story with the cards.
4. Colourful pages with illustrations or drawings.
5. Rhymes and chants.
6. Songs especially ones that include movements.
7. Video.
8. Lively sketches performed by puppets.
9. Projects
10. Story telling

Visual material and stimuli appear to be very significant for young learners. Story-telling forms one of the most useful and effective tools in teaching in context, because telling a story is like speaking their language (Ferell and Nessel 1982 cited in Smith 2000). This is manifested from the quality of attention they engage, as they are engrossed in an involving activity. Stories play a vital role in children's education especially at their developmental stages and in fact some mental processes are taking place. Moreover, as story- telling is not traditionally associated with 'learning', the 'affective filter' is low so the children absorb and assimilate more than in a formal teaching/learning situation. Therefore,

> ...an additional benefit is that the learner's attention is on the message not on the language. They acquire language unconsciously with their whole attention engaged by the activity, in much the same way as they acquired their mother tongue (Cross 1992:153).

It is equally important that a change of pace and approach within the teaching sequence is guaranteed as the children's attention span is short. Some ways of preparing children's future language skills with their significance are offered by Vale and Feunteun (1995). Pelmanism and matching are considered early stages of reading and writing, whereas chaining and combining sentences are supposed to be early stages of speaking and writing skills. Listening and drawing form pre-writing skills.

It is obvious that very effective learning can take place using these methods because in a way, children experience these words themselves. They are immersed and vividly involved in the learning procedure. It can also be concluded that these techniques are used for implicit learning and indirect teaching. They evidently favour memory oriented learners, rather than analytic ones. This is possibly due to the fact that very young learners are considered to be good mimics or listeners but are regarded as having very little abilities in analytic tasks.

2:6. Promising testing qualities for very young learners

In previous sections certain aspects in language and cognition as well as cognitive skills concerning language have been described to provide a solid background for the designing of this research. The rationale therefore, for selecting to examine particular cognitive abilities has been partially offered. In the next paragraphs, the promising testing qualities for young learners will be presented along with arguments for their potent relation to aptitude and second language learning.

1. Memory

Certain forms of memory might show relation to second language learning. As words can be seen visually, short-term visual memory will be tested (Kim's game). Ellis (1996) has suggested in previous studies that 'short term memory capacity is one of the best predictors of both eventual vocabulary and grammar achievement' (cited in Schmitt 2000:129).

A number of studies have revealed the importance of short-term memory. The size of a child's short term memory is suggested to be of vital importance and a critical general-developmental variable that determines his or her ability to cope with linguistic complexity (cf. Bates 1976; Case 1978q; Slobin 1973 cited in Daneman and Case 1981:368). In addition, a number of studies have shown a correlation between short-term memory and various indices of language use (Case 1977). Daneman and Case (1981:376) think that complex syntactic and semantic forms are not mastered until a relatively late age because their acquisition requires a large short term memory and a short term memory of the required size is not available until relatively late in development.

Data on Verbal working memory (word span, story recall, semantic associations) and visuo-spatial working memory (matrix recall, spatial position recall, memory for abstract scrawls) were found by Swanson (1996) to be inter-correlated in children while they also predicted performance on a range of ability tests, for example the Detroit Test of Learning Aptitude (Hammill 1985) and Kaufman Assessment Battery For Children (Kaufman and Kaufman 1983) (all cited in Vecchi et al 2001:39).

Paired associates (associating pictures to shapes or sounds, see again Esser and Kossling's paired associates) is probably relevant because often in second language learning, learners have to pair the concept word in first language with a new word (sometimes even concept as it is not always and only labelling involved). As it is not possible to work with reading (most children are not literate at this age), pictures or shapes can be used instead. In a series of studies, Humes-Bartlo (1989:48) concludes that 'children with good verbal associative memory were expected to find language learning easier, while a good rote memory may or may not be helpful'. Elsewhere in the literature, Naido (1970) states that dyslexic children show poorer memory spans (cited in Brosnan 1996).

Phonological memory can be used, to connect a picture or a concept with a non-sense word. Gathercole and Baddeley (1989) show that the system associated with sub-vocal rehearsal in working memory may influence the repetition of speech sounds and might also contribute to the acquisition of vocabulary (cited in Vecchi et al 2001).

In another study, Gathercole et al (1992:888) suggest that there are developmental associations between short-term phonological memory skills and vocabulary acquisition. They used a method of non-word repetition (as it is a much simpler task and appropriate for young children). In the long study, non-word repetition scores at ages four and five were found to be significantly linked with vocabulary scores at the same time, even when more general factors such as the age and the non verbal intelligence of the children in the cohort have been partialled out statistically. Therefore, they concluded that phonological memory contributes vitally to the long term learning of new words.

Other set of studies emphasise the role of performance in phonological memory as they suggest that poor performance in these areas are directly linked to children with language problems or poor linguistic ability (Raine et al 1992; Gathercole and Baddeley 1990; Adams and Gathercole 1996 all cited in Groome et al 1999:102). It has also been suggested that phonological short-term memory correlates strongly with future language ability (Reynolds 2002:3).

In Gathercole et al's study (1992) it was found that the non-word repetition test's performance accurately discriminated all of the language-disordered children from the normal ones. So they concluded that:

> Phonological memory skills are a prerequisite for normal vocabulary development, and it also suggests that the links between memory and vocabulary should not simply be explained in terms of environmental experience of new words (Gathercole et al 1992:889).

Moreover, Service studied cognitive predictors of second language acquisitions and argued that the link between non-word repetition and foreign language learning is mediated by the contribution of phonological memory to the learning of new words.

It is important to bear in mind, however, that as Baddeley (1990:94) remarks:

> ...correlation does not necessarily mean causation. It is possible that both phonological short term memory and vocabulary learning are dependent on some third factor like phonological awareness or the amount and richness of language that has already been learned.

This, he concludes, shows how primitive is the understanding of the processes underlying the operation of phonological loop. And he ends by stating that 'They do, however, suggest that they are of great potential importance' (Baddeley 1990:94).

In another influential paper Humes- Bartlo (1989:50) have found in a study that:

> Interestingly, high scores for block design and arithmetic scores more strongly identified the slow English group, while high scores for verbal analogies, auditory discrimination, verbal associative memory and English vocabulary identified the fast English learners.

For all the apparent reasons stated above, during the studies various types of memory will be examined to show any relation to language aptitude.

2. Classification/Categorisation

'Categorisation ability is one performance indicator of underlying conceptual knowledge' (Rosser 1994:123). One favoured technique to test this ability for studying conceptual development is the object-sorting task (Markman et al 1981:115). As Rosser sees it, 'categories come from concepts which in turn are bound up with a basic understanding of the objects and events making up the world' (Rosser 1994:115).

Conceptual knowledge is supposed to be developmental. Hence, 'the ways in which stimuli are grouped, ordered and differentiated reveal systematic age-related change' (Inhelder, Piaget, Vygotsky 1962 in Rosser 1994:16). However, if the classification tasks are unstructured, young children may simply classify objects in a manner they find interesting or in a way they like it. In addition thematic collections, idiosyncratic object conglomerations, and chain concepts (Vygotsky 1962; Rosser 1994) may attract their preference and affect their classification performance. Again there is a potential decoupling between performance and underlined cognitive process. If the performance is deficient, it does not always mean that cognitive competence is also deficient because:

> Young children may resort to a holistic sorting strategy comparing objects as whole, inseparable units for overall similarity. The interpretation is that there is an age-related developmental shift in the basis for classification (Rosser 1994:127).

Terms like animal are class nouns whereas family is collective noun. 'The ability to comprehend the language used in a task, to understand and follow instructions, and the capacity to remember the problems, however, are aspects of procedural knowledge' (Rosser 1994:133).

Furthermore, Verbal classification (object sorting in groups verbally) is thought to be one of the primary mental abilities, introduced by Thurstone and Thurstone (1963:23). Verbal classification will form a method of testing classification ability in young learners.

3. Phonetic discrimination

Baddeley and Hitch (1996:408) cite Conrad (1972) who in his study found that children 'begin to show a phonemic similarity effect when remembering sequences of pictures at about the age that they learn to read'. So this might be a good point to follow and see if individual differences in performance in such a task might reveal weakness in foreign language performance. A test of phonetic discrimination will include possibly repetition of non-words, discrimination between non-words and recognition of them (recall) when prompted after initial introduction. This way, phonological awareness can be examined at this age and it is a very significant factor since it has been found to predict future alphabetical reading ability (Reynolds 2002:5).

4. Spatial ability

Jigsaws will be used to test spatial ability as well as visual perception. As Vecchi et al (2001:38) claim 'this methodology possesses good ecological validity and also appears to be sensitive in identifying individual differences across childhood there is an increase in the capacity to remember visual and spatial information and declines with age'. Vecchi et al (2001:4) state that imagery abilities develop with age, while children's performance on VSWM and jigsaw solutions increase from 7-11.

5. Visual perception

Mental images created by children under seven are mostly static perhaps paralleling the difficulty children experience in understanding the conservation of quantity when varying the perceptual appearance of the substance (Piaget and Inhelder 1955 cited in Vecchi et al 2001). Research into visual perception has shown (Bever 1970), that children have a notion of more/less than five objects at a very early age; this is an example of basic perceptual strategy that presumably converts to a plain form of generative grammar, the number system.

6. Logical reasoning

Analogical reasoning has been found by other researchers to be important in second language learning and this includes inductive and deductive abilities so it is useful to attempt testing those to see whether this is true for young learners as well.

These form the most important cognitive skills that are related directly or indirectly to language learning. It will be interesting attempting to test them with young learners and examine potent relation to second language learning.

CHAPTER THREE

THE GREEK CONTEXT: TEACHING LANGUAGES IN GREECE

This thesis uses data from young learners of 5-9 years of age, in the city of Thessaloniki, Greece. It is therefore important to describe the learning situations and environment of the country.

The teaching of English in Greece normally starts at the age of nine. English is formally introduced in public schools for the first time during this period. However, second language learning is a flourishing market in Greece and there are many private English schools offering English lessons (so called 'Frontistiria') that take place in the evening or afternoon for the learners to progress faster and be helped with additional teaching. In this context, all these schools introduce English at a younger age, 7, 8 and most of them have pre-junior classes for 5 and 6 year olds as well.

Multilingualism was once a fashion, it has now become reality. The demand of starting younger to finish or become fluent quicker raises, so many private as well some public nursery schools have started experimenting with the idea of teaching children of five and six years. These lessons are normally taken once per week for the course of an academic year or to be more precise for nine months. Each lesson lasts about fifty minutes. The lesson usually includes a variety of playful activities, songs, rhythms, short poems etc. The teaching is indirect and the learning is supposed to be implicit. The teaching syllabus is vastly similar and referential among schools and includes basic naming (only naming at this age and not writing or reading) of colours, animals, numbers, food, and at times (gestalt) action phrases.

Strangely enough according to Milton and Vassiliu (2002) elementary foreign language textbooks include large quantities of infrequent vocabulary. In a list of lemmas taken from three popular coursebooks 'nearly half fell in or below the three thousand word frequency band' (Milton and Vassiliu 2002:453). It also appears that textbook writers are highly idiosyncratic in the selection of infrequent vocabulary. This in turn, reveals that there is not at present any common core of infrequent words for use by beginners at the outset of learning. What is more, in another study, it was found that Greek teachers rely heavily on course-books when introducing and teaching vocabulary (Alexiou 2003). What might strike an observer is that in one year, approximately 60 lexis are introduced and even more strikingly, for the majority of children, only around a quarter of them are productively learned whereas around half of them are receptively learned.

Mainstream nursery teaching in Greece (where this research will take place) is based on the following five sectors: Aesthetic, psycho-movement, socio-ethical-religious, intellectual and sector of dexterities (skills). Only pre-literacy skills are acquired at this stage, so children do not learn to write or read. Recently, however, it has been proposed that literacy skills should start at this age but this idea has just been introduced. The official curriculum found in the Analytical program of the Greek government, up to date focuses on five general aims:

- Children are expected to develop their five senses and organise their actions, motional and intellectual
- Children at this stage need to enrich and organise their experiences from natural and social environment, to acquire the ability to distinguish relationships and their interactions in it
- Children are expected to develop the ability of understanding and expressing with symbols especially in the aesthetic and pre-mathematic sector
- Children need to proceed to the creation of personal relationships that will facilitate their gradual and harmonious placement social life
- Children are supposed to develop initiatives freely and easily so as to adjust without difficulty to the mutual relationship of individual and group in frame of organised environment.

Bearing that these aims and sectors that form the target of the Greek curriculum, it becomes apparent that teaching methods and learning strategies are heavily based on these grounds.

In a small survey performed throughout this year, twenty questionnaires were given to the teachers and eight more were interviewed in order to see if they thought that aptitude can be demonstrated (see Appendices 1 and 2). The task was to try to identify what the teachers are able to see that separates fast from slow learners, place their insights in the context of a theory of language learning, and try to turn these insights into a properly validated, normalized set of tests.

Teachers support that some children have this natural ability to grasp concepts easier and quicker than others because they have quicker minds. For example, they say, it depends on how many times a child needs to hear a concept, repeat it in order to identify it, assimilate and produce it. Some can do it after the 1st lesson, some after the 5th. There are children who can not keep the new concepts, some can not retain them, but there are also these children who absorb them immediately. This ties back to memory that Carroll and Sapon identified as an aptitude characteristic.

Teachers also think that children with sharp perception always stand out. These children are able to see connections and distinguish relationships relatively easy. And this is similar to the grammatical sensitivity and the inductive learning ability that are again supposed to form important aptitude characteristics. According to the teachers' views, concentration span affects memory directly, so absent minded ones have more difficulty comparing to the ones with longer concentration span. The teachers felt that visual memory is very important at this time and most of them claimed that children's analytic thought is at an 'embryotic' stage.

On the question of the existence of aptitude, teachers responded that it does exist and that sufficient stimuli can activate or cultivate it at some degree. They claim that all children can learn but not at the same speed or ease. It takes from the first few weeks to three months to be able to identify the fast learners (teachers claimed they can even see it from the way they hold the pencil or open their schoolbags!).

To the idea of starting a foreign language early, the teachers were positive but they also expressed some fears. The fears include that their first language is not complete, which might cause some confusion, the possibility of getting the children tired and the possibility of potential loss of confidence. Another fear was that they might lose interest and desire for their native vocabulary. Difficulties include articulation, short concentration span, limited conceptual learning, overactive and/or indifferent personality types. Some teachers also stated that some children have to start late as they are not mature and that there are vast differences among 5-8 year olds, therefore the 'readiness' issue was frequently addressed.

On the question of attitude and motivation towards the foreign language, the teachers were very positive. It seems that the natural curiosity that children have, gives them motivation. As long as there is no pressure and the family encourages them, the reactions are positive. The children seem to have fun and think that English is another game, an adventure. It is different, they have interest for the unknown, it presents a new challenge for them and they want to learn and participate (often to show off to the parents as well). The vast array of TV, computer games and other external stimuli provide more opportunities and reasons for them to become even more excited.

The benefits include familiarisation of the foreign language, native-like learning, pronunciation, and the feeling that language becomes their possession. More generally, Greek teachers think that early exposure to the English language broadens the children's horizons, cultivates their spirit and offers intercultural exchange. However, they did mention that this exposure should be held constant and the progress really depends on parental further support and the provision of adequate stimuli.

Finally, as a preliminary study to the research contained in this dissertation, I asked Greek teachers how they would feel on the development of a computerised foreign language learning aptitude test-in a game format- for young learners. They were cautious and said that labelling and prediction should not be the focus of such a test but the diagnostic use of it would be valuable. Here are some of their answers:

'Aptitude test indication for future language development, language and its means to acquire it is a living organism and may bring new things in the process of research'.

'A benefit in that case would be to find proper ways and methodology to teach children according to their needs making sure they succeed to what they do'.

'Definitely! It would be a brilliant idea as little ones get hypnotised and excited by the computers even at this age. This is a good motive even for learning a foreign language. This test would serve beautifully as a diagnostic medium. Even if they don't know any English, they would go straight tot the computer to experiment on the game because they accept all stimuli. That would be a good start'.

'I believe that aptitude is genetic at the start but you have to cultivate it. I'm for everything that shows indications or tendencies, not labelling'.

Teaching at young ages has become a standard across Europe and English as a foreign language is now being introduced from nursery school age. European funded projects confirm this trend. For example, VIRLAN involves the development of internet based communicative tools for low level language learners. The trend is also obvious with other similar European projects like Kid-Net, an English Course for children that involves the familiarisation and teaching of several word items in English that are presented using an audio-lingual method in a clickable fashion.

The thesis here is concerned with the ways young learners seem to be acquiring the language knowledge at this stage. Is their thought analytical? What sort of memorisers are they? What cognitive qualities make a good language learner?

The research on aptitude for very young learners has three main ideas behind it. The first is that, at this stage, learners have mastered the basic at least rudiments of their first language-in this case, Greek. This means that they are familiar with basic phonemic contrasts, vocabulary aspects and major sentence patterns and structures. The second reason is that they are not old enough to be influenced by the formal school situation and the written language that makes them impervious to attitudinal factors. Results can reveal what behaviour, exposure and environment would be ideal for them. The third reason is that, if aptitude is to be studied effectively, then its nature and existence is expected to be revealed at the very early stage of learning before any of the other factors take place.

CHAPTER FOUR

FIRST PILOT STUDY ON MEMORY, CATEGORISATION AND INDUCTIVE LEARNING

(JANUARY 2002)

Preface

The experimental chapters which follow attempt to begin the process of investigation into the nature, even the existence, of foreign language learning aptitude in young children. Chapters 4 and 5 are pilot studies designed to test the workability of measures thought likely to associate with foreign language learning, and to test and examine whether they can predict language learning success at all. Chapter 6 develops these ideas and attempts to replicate with young learners a set of general cognitive skills tests, as suggested by Esser and Kossling. These chapters will be based very closely on existing aptitude tests like those of Carroll and Sapon, and Esser and Kossling, and on the ideas of aptitude described by Skehan. The replication of Esser and Kossling suggests that aptitude in young learners is multi-component, so Chapter 6 attempts to address the question of what, in more detail, makes up these components? It examines particularly questions of memory ability and analytic skill. Chapter 8 extends the question in Chapter 7 but also asks, if aptitude is a series of general cognitive abilities then can the age effects that characterise other cognitive abilities be seen? Finally, Chapter 9 draws together a combination of the tests which seem to predict language learning best and attempts factor analysis and regression analysis in an effort to test whether the separate components of aptitude thought to exist in young learners can be statistically demonstrated and ask how do the various elements of aptitude appear to inter-relate with each other in predicting language learning success.

The starting point in this study is the question of language learning aptitude in very young learners. To the best of my knowledge, no work has been done at this age so it would be interesting to discover whether tests for aptitude work at all with young learners. This, in turn, might shed light into the nature of language learning aptitude itself and its potential components in young learners who are thought to be significantly different from adult learners. The tests devised here involve the examination of certain cognitive skills that according to recent belief influence language aptitude (for more, please refer to Chapters 1 and 2). The whole testing approach is cognitive-oriented because this is far more appropriate and viable to apply to young learners. The next plausible question involves the matter of predictiveness. In other words, if tests of aptitude work with young learners, to what extend do they predict language success?

In order to present the results of the study that took place in January 2002, a brief description of the procedure, the aims and the rationale of each task is provided. Following that, some general comments are given to offer explanation and analysis of the results that emerge.

4:1. General cognitive test

4:1:1. Aims and objectives

This study is a preliminary attempt that is driven by two main questions:

- Can cognitive skills be tested in very young learners?
- Can a range of scores be ensured to show differentiation in learning or coping with learning?

The experiment will be thought successful if, firstly, the young learners can complete the tests and secondly, if the tests elicit a variety of scores producing a reasonable spread of scores around the mean.

A test with different activities is developed that would measure children's various dexterities. These activities aim to offer a spread of scores across children so as to reflect different abilities and cognitive prerequisites. It is expected that some at least of these features will correlate with the vocabulary knowledge measures at the end of the academic year. At this stage, a test of foreign language achievement is not included due to several restricting reasons. First, it is quite early to measure such a quality because the learning period is too short (only three months from the start of learning) which means a very limited vocabulary of less than thirty words can be tested. Second, it is the aim of the experiment to concentrate on testing as many cognitive qualities possible in one test since not all qualities may be expected to explain and predict success in foreign language learning. This, in turn, means having a foreign language test would severely restrict that for reasons of time and duration.

It is a fact that there are plenty of diagnostic tests available, particularly in the USA. However, surprisingly enough, little detailed statistical data is available to know exactly how the tests will work with very young learners. Therefore, this pilot study has drawn mainly on activities highly recommended -as an everyday practice for nursery children- by Piaget, Montessori, Vygotsky, etc (for more please refer to the literature review).

4:1:2. Methodology and design

The data are taken from three different schools in the city of Thessaloniki, Greece; one public nursery school, one private nursery school and one private English School. 56 children took part in those experiments. From those 24 are five year olds, 19 six year olds and 13 were seven year olds.

A relaxing and playful atmosphere should be ensured. Thus, the researcher visited the schools in order to meet the children some days before the experiments took place. While playing the different activities with the children, she tried to be as encouraging as possible and praised the children constantly. The activities are all done in the mother tongue and thorough explanations and instruction are provided. The flashcards are well designed with vivid colours, appropriate for the age level.

The researcher was concerned that the experiments done by a stranger might intimidate them and impact negatively on their performance. She always explained to the child from the very beginning that the whole process was a type of game and that by the end of it, he/she would get a Christmas chocolate. Of course, each child, regardless of the performance gets the candy. Understandably, the children volunteered to take part and if one was unwilling, he/she was in no case obliged to do it. However, there was not a single case of unwillingness probably because of the curiosity for anything novel that characterises this age.

Below the activities are described in order to give an idea of the experimental procedure:

- Short term visual memory is tested in a memory for pictures activity.
- Categorisation is tested through a word association-grouping game.
- Inductive learning ability is tested via a symbol association game with shapes and numbers.
- Visual perception memory span is tested by a picture learning and recognition activity.

Memory and inductive learning ability are thought to be important aptitude elements according to Carroll and Sapon. Grouping (sorting ability) and sequencing ability are thought to be essential cognitive skills at this age according to Piaget and Vygotsky (Piaget 1926). Therefore, their acquisition might reveal interesting results of their own merit but will yield useful information concerning their relation (if any) to language learning later in June. This is a process of trying out a variety of likely skills and abilities in order to find what might associate with learning, and is exactly what Carroll did at the outset of the process that led to MLAT.

4:1:3. Description of general cognitive test

1. Memory game (codes: mem 1,2)

Six unrelated flashcards are shown to the child for 30 seconds. Then the cards are turned upside down so the child can see only the back of the card. The child is asked to recall the pictures (mem1) and then try to recall their position (mem 2).

The aim is to test visual memory ability as it is believed that a good language learner will have a talent in memory. The quantity of the words that would be recalled is expected to vary among children.

Flashcards: sun, strawberry, umbrella, tortoise, bicycle, clock.

One point is awarded for every item recalled and an additional one for its recalled position. There is a total of 12 points.

2. Categorisation (code: wa for word association)

A set of random realia that have something in common among some of them are shown to the child. The child is asked to create three different groups and distinguish into which group each toy-item belongs. There are some items that do not belong into any group and the child is aware of that.

The aim is to test word association through a sorting task. Word association tasks are thought to be a pre reading skill since they are based on the concept of categorisation (Vale and Feunteun 1995). It demands good command of analytical skills and epagogic thinking. The researcher asks the child to justify why each card is chosen for the particular group because it is important to know the child's thinking and how he/she reached the decision. What might seem obvious to an older person could have entirely different meaning for a young child.

Toy-items: grapes, bananas, pear, apple, airplane, car, van, frog, duck, dolphin. Extras: toothbrush, clock.

One point is awarded for every item correctly grouped. There is a total of 12 points.

3. Symbol association (codes: sy1, sy2)

The child is given a code for numbers 1-4. Each number is represented with one shape. The child has 15 seconds to look at them. Then, the shapes are given to the child and the child is asked to present in shape 3 different numbers (sy1) and then to do two additions (sy2) with the shapes that represent numbers.

The aim is to test paired associative memory as each number is represented by a different shape. When they can perform additions in the same way, a good analytical skill can be revealed.

Numbers: 1-circle, 2-star, 3- triangle, 4- square. Additions: 3+1=4, 1+2=3.

One point for each correct symbol and addition is given and there is a total of 5 points.

4. Visual perception memory (codes: vismem1,2,3)

Two sets of topic areas picture words (animals living in water and animals living in the jungle) are shown to the child. The child is asked to state the topics (vismem1) and looks at them for 15 seconds. After that, a distraction activity takes place for 10 seconds, where the child is asked to name two irrelevant objects. Immediately after that, the same sets are again shown but two pictures are missing (one is totally gone and the other is replaced with a new one) and the child is asked to identify them (vismem2, 3). The researcher notes down the results.

The aim of the task is to test visual memory span. The short interval with the distraction activity is applied so as to distinguish which child will be able after that to recall the words missing, and as Carroll mentions, this is indicative of a future good language learner (Carroll 1971 cited in Parry and Child 1990:32-33).

One point is given for stating the topic area of the two lists. One point is given for every picture found to be replaced, added or taken away. There is a total of 4 points.

Total score for the general cognitive test: 33 points. For more details, please see Appendix 3.

At this stage there is no attempt to normalise the scores or examine the inter-relationships between the tests. The intention here is to look for a mean score on these tests which is somewhere in the middle of the range of possible scores. A spread around this mean score would then mean that more and less able subjects on each test are being distinguished.

4:1:4. Results

Aim 1: *Can cognitive skills be tested in very young learners?*

Before analysing the significance of the data and their relation to the aims of the experiment, it is important to comment firstly on the workability and the performance of the tests. A profile of performance and the scores of each test of the individual subjects is offered in Appendix 4. A variation in scores can be observed, which in turn, lends credence to the fact that cognitive skills can be tested even at this age and these skills show variation between same aged children.

Aim 2: *Can a range of scores be ensued to show differentiation in learning or coping with learning?*

Table 4:1 presents the standard deviation and the mean of the tests. The minimum and maximum score is also shown in order to ascertain the range of scores that is accomplished. The Memory test shows a mean score of 9.14 and standard deviation of 1.77. Although this does not allow a wide range of scores, there appears to be no problem of workability when applying this test to young learners. One possible reason for the limited spread is that the memory test does not perform equally or it has been constructed as being too easy even for this age. This is definitely true for the categorisation task, a surprising fact that will be discussed later on in more detail. Symbol association, a rather difficult task, and visual perception though do succeed to offer a wider spread of scores among individuals with satisfactory mean scores and standard deviations.

Test	Minimum	Maximum	Mean	SD
Memory	5	12	9.14	1.77
Categorisation	2	12	11.23	2.13
Symbol association	1	5	3.98	1.44
Visual perception	1	4	2.60	1.02
Overall	17	33	26.96	3.36

Table 4:1: standard deviation and the mean scores of the tests.

4:1:5. Discussion

In the short-term memory task, the majority of children remembered 4-6 of the test items and much of their ordering. Although the cards showed unconnected objects, it is noticeable that it was easy especially for the younger ones to remember the pictures. There are different scores in memory among ages and this age question will be comprehensively discussed later in this thesis.

In the categorisation task, younger children had more difficulty in completing the task. Some of them would group the objects according to their colour or liking. However, the mean score of over 11 out of 12 suggests that nearly all the children got all the questions correct at the end. There seems to be a ceiling effect here – it doesn't discriminate one learner from another regardless of ability. This test, if it is to work at all, would need to be more difficult for the majority of learners. The test may be workable in the sense that the very young learners can do it but needs refining or rethinking so it discriminates between learners of different abilities in this area.

In the symbol association activity there was a variation but generally it was an easy task to do. This is even more surprising as piloting the same tasks with adults; they showed difficulty in performing the activity to the end. It is also true that some of the children had difficulty in adding normally, impeding them in successfully performing the additions in the artificial language. Yet, the majority was able to recall the shapes that represented the numbers asked. However, children at the age of 5-7 are supposed to experience great difficulty in categorising and arithmetics according to Piaget (1929) so this easiness is a surprising finding, which contradicts traditional theories and agrees with more modern approaches that claim that the stages in the children's development are 'going down'.

The visual memory card game is indicative of different talents possibly due to the distraction activity that took place in between the learning and testing phase. That is really interesting and despite that some of the children appear to be good memorizers in the first memory game, they showed a great often difficulty concentrating and recalling in the last memory game.

The most important finding in the first pilot study is the fact that general cognitive skills can be tested. The study also suggests that a range of scores can be accomplished even if the tests in their current form are not all spreading the learners out. Having said that, it would have been surprising if there was a perfect spread at a first attempt. These are matters extensively dealt with in later chapters as tests are refined and added to.

In terms of their practicality, the observation papers were handy, simple and practical. There were no omissions and had the researcher the opportunity to redesign them she would only have to cut things out. In the general aptitude test, the number of attempts in order to perform the task was indicated. Some might say that interesting points concerning motivation could be come into sight; the researcher though is not convinced that this served any interest. That is because all children found most of the tasks easy and challenging to play but mostly due to the fact no child was being corrected when mistaken in fear of discouragement so why should he/she have a second go?

There was hardly any time differentiation between the children in performing the task. So, practically it took two or three minutes for the children to perform any kind of task which meant that no matter how easy or hard the task was, it would not take them more than three minutes in the worst case. One conclusion to be drawn from this initial study is that the time taken to complete a task is unlikely to be a useful metric in gauging language learning aptitude and it will be discarded from future considerations.

For the record, the general aptitude tests lasted around 9-11 minutes and the foreign language aptitude another 4-6 minutes and were done on a one-to-one child basis. For clear practical reasons both tests were performed subsequently and that was possible since the activities were quite different so as not to bore them. It is true that children, especially at this age, have a short span of concentration unless they have different things to "play with".

Yet, it was noticeable that the children expressed a lot of eagerness to take part in the games again which means that regardless the anxiety, the researcher never lost touch with the fact that there were children participating and the way of handling with them should in any case be motivating. Therefore, the subjects did not find this kind of test intimidating and enjoyed it. The baggage of fear of failure that goes with aptitude testing in adults does not appear to exist in children.

4:2. Conclusion

This was a pilot study to check whether it is possible to test cognitive skills in young learners and obtain different scores so that a variation in abilities would be concluded. The workability was also the concern but it seems that there was no problem after all. Concerning the spread of scores, most of the tests appear to demonstrate a moderate variation. Given that this is only a first attempt, this is satisfactory and forms the prologue of the second study, more organised and carefully devised in order to obtain clear variation and see whether cognitive skills show any impact on language achievement.

The study was driven by two main aims. The first one was concerned with the possibility of testing cognitive skills in very young learners. There is now a set of tests that learners can do so this aim is attained. The second question involved the possibility of potent differentiation in learning or coping with learning. There is a range of scores in the study that suggests that distinguishing between learners of different abilities is possible but, not surprisingly, this is an area that needs some work to avoid the ceiling effects, which these tests produced.

CHAPTER 5

SECOND PILOT STUDY ON SHORT TERM MEMORY, PHONETIC MEMORY AND VISUAL PERCEPTION

(JUNE 2002)

Preface

This study is still concerned with the question of aptitude in very young learners. The previous study showed that cognitive skills can be tested very early and they do offer hope of a spread of scores - hence a range of abilities- between same aged learners. The main question in this second study is concerned with predictiveness. If these tests work with young learners, to what extend do they predict or even indicate language success? In order to answer this question, tests of language performance are needed. Correlations of scores between cognitive tasks and scores of language achievement tasks might reveal a direct relationship between cognitive skills and language aptitude.

This chapter first discusses the aims and objectives that inspired the construction of this experiment. Following that, it focuses on some of the methodological issues that have concerned the study in itself while the process-production framework is examined in terms of its suitability as a structure to guide the present research. Next, the results that were generated are presented along with a discussion of the data analysis. Finally, some conclusions are provided with the view to determining the experiment's usefulness in providing coherent structure for subsequent studies.

5:1. Background

In the previous study cognitive abilities such as short-term memory, grouping, association and visual perception were tested. The short-term memory test proved to be problematic due most probably to the small numbers of the test items although it is worth noting even at this stage that memory has proved problematic for many aptitude research (e.g. Carroll 1981; 1990). Weak results from the previous experiment gave guidelines for this experiments' design. Small numbers of questions should be avoided if possible and a spread of scores seems to be important if correlations with language achievement scores are going to emerge. As memory according to the literature is thought to be pivotal in language learning, another attempt to test this quality is included in this experiment along with several other qualities tested for a first time here.

As using a cognitive and not strictly linguistic approach in testing proves to be a workable idea for young learners, Esser and Kossling's study (1986) of aptitude testing as a cognitive process is now considered in order to give clues for the actual content as well as the design of this study. This study is intended as a preliminary to an attempt at replicating Esser and Kossling's study.

5:2. Aims and objectives

The present study endeavours to adapt Esser and Kossling's (1986) cognitive approach for a group of young EFL learners in Greece. The principal aim again is the workability of the tests. It is intended to address the questions:

- Will tests like this work with 5/6/7 year olds? Will they produce a range of scores likely to indicate variation in cognitive skills?
- Will these results correlate with other scores in foreign language achievement in order to suggest that they predict language learning ability?

A test of different activities in a game form is developed to measure children's dexterities. In order to achieve that, it was important to find out which dexterities relate to second language learning. For this purpose, aptitude is tested in comparison to testing language specific skills or ability. To be more specific, during the experiments children's various dexterities (such as visual/acoustic memory, analytical thinking, associations, etc) are examined along with their achievement in the English language, to enable later valid predictions. Naturally, these tests are performed in playful activities to suit the interests and needs of the target age group. This test will be considered successful if the ceiling effects seen in the previous experiment are avoided and if a lower mean is attained with a wider range of scores around the mean.

These activities are designed to offer a spread of scores across children so as to reflect different abilities and cognitive prerequisites. Scores between aptitude tests are not expected to correlate with each other particularly well; otherwise they would be testing identical cognitive features. It is hoped that some at least of these features will correlate with the language knowledge measures. The higher correlation between aptitude and vocabulary learning, the better, but realistically as Carroll after long term studies has proved, correlation emerging at 0.4 would be considered good. This correlation, in turn, ought to indicate learning achievement and therefore language learning ability based on Esser and Kossling's testing procedure and philosophy.

5:3. Methodology and design

53 children are tested one-to-one in June 2002 in Greek public and private schools. To be more specific, there are 24 five year olds, 17 six year olds and 12 seven year olds. They are all Greek native speakers with no immediate English background. Based on Esser and Kossling's views that there must be cognitive prerequisites, four elements of learning were considered to be pivotal for aptitude. Four activities respectively are presented below in a preliminary attempt to adapt Esser and Kossling's study:

- Short term memory is tested via a picture memory game.
- Phonetic memory skill is tested through a naming game linking a name with an object.
- Recognizing order or sequence is tested among several pictorial elements in the short term memory game.
- Recognizing parts or elements that have been added or taken away is tested by a visual perception activity of finding the differences between two seemingly identical pictures.

The first two tests are memory tests to accomplish the aim of smartening up this element and testing more items of varying difficulty. Since sorting and sequencing are keys to enhancing memory, in the short term memory test this element is tested. The third spot-the-difference game is close to the semantic integration task without the memory element thrown in it. Consequently, it shies away from the memory testing and is really an analytic task of visual perception.

There are three game tests presented for this first part of the study in order to trial Esser and Kossling four tests. This is because, at this time the workability of the tests is the main focus. The formation of four separate tests would come after that and there is an additional problem of time. Hence, an estimated reasonable time of completing the task would be no more than 18 minutes. If another activity was to be included, it meant more time would be needed. What is desirable here, is a sensible mean score and a decent standard deviation to give a spread of scores around the mean. To ensure this, the number of items in the tests is increased.

Their achievement in the English language is also tested, to enable to later valid predictions. The test type is again a naming activity of the items learned during their first year's exposure to English in order to test their productive vocabulary and a listening to test receptive vocabulary. The experiment lasted about 15-18 minutes for each child tested. A detailed description of each activity is offered below.

5:4. Description of general cognitive test

1. Memory game (code: vis mem A)

A toy that has got many pictures on it, is showed to the child. There are fruit, animals, transport means and other irrelevant things. The child is asked to look at them very carefully for one minute. Then the pictures are turned so that the child can not see them any more. The child is asked to demonstrate the position of two pairs (at random) of fruit, two pairs of animals and one pair of transport means.

The aim of the game is to test short-term visual memory, sorting and sequential ability as memory is salient for language learning. Sorting and sequential ability are cognitive abilities that are supposed to be important elements of aptitude and they are related to vocabulary acquisition (Esser and Kossling 1986).

One point is given for every picture. The total score is 10 points.

2. Find the differences (code: differs)

The child is given two seemingly identical pictures. The child is asked to observe them closely and identify the differences. There are eight differences some more obvious than others. So, a strain among children is expected.

The aim is to test visual perception and partly analytical skills. Various perception areas are included in the differences hidden, such as colours, numbers, objects, etc. This looks like the semantic integration task (learning and recognition lists) in the study of Esser and Kossling (1986) without the memory element thrown on it.

One point for each spotted difference is awarded and there is a total score of 8 points.

3. Phonetic associative memory (code: decode)

Four different non-sense names (sounds) for each colour are provided and the child is asked to remember each one. Then the child is asked to name the codes (sounds) in different order (red-ani, blue-teri, yellow-mipa, green-soufo).

The aim here is to test phonological associative memory. This is considered to be a more difficult task but phonological ability is argued to be one of the pivotal elements of language aptitude (Reynolds 2002; Skehan 1989).

One point for each correct sound pair or order asked is given and there is a total score of 9 points.

Overall score for all activities: 27 points. For more details please see Appendix 5.

5:5. Description of foreign language achievement test

The learners' achievement in the English language is tested here. The test type is a naming activity of the items in order to test their productive vocabulary and a listening to test receptive vocabulary. The contents of the test are devised according to the syllabus/language content of the English language teaching that has occurred over the course of the year's study. These lessons take place once per week for the course of an academic year or to be more precise for nine months, so the total teaching hours is around 35-36 hours per academic year. Vocabulary is mainly presented and taught whereas some structures are introduced that are really simple action phrases (for example, 'sit down', 'stand up', 'come here' etc). The teaching syllabus is vastly similar among schools and includes basic naming of colours, animals, numbers, food, and at times action phrases. Therefore, a single test could be designed for use in all schools.

1. Naming activity (code: prod voc)

A flashcard of a rainbow and a basket of teddy animals and fruit are shown and the child is asked to verbalise the names of the colours, animals and fruit. The aim is to test productive vocabulary.

One point is credited for each word item correctly produced and there is a total score of 21 points.

2. The shopping list (code: recept voc)

Several mini picture cards are laid and a trolley-like carton is given to the child. The child is asked to 'place' on the trolley all the objects-picture cards the researcher calls and ignore the others. The aim is to test receptive vocabulary.

One point for each correct word is credited and there is a total score of 19 points.

Overall score for this test is 40 points. For more details, see Appendix 6.

5:6. Results

Aim 1a: *Will tests like these work with 5/6/7 year olds?*

Appendix 7 shows the scores of each test and overall scores of the individual subjects. This is to offer a more detailed picture of the children's performance in each task and allow room for the discussion part later. To take the first aim, this table gives a convincing answer to the question of workability. As it can be seen all children of all three ages are equally able to perform all the tasks. Hence, there is no problem designing and working a test for this age.

Aim 1b: *How can a range of scores be guaranteed?* Different scores are obtained for the individuals in different tasks. This, in turn, offers a range of scores, which was desired again in the first aim. There are children who gained better scores in some tasks than in others and not one has the same range of scores with the others in all tests.

In Table 5:1 the standard deviation and the mean of the tests are presented. It is noted that the memory test has a fair mean score, namely 5.98, and a standard deviation of 2.58, which allows better spread of scores than previously. The phonetic associative memory test offers a fair range of scores with a standard deviation of 3.02, and productive and receptive vocabulary seem to work quite satisfactory with a standard deviation of 4.74 and 3.50 respectively. As can be noticed, a wider range of scores is accomplished which, in turn, allows decent correlations if they exist, to be seen.

Test	Minimum	Maximum	Mean	SD
Memory	0	10	5.98	2.58
Differences	1	7	5.09	1.32
Phonetic memory	0	9	3.45	3.02
Gapt tot	3	25	14.52	4.97
Prod vocab	0	18	11.15	4.74
Rec vocab	5	19	12.83	3.49
Lang tot	5	37	23.98	7.58
Overall	14	58	38.32	10.52

Table 5:1: mean and standard deviation of tests

Aim 2: *Will these results correlate with other scores in foreign language development in order to suggest that they predict language learning ability?*

Lastly, Table 5:2 below presents the correlations yielded between the tests. The second aim questioned the possibility of correlations emerging from the results with other scores in foreign language development in order to predict language learning ability. As seen in the table, there are significant correlations between differences, phonetic memory with productive vocabulary and total language scores. The correlations are about 0.4 very close to what Carroll and Sapon produced in MLAT where scores on foreign language performance over an academic year are compared with aptitude test scores.

	Memory	Differ	phon.memory	Apt tot	prod voc	rec voc	Lang tot
Memory	1.000	0.395**	0.162	0.722**	0.239	0.219	0.250
Differ		1.000	0.255	0.625**	0.311*	0.058	0.221
Phon.memory			1.000	0.758**	0.353**	0.241	0.332*
Gapt tot				1.000	0.421**	0.275*	0.390**
Prod voc					1.000	0.688**	0.942**
rec voc						1.000	0.891**
Lang tot							1.000

Scores with ** are significant to 0.01

Table 5:2: Correlations between cognitive activities and language achievement

5:7. Discussion and data analysis

Regarding the first aim about how workable a test can be at this age, some positive results emerged, verifying the notion that aptitude tests that are cognitive orientated are a promising tool for future research. There was no problem with the children in completing the tasks and a range of scores was indeed guaranteed although not for all tasks. This was due to the inability of some tasks, such as memory, to provide a spread of results and offer a greater difference in achievement because of the small number of items asked. Overall, the ceiling effects seen in the previous experiments were avoided and the desired range of scores around the mean achieved. A range of scores of this kind will, hopefully, distinguish also a range of abilities that may associate with success in foreign language learning.

The second aim was to test whether the qualities, which we have attempted to measure, are associated in any way with the scores on the language test. The data and the analysis offered correlations between the language and aptitude tests and suggest that foreign language learning success is predictable to some degree, which satisfies the second aim of this experiment concerning correlations.

Surprisingly, the rote memory section of the tests does not yet prove to be a good predictor of language learning while the analytic tasks predicted best of all. Although analyzers at this age were not expected, it seems that children have developed some primary analytic skills. Consideration of the memory tasks suggests that the problem may lie with the test that failed to achieve a spread of scores likely to allow differences in ability to be shown. This element will need revision.

The task of finding the differences correlated with productive vocabulary (0.311*) unveiling the important role of visual perception and recognition in language learning as Esser and Kossling have previously claimed. Furthermore, the phonetic associative memory task offered a fair spread of scores and correlated quite well with productive vocabulary (0.353**) and language total score (0.332*) which explains the vital role of phonetic coding ability in language learning. Finally, the aptitude total score correlated significantly with productive vocabulary (0.431**) and language total score (0.390**). This is probably the most important finding. It implies that the aptitude qualities tested here on the whole relate well to language ability and to the ability of remembering and producing vocabulary. It supports the claim that cognitive elements form vital prerequisites for language acquisition. What is more, the results reveal some of the most important ones, namely visual recognition and phonetic coding ability. However, one would anticipate that receptive vocabulary, on its own, would show correlations at least with some of these qualities. This can be due to the failure of memory test to provide a spread of scores that may be related mostly with receptive vocabulary.

On the whole, it seems that language learning aptitude is, as Esser and Kossling indicated connected to general cognitive abilities. It is not therefore, an aptitude separate from these general skills. This begins to make clear the nature of aptitude in a way that Carroll and Sapon and others really have not done because they have always been looking at and testing language learning. It also makes aptitude testing among very young learners who cannot handle traditional language learning aptitude tasks possible.

It is understandable that the sample test types here are clearly not purely linguistic. It is self-evident considering the target age, that the tests should not require high literacy, education and sophistication. There is also no writing or grammatical activity included and this is because young learners have not acquired these skills. According to Daneman and Case (1981:376) 'syntactic and semantic forms are not mastered until a relatively late age because their acquisition requires a large STM (short term memory) and an STM of the required size is not available until relatively late in development'. Still, although analyzers at this age were not expected, it seems that children at this age have developed some primary analytic skills (associative skills, visual perception).

As Reynolds (2002) claims phonological short-term memory factors in aptitude and that is why a great emphasis was placed on phonological memory activities. However, memory as a unitary thing is not a convincing notion here. Additionally, this memory function that appears to be merely language specific poses questions, therefore the test needs to be differently constructed in order to assess this quality more effectively. In a variety of experimental studies Gathercole and her partners (1992) demonstrate that young learners are particularly dependent on memory and that success in language learning can vary according to variation in short-term memory in particular. Ellis (1996 in Schmitt 2000) suggested that short-term memory capacity is one of the best predictors of both eventual vocabulary and grammatical achievement and it is now a challenge to see if he is right.

To sum up, considering language learning aptitude in much broader cognitive terms than what Carroll and Sapon at their time suggested sounds a promising idea. It is suspected that there may not be a specific language learning aptitude at all but rather a series of general cognitive skills or qualities which predispose people to be better at something than other including learning particular languages.

5:8. Conclusions

This study appears to support the idea that tests of general cognitive skills, more suitable for young learners than narrowly linguistic tests and can be used to predict language learning success in young learners.

Significant correlations emerged between differences and phonetic associative memory with productive vocabulary and total language scores, indicating that these particular general cognitive skills relate to language learning. While these correlations are smaller than those obtained by Esser and Kossling, they are comparable with correlations obtained by Carroll and Sapon and others where, as in this case, language learning took place over a period as long as an academic year. These results support the contention that language learning aptitude is, as Esser and Kossling indicated, connected to general cognitive abilities. It also makes aptitude testing among very young learners who cannot handle traditional language learning aptitude tasks a workable idea.

CHAPTER SIX

REPLICATION STUDY ON SHORT TERM MEMORY, ASSOCIATIVE MEMORY, INDUCTIVE LEARNING ABILITY AND SEMANTIC INTEGRATION

(JANUARY 2003)

Preface

Results obtained in the previous two studies lend support to the claim that language learning aptitude is, as Esser and Kossling (1986) hypothesised, related to general cognitive abilities. Therefore, the link between cognitive skills and language learning has just been established. A replication of Esser and Kossling's cognitive study of aptitude is attempted in the following study in order to confirm this link and expand understanding by drawing on what appears, by some way, to be the most successful predictive tool. The principal question here is to find out whether aptitude in young learners is a set of general cognitive skills as Esser and Kossling suggest. Esser and Kossling's study is also most appropriate where memory questions are raised since their format and results are markedly good.

6:1. Background

The previous two studies have given credence to the idea that tests of general cognitive skills- undoubtedly more suitable for young learners than narrowly linguistic tests- can be used to indicate language learning success in young learners. In Appendix 20, all the tested qualities of all studies are offered as reference and reminder.

Significant correlations emerged between visual perception/recognition and phonetic associative memory with productive vocabulary and total language scores. The correlations are smaller than those obtained by Esser and Kossling's study, yet they are comparable with correlations obtained by Carroll and Sapon and others where, as in this case, language learning took place over a period as long as an academic year. These results support the claim that language learning aptitude is, as Carroll and Sapon suspected, connected to general cognitive abilities. It also makes aptitude testing among young learners who cannot handle traditional language learning aptitude tasks a feasible suggestion.

A direct replication of Esser and Kossling study is trialled in this study. The idea is that since their test showed high correlations and unveiled the importance of testing general cognitive skills for aptitude, a modification to suit the target age group might also offer valid results about aptitude for youngsters. As described below, three of the four subtests are designed - with the necessary alterations to fit the age of subjects - in such a way so as to be as similar as they could possibly be. One test is neglected though, namely, the analogy formation as it proved to be difficult to administer and impractical to design for the particular age group.

Previous short-term memory test failed to predict learning possibly because it failed to discriminate between different ability levels which was suspected to exist in children. It was also hypothesised that the number of items to be recalled was small (6 in one case) so a spread of scores was impossible to be attained. With this view in mind, and with background reading on children and memory (please refer to Chapter 2), Kim's game seems to be a promising idea of testing memory. In Kim's game ten pictures are shown, they are then hidden and then children are asked to recall them.

Two matters differentiate this memory game from the initial one. First, the number of pictures to be recalled 6 before 10 now (10 gave a fair spread in June 2002), which might offer a spread of ability and second, the pictures are presented vertically now and not horizontally as before as it seems that the operative schemes facilitate or hinder memory performance (Piaget and Inhelder 1973 cited in Liben 1981).

6:2. Part 1: General cognitive test

6:2:1. Aims and objectives

In previous studies there was an attempt to refine some of the qualities tested with Esser and Kossling's (1986) psychometric method to work for a group of young EFL learners in Greece as this approach is clearly amore appropriate way of testing the target age group. The following experiment is based upon Esser and Kossling's work for they seem to work well with young learners but it is rather a direct replication of their study so as to provide more concrete results on previous problematic results (i.e. the memory test). It is intended to address the questions:

- Will this study identify any more cognitive skills or qualities that can be assumed as pre-linguistic abilities? Up to now, some have been shown to work, namely visual perception/recognition and phonetic associative memory.
- Which are these cognitive skills or qualities?
- Can they be measured so as to offer a range of scores?

Consequently, a test with different activities is developed that would measure children's memory and analytic abilities. These activities are designed to offer a spread of scores across children so as to reflect different abilities and cognitive prerequisites. It is expected that some at least of these features would correlate with the language knowledge measures at the end of the academic year.

At this stage, a test of foreign language achievement is not to be included due to several restricting reasons. First, it is quite early to measure such a quality because the learning period is too short (only three months) which means a very limited vocabulary of less than thirty words can be tested. Second, it is the aim of the experiment to concentrate on finding as many cognitive qualities possible in one test. This, in turn, means having a foreign language test would severely restrict that for reasons of time and duration. However, this test's results will be taken into account when carrying out correlations in June along with the foreign language achievement test.

6:2:2. Methodology and design

73 children were tested one-to-one in January 2003 in Greek public and private schools. To be more specific, there are 23 five year olds, 27 six year olds and 23 seven year olds. They are all Greek native speakers with no immediate English background.

Esser and Kossling's views strongly support that there must be cognitive prerequisites, and their study greatly influenced this study. A description of the processes tested is presented below:

- Short term visual memory is tested via Kim's picture memory game.
- Inductive rule acquisition is a process tested through an artificial language game.
- Semantic integration process is tested with learning - recognition list game.
- Paired associate learning is a process tested through a picture-shape matching game.

As short-term memory was the quality that needed further examination and thinking, it is now modified and will be retested in this experiment to see whether a spread of differences among young learners can be ensued or whether it is a quality that *does* count in learning a foreign language. Three of the four processes Esser and Kossling suggested are replicated and amended to serve young learners age group. The process of analogy formation is excepted because it proved a very hard task to be included for this age. The duration of the test was 15 minutes for each child. A detailed description of each activity is offered below.

6:2:3. Description of general cognitive test

1. Short memory (Kim's game) (code: shortmem)

Ten picture cards of unrelated objects are shown to the child for approximately thirty seconds. Then the pictures are turned so that the child can not see them any more. The child is asked to recall as many pictures possible.

The aim of the game is to measure short term rote memory, hence the concept of rote memory as Carroll and Sapon have used in their tests.

One point is given for every picture recalled and there is a total of 10 points.

2. Artificial language game (code: artiflang)

The child is given four soft cubes of different colours. The child is asked to remember that each colour represents a different group. Namely, the red cube represents all the fruit, the blue all the animals, the yellow all the flowers and the green all the drinks.

Then, the child is asked to demonstrate each colour according to the objects each time shown on the table.

The aim is to measure primary analytic skills (deductive ability) and grouping abilities.

One point for each colour correctly demonstrated for an object is awarded and there is a total score of 10 points.

3. Semantic integration game (code: semin1, semin2, semin3)
A learning list of four shapes is presented to the child (square, hexagon, diamond, X). The child is asked to look at it carefully and name the shapes. After that, the child is given a recognition list of six shapes (triangle, parallelogram, X, circle, hexagon, star). Then, the child is asked to recognise (semin1) the shapes existing as well in the learning list (hexagon, X), then recognise (semin3) the new shapes in this list (triangle,star, circle, parallelogram) and recall (semin2) the shapes which are omitted from the learning list (square, diamond).

The aim here is to measure recoding ability, which serves to increase storage capacity (Esser and Kossling 1986:97).

One point for each correct shape recognised or recalled is awarded and there is a total score of 8 points.

4. Paired Associates game (code: pairasso)
The child is shown six different picture cards and a set of six various shape like figures. Each picture is matched to only one figure and the child is asked to look at the pairs carefully for 30 seconds in order to be able to recall them. Then, the set of figures is given to the child while the pictures are disordered. The child is asked to match each picture with the correct figure previously shown.

The aim here is to measure the capacity to retain sign pairs as conclusions about the capacity to retain foreign language vocabulary can be drawn according to Esser and Kossling (1986:96).

One point is awarded for every pair correctly matched and there is a total of 6 points.

Overall score for all activities: 34 points. For more information on the test, see Appendix 8.

6:2:4. Results

Before analysing the significance of the data and their relation to the aims of the study, it is important to comment firstly on the workability and the performance of the tests. A profile of performance and the scores of each test of the individual subjects is offered in Appendix 9 and shows that learners even at this very young age are able to cope with cognitive tasks somewhat more complex than previously thought.

Table 6:1 presents the standard deviation and the mean of the tests. The minimum and maximum score is also shown in order to ascertain the range of scores that is accomplished. Memory test in the first study showed a mean score of 9.19 and a standard deviation of 1.74 while in memory test in the second study a mean score of 5.98 and a standard deviation of 2.98 was drawn. Hence, comparing former data, a bigger range is attained while there is no problem of workability when applying it to young learners. That, in turn, means that, one aim is satisfied and, provided that the test has any validity at all as a test of memory, this test stands clearly a better chance of demonstrating a connection with language learning if one exists.

As can be seen from the table, paired associates seems to have the ideal mean score of 3.13 and a standard deviation of 2.03 which allows for a very well distributed attainment and a clear differentiation among learners. The artificial language test is quite satisfactory but the semantic integration was expected to show a better range.

Test	Minimum	Maximum	Mean	SD
Short memory	0	7	3.71	1.54
Artificial language	2	10	7.23	2.91
Semantic integration	0	8	5.91	1.42
Paired associates	0	6	3.13	2.03
Overall	5	30	20.00	5.42

Table 6:1: mean and standard deviation of tests

Aims 1-2: *Will this study identify any cognitive skills or qualities that can be assumed as pre-linguistic abilities? Which are these skills or qualities?*

Regarding the first aim, it seems that the replication has revealed several qualities that can be regarded as cognitive skills. First, associative memory, the ability to associate a concept with another concept has given a very satisfactory mean score and standard deviation that shows that this cognitive skill differentiates learners and shows a range of abilities. We have seen phonetic associative memory in previous experiments here and the results were satisfactory and yielded significant correlations with productive vocabulary and language total scores. Now, associative memory between concepts and shapes are tested and it will be interesting to see whether this, too, will reflect different abilities in language achievement.

The semantic integration task focuses on the ability to recognize parts that are added, abstracted, or taken away from a learning list requires visual memory and perception. This is a general cognitive skill and not a linguistic one. Views on general cognitive skills expressed by Pimsleur, the correlations yielded by Esser and Kossling and previous studies of this thesis give strong indications that this might influence language achievement.

Finally, artificial language is a test of inductive learning ability, which includes skills of matching or associating a concept with a group of concepts. This is a cognitive skill very popular in nursery and primary classrooms that offers a fairly good spread of scores and it will be interesting to see if this reflects language achievement. According to results by Esser and Kossling and the emphasis on this quality given by Carroll, it is expected that inductive rule acquisition will impact language achievement to some extent.

Aim 3: *Can they be measured so as to offer a range of scores?*

As far as the third aim is concerned, it becomes obvious from the first table that there is a range of scores among the subjects which makes the whole idea of testing and exploring cognitive prerequisites a feasible prospective. The whole procedure of measuring these will probably need a more delicate approach yet it appears a promising concept. Some tests appear better than others. The means for the memory tests are still low but the range and the standard deviations are bigger so the test appears to strings learners out more. Therefore, it stands a chance of seeing the effect of variation in this skill on language learning.

6:2:5. Discussion and data analysis

On the whole, the idea of replicating Esser and Kossling's study of cognitive prerequisites seems to be the most appropriate. It makes the designing of this test workable and operational for the target age group and creates the conditions for potentially positive results.

The artificial language activity is interesting as it offers several outcomes. Many children are able to play along the whole game but many also were those who got carried away or were tricked by the colours of the object and not the group. From the literature point of view this is very intriguing as at this age most of them are supposed to be quite able in grouping and their deductive ability is satisfactory. This might indicate children who are in need for more training concerning this cognitive skill. Remembering a concept (here colour) and its representation with a particular group (animals, fruit, drinks, etc) can be perceived as a pre-linguistic skill. It is important to be able to acknowledge that for example words ending with –ly (concept) are most of the times adjectives (group), a verb ending with –s (concept) usually refers to the third person (group), objects ending with –s (concept) are normally plural forms (group). So a child as a learner will be able to label in mind parts of speech, prefixes, suffixes, etc.

The semantic integration activity offered some variation in ability. This is a more difficult and delicate task and it reveals that most children are able to identify new parts from a learning list, it is fairly easy to recognise old parts but it is quite hard to remember what the last entailed after being given the recognition list. The aim here is to measure recoding ability, which serves to increase storage capacity as stated in Esser and Kossling's (1986:97) study.

The paired associates test yielded remarkable results. A range of scores is guaranteed which demonstrate a strong cognitive skill that will probably correspond to a pre-linguistic skill .The aim here is to measure the capacity to retain sign pairs so as to measure the subsequent capacity to retain foreign language vocabulary (Esser and Kossling 1986:96).

Finally, the short memory activity gives a mean score of 3.71 and a standard deviation of 1.54. Although this result is weaker than the rest, combined with the results so far raise several questions concerning the structure and place of language in the developing learner's mind. There is a model here that must include memory and the development of analytic skills and all sorts of kinaesthetic ideas which do not usually form part of language learning in adults or form much in the model of language in the brain. Here, these results support the idea that some of these qualities do exist in young children and are measurable.

Reconsidering the memory factor again, it could be the construction of test that does not allow for any range of scores or the fact that young children are more able to remember things that they associate in their dreaming minds than abstract things shown at them. It might also be the case that they are too absent minded to be concentrated for some seconds on something in particular and thus unable or unmotivated to recall at demand. Whatever the case, it seems that easy accessible memory does not prove to be a predictor of ability.

In retrospect, short-term visual memory does not seem to count much as a pre-linguistic ability. It is undeniable that memory, with all its sub-functions is a determinant factor for learning any language (first, second, third, etc). Yet, the specific type of memory described above gives no evidence for further pre-linguistic function. Thus, it is important to associate, group, name words and structures in the first language and in addition label and store words in the foreign language learning. But what use would it be linguistically only speaking if a learner would be able to say 'table' in his own language if he could not recall its equivalent in the foreign language? This sort of memory consequently appears to count vastly for the learning of the first language, as it seems not to relate apparently with the learning of a foreign language. However, it would be interesting to see if it will give any correlations with language achievement at the end of the year.

6:3. Part 2: Foreign language achievement test

6:3:1. Aims of the foreign language achievement test

Language learning aptitude in young learners has not been investigated before. Very little is known about how languages are learnt and although language instruction is similar among countries, there is no research to back up the theory. According to the language instruction followed so far, which is heavily oriented and does not include much analytic skills we might expect to see learners that are very good memorisers but weak analysers. In order to investigate these matters foreign language achievement tests are included after general cognitive tests to show any relation between general cognitive skills, aptitude and language learning success. Esser and Kossling's cognitive approach appeals to young learners much more than a purely linguistic one favoured by Carroll and Sapon and it is far more appropriate.

However, there is great difficulty in extracting data from young children, and the nature of the language learning expected of them is very limited indeed. It would, therefore, be surprising if really good correlations are achieved. Even in Carroll and Sapon's successful and influential MLAT the correlations were about 0.4 most of the time.

The aim and the question for the development of a foreign language achievement test at the end of the academic year is obviously:

- Will the cognitive qualities tested in January correlate with subsequent success in foreign language achievement test at the end of the academic year in order to suggest that they predict language learning ability?

It is hoped and assumed that some of the qualities tested in January 2003 that worked well and offered a fair range of scores will give a clear idea of their significance regarding subsequent success in the foreign language learning.

6:3:2. Methodology

66 children are individually tested in June 2003 in Greek public and private schools. There are 20 five year olds, 26 six year olds and 20 seven year olds. They are all Greek native speakers with no immediate English background and they are the same (but less for different reasons) that were tested in January 2003. Hence variations in the various cognitive skills already tested can be compared with variations in language learning ability as shown by the tests in this study.

Their achievement in the English language is also tested through two game like activities. The test type is a naming activity of the items learned during their first year's exposure to English in order to test their productive vocabulary and a listening activity to test receptive vocabulary.

6:3:3. Description of foreign language achievement test

The learners' achievement in the English language is tested now. As before, the test type is a naming activity of the items in order to test their productive vocabulary and a listening to test receptive vocabulary. The contents of the test are always devised according to the syllabus of the English language teaching that has occurred over the course of the year's study. The language content of the English language teaching involves basic naming (only naming and not writing or reading) of colours, animals, numbers, food, and some action phrases. Therefore, a single test is used for all schools and is a reasonable one of what they have tried to learn in English.

1. Listening activity (code: recvoc)

Several mini picture cards of objects, animals, musical instruments, etc are laid on the desk and while the experimenter is calling some of these, the child has to collect them. The aim is to test receptive vocabulary.

One point is credited for each word item correctly recognised and there is a total score of 20 points.

2. Naming activity (code: prodvoc)

Flashcard of a rainbow, body, seasons and realia are shown and the child is asked to name the colours, body parts, seasons and other objects. The aim is to test productive vocabulary.

One point for each correct produced word is credited and there is a total score of 20 points.

Overall score for the foreign language test (code: langtot) is 40 points. For more details, see Appendix 10.

6:3:4 Results

In Appendix 11 the individual scores for each task are presented. There is a variety of scores in both general cognitive and language performance tasks which is positive as a string of attainment can be concluded. Yet, the semantic integration task behaves quite differently possibly because there are not enough questions, but only 2 or 3 in each subtest, thus not allowing any wide variety in achievement. Memory behaves better this time with a mean score of 3.82 and a standard deviation of 1.53 which allows a strain of scores. The paired associates as shown before has the best range of scores and here receptive vocabulary and language total share very satisfactory mean scores and standard deviations offering hence a very impressive range of ability in language. The scores in productive vocabulary are expectedly less exciting because it is general truth that at this age, learners are far more receptive and take much longer to produce language. Table 6:2 shows the mean scores and the standard deviation of each task.

Test	Minimum	Maximum	Mean	SD
Shortmem	0	7	3.82	1.53
Artlang	2	10	7.15	2.90
Semintot	0	8	5.89	1.47
Pairass	0	6	3.07	2.05
Apttot	5	30	19.94	5.50
Rec vocab	1	20	9.85	4.36
Prod vocab	0	14	3.79	3.59
Langtot	1	34	13.63	7.20
Overall	6	57	33.57	10.39

Table 6:2: mean and standard deviation of tests

Aim 1: *Will the cognitive qualities tested in January correlate with subsequent success in foreign language achievement test at the end of the academic year in order to suggest that they predict language learning ability?*

The aim of the development of this test is to allow correlations between cognitive qualities and scores in language performance in order to predict or suggest language learning ability. Table 6:3 shows the ones that emerged. The correlations are about 0.3.

	shortmem	Artlang	Semintot	Pairass	Gatot	Recvoc	provoc	Langtot
shortmem	1.000	0.336**	0.279*	0.230	0.615**	0.259*	0.178	0.246*
Artlang		1.000	0.429**	0.253*	0.829**	0.265*	0.109	0.215
semintot			1.000	0.135	0.621**	0.314*	0.223	0.302*
Pairass				1.000	0.607**	0.164	0.150	0.174
Gatot					1.000	0.357**	0.223	0.327**
Recvoc						1.000	0.636**	0.923**
Provoc							1.000	0.884**
Langtot								1.000

Scores with ** are significant to 0.01

Table 6:3: Correlations between cognitive skills and language achievement

Short-term memory correlates with receptive vocabulary at 0.259* and with language total score at 0.246*. This is the first time that memory gives a correlation with language achievement scores. It suggests that short-term visual memory can be related to receptive vocabulary process although it was previously thought that rote memory was not expected to perform as a pre-linguistic function. There is also a correlation of 0.265* between artificial language and receptive vocabulary which implies that deductive and grouping abilities assist vocabulary learning or at least receptive vocabulary. The semantic integration total correlates with receptive vocabulary score at 0.314* and language total score at 0.302*, a finding that verifies the cognitive approach of testing aptitude that Esser and Kossling first introduced. The paired associates' task, surprisingly enough, does not give any correlations. This is an obscure finding as one would expect associative memory or as Esser and Kossling (1986:96) call it 'the capacity to retain sign pairs' would possibly be related with foreign language learning and vocabulary learning in particular. Furthermore, this quality has been shown to offer strong correlations in Carroll and Sapon's study. The possible reasons for this are touched upon in the discussion part below. Hence, short term visual memory; grouping and deductive ability (artificial language test) and visual perception/recognition (semantic integration) appear to play a facilitating role on language acquisition. The capacity to retain sign pairs though (paired associates) shows no significant impact as yet.

To sum up, the cognitive tests continue to predict but fairly weakly - hence the 0.327** correlation between general cognitive and language achievement test. The language tests work well as tests as they seem to give a decent range of scores. The weak correlation must have other explanations. One can be that the relationship really is weak and other cognitive factors that have not been yet tested are involved and are more important to language learning.

6:3:5. Discussion of findings

It is interesting that some tests produce correlation on receptive but not productive vocabulary and vice-versa. The semantic integration subtest 2 (recall the missing shapes) in particular, is the only one that correlates strongly with receptive vocabulary at 0.349, with productive at 0.341 and language total at 0.368**. It is plausible to suggest that these sub-elements might all correlate significantly given a large enough sample but the sample here is quite small.

However, the test as a whole correlates, even if, in the current form of the test, the connection is not a strong one (0.302*). All the other subtests offer correlations either for productive or receptive ability. However, the difficulty of the language testing task is to be noted here. The learners are young and there is comparatively little knowledge to actually test. The results may just be a reflection of these difficulties.

In the same vein, short-term memory and artificial language work for receptive but not productive language. The question here is: 'Is there a model of language learning/production which makes this happen?' This distinction between different types of language learning is novel as there is no research previously stating that some tests predict one type of language behaviour and another test might predict different sort of language behaviour in young learners. Having said this, Wesche (1981) and also Meara et al (2001), suggest that learners strong in analysis do well at language tasks, which permit formal analysis (like translation) while memory strength suggests learners who will be good at more communicative stuff. It is assumed, however, that language reception and language production are two significantly different processes (Aitchison 1987).

This was a direct replication of Esser and Kossling test (modified of course, to suit the target age group). There is a good set of correlations here indicating that children vary in aptitude. These are in addition, general cognitive tests that produce this results so the notion of solely linguistic skills are separate from general cognitive skills is gravely doubted.

However, the correlations are very modest. This can be due to the fact that there are numerous other factors not tested yet, affecting the results. It may be because collecting data with this age group is considerably more difficult than with adults. This is because young learners although curious and motivated, they are very restless, impatient and with a short concentration span. It is also difficult to make sure that they have understood exactly what they have to do. Another hypothesis is that the effect of these cognitive differences genuinely is weak in this age group. Some tasks are more difficult than others, yet all tasks tested here are vastly related to memory. It is reasonable to suspect that the age effect in tasks of a similar quality is not easily discernible. Or perhaps the tests are not refined sufficiently yet to pick up the skills which contribute to successful language learning.

Although the current study did not manage to give the strong correlations previous researchers accomplished, it still offers some useful insights for future studies and provides more support for the cognitive aptitude testing method. Finally, the findings here support previous findings on several general cognitive skills that appear to facilitate or influence language achievement. To sum them up, it seems that promising testing qualities are visual perception/recognition, associative memory, inductive and deductive learning ability and with the last findings, short term visual memory.

Is it worth noticing here that the results suggest that young learners, like adults, appear to have a multi-component aptitude. This finding ties back to Skehan's ideas of aptitude discussed in Chapter 1. The idea that, all young learners are very similar in their abilities and are all good at foreign language learning, is not supported by the data. They appear to be, like adults, quite varied in the skills they have. This, consequently, suggests they will learn a foreign language differently. The language learning results obtained here verify that, indeed, they do learn differently.

One really important conclusion from this is that the fondly cherished idea that children are particularly good foreign language learners and are somehow qualitatively different in their learning than adults, is beginning to look strange if not wrong. Memory, analytic skill and sound discrimination variation, which characterised adult language learning aptitude, also seem to associate with and predict foreign language learning success in young learners. This raises a whole array of interesting questions to tackle in later experiments. Questions to be addressed will be for example, whether children are better at memory/analysis/etc than adults; and if so at what extend these qualities might change with age.

The next studies are also an effort to expand on the nature of the components that make up this multi-component model. The experiments to date draw on a small number of sources because they were done in order to give an idea of where to look. The results drawn so far suggest that language aptitude in young learners is similar to adults and is likely to comprise memory and some analytic skills. Consequently, in subsequent experiments we can draw on a wider range of more relevant sources will be drawn such as Anderson (2000), Daneman and Case (1981) or Gatercole et al's (1992) notion and findings on memory in children. At the same time, it is a good idea now to test whether different types of memory and memory tests may predict better as Humes-Bartlo (1989) has previously suggested.

6:4. Conclusions

It was necessary in the early experiments to set general aims in order to get an idea for what will work and what might link with success in learning. Some interesting results indicate now what aptitude in young learners might consist of. To sum up, these are also some conclusions reached which are interesting in their own right:

1. Success in foreign language learning in young learners can be predicted.
2. Various qualities seem to predict success.
3. These qualities appear to be general cognitive abilities rather than narrowly linguistic ones.
4. These qualities appear to include elements like memory ability and analytic skill.
5. Young learners are beginning to look remarkably like adult learners.

CHAPTER SEVEN

TESTS OF SHORT TERM / LONG TERM ASSOCIATIVE MEMORY AND SPATIAL ABILITY

(JUNE 2003)

Preface

In the previous chapters some interesting conclusions were drawn that form the basis for the next studies. It was found that success in foreign language learning in young learners can be predicted and there are certain qualities that seem to be predictive. These qualities are general cognitive abilities rather than narrowly linguistic ones and involve elements like memory ability and analytic skills. Therefore, young learners are not as different to adult learners as it was previously thought.

The next three chapters will be much more tightly focused on some of the questions that these conclusions raise. The first question will be concerned with what makes up good memory for language learning. Different tests ought to test different things and reflect different cognitive processes. So, some of these tests, and the models of cognitive processing they imply will be examined, in order to try to pin down what is the quality or what is the process which seems to be associated with foreign language learning. Similarly, the second question is concerned with what makes up analytic skill and the same process will be followed.

Another question will be whether- like Skehan and others have suggested about terms like memory- these qualities are indeed separable elements. Chapter 9 will deal with these questions. Hypothetically, if memory test scores tend to cluster together then they might suggest a memory factor in foreign language learning in young learners. The same applies to the analytic elements. Lastly, it will also be interesting to observe how much of the variation in language learning can be explained by variation in memory and analysis.

The next studies are based very closely on existing aptitude tests. The replication of Esser and Kossling's study suggests that aptitude in young learners is multi-component like Skehan has recently argued. The question now is what, in more detail makes up these components. In this chapter the aims and objectives are stated for the application of the study. Several methodological issues are discussed while the process-production framework is examined in terms of its suitability and usage. Next, the results that were yielded are presented along with a discussion of the data analysis.

7:1. Background

Findings from the replication of Esser and Kossling's study have implied that instead of the monolithic aptitude notion, a multi-component model of aptitude exists. It looks as though there is a memory component and an analytic element involved in this model. This is very similar to what Skehan has noted. The study here aims at finding out what exactly makes these components up in more detail. The process of the last three studies has offered convincing account for the idea of testing cognitive abilities for the investigation of foreign language aptitude in young learners. Apart from the fact that this is a more appropriate method of testing youngsters, it was found that success in language performance and especially vocabulary learning was facilitated and strongly related to various memory and analytic skills.

More specifically, phonetic associative memory and short-term memory correlated with language achievement scores and more precisely phonetic memory was related to productive vocabulary whereas short-term memory was seen more important when receptive vocabulary was measured.

Analytic abilities were also tested. Recognizing parts or elements that have been added or taken away, an important predictor of language success according to Esser and Kossling's study, was applied to previous experiments in several forms and showed positive correlations. The semantic integration test (learning list of figures/shapes- recognition list), which was a direct attempt to replicate the same testing method that Esser and Kossling have used, offered significant correlations with language total score as well as with the individual receptive vocabulary scores. The visual perception test (finding the differences in two seemingly identical pictures) also presented a correlation with the language achievement total score and also with the productive vocabulary score. This last ability, visual perception is regarded as an analytic task since there is not any kind of memory element needed to perform the task and as this ability requires a certain focus and attention to detail. Finally, reception of vocabulary was related to deductive rule acquisition as it correlated with the artificial language game (coloured tubes representing a group, i.e red cube for animals), another replication of Esser and Kossling's former study.

Memory and analytic skills are fairly broad terms and through varied use it is not clear whether these terms refer to some very specific skills (and if so what they are) or whether they are deliberately generalised. Therefore, it might be that any memory test is likely to predict foreign language learning success. That is what can be investigated here.

7:2. Aims and objectives

The study attempts to test some complementary cognitive qualities and their potent relation to foreign language learning for a group of young EFL learners in Greece. Below are the research questions:

- Will this study identify more or different cognitive skills or qualities that can be assumed as pre-linguistic abilities?
- Which are these cognitive skills or qualities?
- Can they be measured so as to offer a range of scores?
- Will they correlate later with subsequent success in foreign language achievement test in order to suggest that they predict language learning ability?

Five game-like activities are devised in order to test children's dexterities and foreign language achievement. Three activities are developed so as to trial cognitive skills while the two others offer evidence for their foreign language performance at the end of one academic year. These activities are designed to offer a spread of scores across children so that some differentiation would be come obvious.

Apart from these general questions, however, a number of specific research objectives emerge. In the study, it will also be investigated what components make up good memory and what components make up analytic skill for language learning. There are various tests of memory tested here: rote memory (memorising lists); paired associate memory; naming exercises; semantic integration tasks. It is expected that some of types of memory will be revealed while others might suggest that some of these look like analytic tasks (especially when people are asked to explain how they memorise them, people look for patterns and tie them into an analytic schema). By trying out several of these suggested by other researchers, what predicts well will become more obvious.

As short term memory was found to influence language success, in this study there is an attempt to test whether associative memory can be a better predictor of language success and if so, whether long term associative memory could be tested for the same reasons. Associative memory or better paired associate learning is a test that measures the capacity to retain sign pairs which in turn, according to Esser and Kossling's study reveals the capacity to retain foreign language vocabulary. The addition here was that at the end of the four activities, this ability is tested again to show if long term memory storage is accomplished and if so, whether it is important to foreign language achievement.

As in Kim's game (see Chapter 6), it was thought that the significant feature is that of short-term memory, which facilitates recall and use of new sounds and words, a task that is always needed in the foreign learning process. However, it must be said that when attempting to test the same ability in different types of memory (for example using pairs of pictures and schemata or signs), this paired associates task worked inconsistently.

It should be recalled that memory is an area where Carroll also obtained inconsistent results. Two factors might help explain this. One is that the successful activity is a naming activity, clearly a vital element in learning any language, rather than merely a memory activity. It could be that this is what MLAT's paired associates test and this test have picked up on. A second possibility is that the link between memory ability and success in language learning is not a straight-line relationship and that there is a threshold effect visible here (Milton and Alexiou 2004). In principle, it might be the case that minimum memory ability is necessary for success in language learning but beyond this point extra ability does give learning gains. Such a relationship might explain the confusing results that Carroll earlier and these studies so far have obtained.

Finally, there is a test of image perception or more precisely spatial awareness. One reason for this test is the fact that the analogy formation test could not be included so something similar should be devised to fit the age group tested. Thurstone and Thurstone's Primary Mental Abilities (1963) include several tests of spatial abilities while Carroll (1990:24) thought that tests of spatial perception although not directly connected with language learning could be used in aptitude tests. It is also similar to Naiman et al's notion of the Hidden Figures Test, in which subjects are instructed to find simple geometric figures within complex designs:

The perceptual challenge the subject faces is to be able to break up the visual field and keep part of it separate. This challenge was hypothesised to be analogous to a person learning a second language who has to isolate an element from the context in which it is presented (Larsen-Freeman and Long 1991:193).

Another thought is that in nursery schools, one of the most important aims in the curriculum involves spatial awareness enhancement and promotion. Finally, it is the researcher's 'hunch' that spatial awareness could facilitate foreign language learning because size of the words, number of syllables, arranging letters in words (anagrams) play a significant role in retaining foreign language vocabulary. This can also be seen as an attempt to test inductive thinking, as the epagogic process is demanded here in order to be able to see from the whole and the parts.

Different tests ought to test different things and reflect different cognitive processes. These tests also imply certain models of cognitive processing; therefore they will be closely investigated in order to try to pin down what is the quality or what is the process that seems to be associated with foreign language learning.

7:3. Methodology and design

66 children are individually tested in June 2003 in Greek public and private schools. There are 20 five year olds, 26 six year olds and 20 seven year olds. They are again all Greek native speakers with no immediate English background and they are the same (but less for different purposes) that were tested in January 2003.

Below the activities are described in order to give an idea of the experimental procedure:

- Short-term associative memory is tested via a picture-pairs memory game.
- Spatial ability is tested through a jigsaw game.
- Long-term associative memory is tested by recalling the short-term task after an interval of approximately 12-13 minutes (time varied for each child according to the speed of completing the tasks).

Their achievement in the English language is also tested, to allow later valid predictions. The test type is as usual, a naming activity of the items learned during their first year's exposure to English in order to test their productive vocabulary and a listening activity to test receptive vocabulary. The whole test lasted about 14-16 minutes for each child tested. A detailed description of each activity is now followed.

7:4. Description of general cognitive test

1. Short term associative memory (code: shortpa)

Twelve picture cards in pairs of six are demonstrated and the child is asked to memorise the pairs. There is no obvious connection among them; for example, a cup is paired with an iron, an aeroplane with a cake, etc. The time given to memorise the pairs is approximately thirty seconds. Then, the child gets the six pairs and the experimenter mixes the order of the remaining pictures. The child has to find and match the correct pair.

The aim of the activity is to test short-term associative memory as associative memory is salient for language learning (Carroll 1958). Since other random memory activities have failed to show strong connection to language learning, a special sort of memory might be more enlightening to examine.

One point is given for every pair. The total score is 6 points.

2. Jigsaw (code: jigsaw)

A big picture card showing a jigsaw picture with four pieces missing is shown to the child. The four pieces are left out from the puzzle but are shown dismantled on different corners of the card. The child is now asked to observe it closely and identify which pieces fit to each void left in order to finish the jigsaw.

The aim is to test image perception and spatial ability for certain reasons mentioned before. This spatial ability relates linguistically to inductive learning ability (being able to form rules from certain elements/envisage the whole from the parts).

One point for each correct fitting is awarded while there is a total of four points for this task.

3. Long term associative memory (code: longpa)
This is the last activity that takes place after the foreign language test but it is described here for practical reasons. At the start of the test the child is given six picture pairs to memorise (see again first task, shortpa). After all the other tasks are over, the interval is about 12-13 minutes so now the child is asked to recall if possible the picture pairs with the experimenter providing again the first six pictures.

The aim here is to test long-term associative memory as long term memory is supposed (for experimental reasons) to be anything a person can retain in memory for more than a few minutes.

One point for each correct picture pair is given and there is a total score of 6 points.

Overall score for all activities (code: gatot): 16 points. For more details see Appendix 12.

7:5. Description of foreign language achievement test

1. Listening activity (code: recvoc)
Several mini picture cards of objects, animals, musical instruments, etc are laid on the desk and while the experimenter is calling some of these, the child has to collect them. The aim is to test receptive vocabulary.

One point is credited for each word item correctly recognised and there is a total score of 20 points.

2. Naming activity (code: prodvoc)
Flashcard of a rainbow, body, seasons and realia are shown and the child is asked to name the colours, body parts, seasons and other objects. The aim is to test productive vocabulary.

One point for each correct produced word is credited and there is a total score of 20 points.

Overall score for the FL test (code: langtot) is 40 points. For more details, see Appendix 12.

7:6. Results
Aims 1, 2: *Will this study identify more or different cognitive skills or qualities that can be assumed as pre-linguistic abilities? Which are these cognitive skills or qualities?*
In Appendix 13 the scores of each test and overall scores of the individual subjects are provided. This offers a convincing account of the workability of the particular experiment. To start with the first aim, the cognitive abilities that are assumed to play a role in foreign language learning is short term and long term associative memory, two qualities that were not tested together before. This is again an attempt to investigate the role of memory as it offered weak or earlier no correlations to this point. In this experiment, associative memory, that is a very specific kind of memory is trialled with the view that perhaps not any memory is associated with language learning, but (for evident and plausible reasons) more likely this sort (associative memory, for example, labelling one item in memory with another) is directly associated with language achievement.

Aim 3: *Can they offer a range of scores?*
Different scores are awarded for the individuals in different tasks. This consequently verifies a range of scores, which is desired again in the third aim. There are children

who achieved better scores in some tasks than in others and not one has the same range of scores with the others in all tests.

Table 7:1 shows the standard deviation and the mean score of the tasks. The down side with all of these tasks is that there are only a small number of items so each item has to be significantly different from the others in performance if a spread of scores is to be achieved. Noise from things like guessing may well overwhelm any discrimination in ability these tests are able to pick up. Not surprisingly, the means are small although the standard deviations look reasonable in proportion to the means. Again, the foreign language test seems to work quite well as the mean score and standard deviations for the receptive vocabulary test and the total language scores in particular offer a wide range of achievement.

Test	Minimum	Maximum	Mean	SD
Shortpa	0	6	3.18	1.89
Jigsaw	0	4	2.74	1.44
Longpa	0	6	2.83	1.81
Gatot	1	16	8.75	3.80
Rec vocab	1	20	9.85	4.36
Prod vocab	0	14	3.79	3.59
Langtot	1	34	13.63	7.20
Overall	7	46	22.34	8.72

Table 7:1: mean and standard deviation of tests

Aim 4: *Will these results correlate with other scores in foreign language development in order to suggest that they predict language learning ability?*

Correlations between the tasks are presented in Table 7:2 below.

The final aim concerned the possibility of correlations emerging from the results with other scores in foreign language development in order to predict language learning ability. Although the workability of the tests is quite problematic this time because the number of the test items is too small, there are significant correlations between the jigsaw activity and the language tasks. The correlations are about 0.4 which is very satisfactory and surprising at the same time.

	shortpa	Jigsaw	Longpa	Gatot	recvoc	provoc	langtot
Shortpa	1.000	0.097	0.734**	0.884**	0.072	-0.046	0.021
Jigsaw		1.000	-0.011	0.421**	0.408**	0.290*	0.392**
Longpa			1.000	0.839**	0.128	-0.074	0.041
Gatot				1.000	0.252*	0.051	0.178
Recvoc					1.000	0.636**	0.923**
Prodvoc						1.000	0.884**
Langtot							1.000

Scores with ** are significant to 0.01

Table 7:2: Correlations between cognitive activities and language achievement

7:7. Discussion and data analysis

Various aspects of memory and analysis are examined here, each of which is based on an idea of how learning works. Some specific research objectives have also been investigated here. One of them was the question of what components make up good memory and what components make up analytic skill for language learning.

Three more cognitive qualities are tested here, as the main aim of this experiment's series is to indicate additional cognitive abilities that relate to foreign language learning. Firstly, two certain types of memory, namely short-term associative memory and long-term associative memory are trialled. The thinking was that more specific kind of memorising might prove to be relevant to language learning if it correlated with language performance. However, there is only random association to language performance so no definite conclusion can be derived from these tasks.

At a first glance, these memory qualities do not appear to predict consistently, yet it might be that the test is not performing equally for individuals. On the other hand it is true, that many researchers in this field have found it difficult to show a clear and strong correlation between aptitude and associative memory. Carroll himself has stated (1990:20) that he had numerous problems making a memory test that would work consistently and almost left it out from M-LAT. Yet, the notion that memory is related robustly with language aptitude has passed as a self-evident truth. Having said this, in previous test short term immediate recall has been found to correlate with language performance so it might be that the specific test of associative memory might not be sensitive enough considering the mean and standard deviation.

It is additionally noticeable that the memory elements give a negative correlation with productive vocabulary and this is possibly the strangest finding. One would expect that labelling in memory two objects should facilitate foreign language vocabulary learning but it does not seem to be the case here. However, it must be said that the small number of test items makes it hard to offer either a spread of scores or to allow any kind of correlations to emerge.

Finally, there appear to be no immediate difference between short term and long-term associative memory when it comes to language achievement. And although Carroll and others support that short time interval enables the distinction between different cognitive abilities (kinds of memory), the results here are far from convincing. This finding verifies Wesche et al's claim (1982) that cognitive aspects of aptitude are related to general cognitive abilities but this is less valid for memory (cited in Skehan 1992:157).

Gathercole and her partners (1992) have demonstrated that young learners are particularly dependent on memory and that success in language learning can vary according to variation in short-term memory in particular. It appears that not only are young learners inherently different in their L1 memory development but environmental factors may influence the degree to which youngsters are able to harness the skills which come from this form of memory.

The third quality examined is the inductive ability, which involves a task on image perception, and spatial ability via a jigsaw game. This yielded some very positive results. A significant correlation of 0.408** between the jigsaw game and receptive vocabulary and a correlation of 0.290* with productive vocabulary and the jigsaw is found. Jigsaw also correlated significantly with language total at 0.392**. This is another example of how visual (and non-linguistic) skills predict language behaviour, which is really interesting. The correlation here is quite decent and comparable with the test by Carroll and Sapon (1958), yet this test is obviously not linguistically or memory oriented in the normal way. Hence there is ample support here for the general cognitive skills theory rather than the language specific one when testing aptitude or attempting to identify its components. Even at this age the learning appears to be more formal, analytic and explicit rather than like the informal and implicit L1 learning.

To sum up, spatial ability (tested in several ways by researchers like Thurstone and Thurstone 1963, Wechsler 1991 and others), although having no apparent relation to language learning, seem to play a facilitating and also decisive role in language performance and offers help in distinguishing poor from very good learners. As this is more of an analytic ability, it would be interesting to show its potential in grammar sensitivity tasks. Unfortunately, the age and cognitive level of the learners in question is not appropriate to implement this idea. Certainly, though, one should think that if this quality is successful in predicting through only a vocabulary test, then it should be even more useful in other more sophisticated language tests. Whatever the case, spatial ability for the age tested here give way to promising results.

Finally, the theory of developing aptitude tests that are cognitive orientated seems to gain more ground according to the findings above.

CHAPTER EIGHT

THE AGE FACTOR AND TESTS ON ASSOCIATIVE MEMORY, VISUAL/ SPATIAL PERCEPTION, PHONETIC DISCRIMINATION AND REASONING ABILITY (JANUARY 2004)

Preface

The last two studies extend the question raised in Chapter 7, which concerns the idea of a multi-component model of aptitude derived form replicating Esser and Kossling's study. Two vital components seem to be involved namely a memory component and analytic component. The whole notion is similar to what Skehan has recently suggested (1998; 2002). The previous two studies aimed at finding out what exactly makes these components up in detail. Various aspects of memory and analysis were examined, each of which was based on an idea of how learning works. In Appendix 20, all tested qualities for all studies are provided as a reminder.

Up to now, two types of memory seem to comprise the memory element for languages. These are short-term memory for pictures and phonetic associative memory for non-words. Several types of memory tests have been trialled but as Carroll has previously stated, it is quite hard to test memory consistently and derive valid conclusions.

The analytic component seems to comprise several qualities. Recognizing parts or elements that have been added or taken away seems to be an important predictor of language success according to Esser and Kossling's study and is confirmed by the replication carried out in this thesis. The semantic integration test (learning list of figures/shapes- recognition list) which was a direct attempt to replicate the same testing method that Esser and Kossling have used, offers significant correlations with language total scores. The visual perception (finding the differences in two seemingly identical pictures) is also influential to language performance. Inductive rule acquisition (coloured tubes that represented a group, i.e. red cube for animals) seems to contribute greatly to language performance as it offers very good correlations. Finally and quite interestingly, spatial ability (tested in several ways by researchers like Thurstone and Thurstone 1963, Wechsler 1991 and others), has proved a facilitating and also possibly a decisive role in language performance and offers help in distinguishing poor from very good learners.

The second question, which forms the main focus in these studies, is age related. If aptitude is a series of general cognitive abilities can the age effects that characterise other cognitive abilities be detected? If so, it will be interesting to discuss the implications of these age effects. There is also a burning question concerning change in cognitive skills and cognitive maturation over time. If young learners get better or more cognitively mature over time then their aptitude ought to improve. If so, what makes young learners so uniquely better in language learning? And why are adults considered to be less 'apt' to learning languages? There is a contradiction here, which deserves closer investigation. Recent findings have shown that older starters in languages do better than early starters (Munõz et al 2002) so aptitude for young learners may now be questioned and matters like exposure, type of input, time and others might come to light. These are interesting questions that can be examined now that more concrete qualities influencing language learning are found.

8:1. Background

The studies performed so far support the idea that differences in the development of cognitive skills and aptitude do exist even in young foreign language learners. A direct replication of Esser and Kossling's study was attempted in previous experiments. The idea was that since their test showed high correlations and unveiled the importance of testing general cognitive skills for aptitude, a modification to suit the target age group might also offer valid results about aptitude for youngsters.

Up to date, five main activities consistently appear to predict language learning success:

1. Kim's game: a test of rote visual memory ability
2. An associative memory game: a phonetic memory activity that tests the ability to code and retain phonetic pairs
3. Learning and recognition lists: a semantic integration test that tests recoding ability
4. Spot-the-difference game: an analytic task that tests visual perception

5. Jigsaw game: a test of spatial ability

Each of all these activities produced a significant correlation of approximately 0.3 - 0.4 with the scores on the language learning task. Individually these tend to be a little lower than would really be desired in a test of this kind. Combined, however, they produce a higher correlation and one, which is comparable with Carroll and Sapon's MLAT over a lengthy learning period.

This time, two more cognitive skills are tested which according to literature might be promising qualities in language learning. One is phonetic discrimination ability; phonological awareness and phonetic coding ability are pivotal in learning any language. Ellis (1997) has found that phonological short-term memory (STM) span predicts vocabulary and syntax acquisition both in first and second language. Also, it was found that repetition and productive rehearsal of novel words promotes their long-term consolidation and retention. Furthermore, Gathercole et al (1992:888) suggest that there are developmental associations between short-term phonological memory skills and vocabulary acquisition in the first language. It is also one of Carroll and Sapon's four components of aptitude and the third in the three, which Skehan has identified recently (2002).

Second, reasoning ability is tested through an inductive learning ability. This requires the skill to visualise (analyse) the whole from the parts. Carroll himself views this type of ability as important in aptitude when referring to the inductive learning ability (Carroll 1966; 1981). Larsen-Freeman and Long (1991) view that the perceptual task of inductive ability is similar to this of learning a second language as the learner often needs to isolate certain elements from the context. Testing in logical reasoning includes picture cards that when put in sequence make a story.

The process of the last studies offered convincing account for the idea of testing cognitive abilities for the investigation of foreign language aptitude in young learners. Apart from the fact that this is a more appropriate method of testing youngsters, it was found that success in language achievement and especially vocabulary learning was facilitated and strongly related to various memory and analytic skills. This leads to the conclusion that aptitude is associated principally with types of memory and analytic skills as suggested by Skehan (1989) and Esser and Kossling. The last remark, in turn, generates several questions on matters of age development. Therefore this study is addressed to very young learners as well as older learners to verify whether age development, alone, accounts for changes in aptitude or linguistic behaviour. Aptitude, here and previously, is seen a set of general cognitive abilities (Sasaki 1996, Wesche et al 1982). Cognitive psychologists say that these skills develop with maturation in young learners (Piaget 1952; Hargenhahn 1982; Anderson 2000).

Those claims have two important implications. One is that aptitude does change over time and is not an immutable, fixed quality (Carroll 1981), second is that young learners may actually get cognitively better with time. This is contrary to general opinion, which says learners get worse as they get older. Gathercole et al (1992) suggest that the impact of memory ability on learning diminishes with age as, presumably, other influences such as the growth of analytic skills develops (also Kail 1990 in Rosser 1994). Similarly, Vecchi et al (2001:38) referring to visuo-spatial abilities claim that 'there is an increase in the capacity to remember visual and spatial information and declines with age'. However, there are findings that suggest older starters in languages do better than early starters although this might be due to the more systematic way of teaching and the more explicit exposure older learners actually get (Munõz et al 2002).

In any case, the general consensus is that there is a 'window of opportunity'(Zafrana 2001) and that the brain is more acceptant and flexible at the younger age (Lenneberg 1967) while the affective filter (Krashen 1981) is low, if not absent. Therefore, younger learners are like 'sponges' (Munõz et al 2002).

This study involves older learners for one more reason. Up to now, several cognitive skills have been assumed to influence language aptitude. However, all the learners tested up to present, have been tested in their English achievement when they only had to name or recognise certain words learnt. It is a challenge to see whether older learners get similar results both in language achievement and cognitive skills because these older learners are more linguistically sophisticated. This is because they have learned to read and write as well. Therefore, it would be reasonable to suggest that outcomes from older aged groups will verify or shed doubt in the relation between cognitive skills and language achievement where pre-linguistic (word recognition, naming) or linguistic (reading, writing) skills are concerned.

8:2. Part 1: General cognitive test

8:2:1. Aims and objectives

The study attempts to test some complementary cognitive qualities and their potent relation to foreign language learning for a group of young EFL learners in Greece. However, it also includes the same paired associative activity (included in previous study-see Chapter 6- although showing no correlation), for reasons discussed later. Apart from that, in this study, learners of 5, 6, 7 but also 8, 9 year olds participate as age development questions are now brought to light. Below are the research questions:

- Will this study identify more or different cognitive skills that behave as pre-linguistic abilities?
- Which are these cognitive skills or qualities?
- Can they be measured so as to offer a range of scores?
- Will they correlate later with subsequent success in foreign language achievement test in order to suggest that they predict language learning ability?
- Is there a ceiling effect or significant differences between very young and older learners when these cognitive skills are concerned?

Five game-like activities are devised in order to test children's dexterities. These activities are as always designed to offer a spread of scores across children so that some differentiation would become obvious. A test of foreign language achievement is not to be included yet as the learning exposure period is quite short for the young learners. Therefore, the scores of this test will be taken into account when carrying out correlations in June 2004.

8:2:2. Methodology and design

91 children are individually tested in January 2004 in Greek public and private schools. There are 25 five year olds, 22 six year olds, 10 seven year olds, 20 eight

years old and 14 nine year olds. They are all Greek native speakers. Below the activities are described in order to give an idea of the experimental procedure:

- Paired associate learning is a process tested through a picture-shape matching game.
- Visual perception is tested with an activity of finding identical picture pairs.
- Phonetic discrimination ability is tested in a series of phonetic activity tasks.
- Spatial perception is tested through a pictorial game.
- Reasoning ability is tested via a story sequence game.

Short-term associative memory failed to offer any strong correlation with language performance in the June 2003 study. The failure is possibly due to difficulty of the foreign achievement test as low scores were the norm. This quality is once then retested, as it is again a memory task that might offer interesting indications among the enriched variety of ages participating in the present study. The duration of the whole test was 10-13 minutes for each participant. A detailed description of each activity is offered below.

8:2:3. Description of general cognitive test

1. Associative memory (code: pairass3)

The child is shown six different picture cards and a set of six various shape like figures. Each picture is matched to only one figure and the child is asked to look at the pairs carefully in order to be able to recall them. Then, the set of figures is given to the child while the pictures are disordered. The child is asked to match each picture with the correct figure previously shown.

The aim here is to measure the capacity to retain sign pairs as conclusions about the capacity to retain foreign language vocabulary can be drawn according to Esser and Kossling (1986:96).

One point is awarded for every pair correctly matched and there is a total of six points.

2. Visual perception (code: visperc)

The child is shown a set of similar pictures with a model. The child is then asked to match the model with the identical picture of the set.

The aim is to measure the visual perception as earlier studies reported this as a significant quality possibly relating to language learning (for more, please refer to Vecchi et al 2001).

One point is awarded for each correct matching and there is a series of six sets, leading to a total of 6 points.

3. Phonetic discrimination (codes: phdisrep, phdisdis, phdisrec)

In the first part (phdisrep), the child is asked to repeat a specific set of five non-words and is awarded one point for each word identically produced. In the second part, the child is asked to state if two non-words sound exactly the same. One point is awarded for each correct answer and there is a total of five points. In the third part, the researcher pronounces a set of non-words and the child is asked to recall if he/she had heard any of these non-words during the previous two parts. The child is awarded one point for each correct recall and the total in this part is seven points.

The aim in this series of tests is to measure the ability to accurately repeat, distinguish and recall phonetic sounds as this is vital in language learning and more specifically vocabulary learning.

Overall score for this test is 17 points.

4. Spatial perception (code: spatper)

The child is given a set of 14 pictures that include seven identical picture pairs shown in different spatial positions. The child is asked to identify and show the picture pairs.

The aim here is to measure accuracy in spatial perception or destructiveness that might be caused because of the different spatial arrangement of the pictures.

One point is awarded for each correctly identified picture pair and there is a total of 7 points.

4. Reasoning ability (code: storyseq)

The child is shown four jumbled up pictures that include a boy performing different everyday activities. The child is asked to put the pictures in order to tell a story of the boy's day.

The aim here is to measure inductive learning ability with the aid of situational clues. The child is awarded one point for each picture correctly placed.

Overall score for all activities: 40 points. For more details, please go to Appendix 14.

8:2:4. Results

Before analysing the significance of the data and their relation to the aims of the experiment, it is important to view the workability and the performance of the tests. A profile of performance and the scores of each test of the individual subjects is offered in Appendix 15.

Table 8:1 presents the standard deviation and the mean of the tests. The minimum and maximum score is also shown in order to ascertain the range of scores that is accomplished. As seen in this table, apart from the spatial perception that shows poor mean and SD, the others seem to be quite satisfactory. The feeling here is that spatial perception test was quite easy. For the reasoning ability one, it makes sense that not much discrepancy has been achieved since there were only four elements to tested. It is obvious that in next attempts, more test items should be included if there are to show any fair indications. The associative memory and the phonetic discrimination tests seem to work well.

Test	Minimum	Maximum	Mean	SD
associative memory	0	6	3.28	1.73
Visual perception	0	6	4.57	1.30
Phonetic discrimination	5	17	10.74	2.73
spatial perception	0	7	6.39	1.24
reasoning ability	0	4	2.19	1.59
Overall	10	37	27.19	5.49

Table 8:1: mean and standard deviation of tests

Aim: *Will this study identify more or different cognitive skills or qualities that behave as pre-linguistic abilities? Which are these cognitive skills or qualities?*
This will be shown after the foreign language test has been administered.

Aim: *Can they be measured so as to offer a range of scores?*
It becomes obvious from Appendix 15 that there was a range of scores among the subjects which makes the whole idea of testing and exploring cognitive prerequisites a viable idea.

8:3. Part 2: Foreign language achievement test

8:3:1. Aims of foreign language achievement test

In order to see if there are some correlations of significance between more general capacities and talents like associative memory, phonetic discrimination, visuo-spatial perception, reasoning and language achievement (productive or receptive) a foreign language test is administered in a game form to suit the subjects' age. The aims and the question for the development of a foreign language performance test at the end of the academic year are obviously:

- Will the cognitive qualities tested in January 2004 correlate with subsequent success in FL progress test at the end of the academic year in order to suggest that they predict or imply language learning ability?

- Will this study identify more or different cognitive skills or qualities that behave as pre-linguistic abilities? Which are these cognitive skills or qualities?

8:3:2. Methodology

72 children are tested one-to-one in June 2004 in Greek public and private schools. To be more specific, there are 17 five year olds, 19 six year olds, 8 seven year olds, 15 eight year olds and 13 nine year olds. They are all Greek native speakers with no immediate English background and they are the same children (but less for reasons of quitting the course/absence) that were tested in January 2004. Their performance in the English language is tested again through two activities played on the CD-ROM. The first test is a listening activity of the items learned during their first year's exposure to English in order to test their receptive vocabulary. The second test is a naming activity to test their productive vocabulary. This time it is arranged by the researcher that the identical list of words would be tested in all schools to disable any discriminations in performance that could be dependent on the lexis' nature.

8:3:3. Description of foreign language achievement test

1. Listening activity (code: rec voc)

A slide of different randomly put objects is shown and the researcher pronounces the names of the objects at random. The child is asked to point to the right object name. The aim here is to test receptive vocabulary.

One point is credited for each word item correctly produced and there is a total score of 30 points.

2. Naming activity (code: prod voc)

A slide of other randomly put objects/ pictures of actions is shown and now the child is asked to name them in English. The aim is to test productive vocabulary. For reasons of time, it was not possible to devise anything but straightforward activities.

One point for each correct word is credited and there is a total score of 30 points.

Overall score for this test is 60 points. For more details, see Appendix 16.

8:3:4. Results and discussion

Appendix 17 presents the individual scores for each task to verify again the workability of the tests. Table 8:2 shows the mean scores and the standard deviations. It is clear as before that most of the test have satisfactory mean scores and standard deviations. Especially associative memory (pairass3), the phonetic discrimination tests and the receptive vocabulary test seem to have been efficient.

However, there are some weaker scores in the spatial perception, story sequence and productive vocabulary. Spatial perception has a mean score of 6.38 out of a total 7 and the standard deviation is 1.13 which means probably that the test was too easy so most of the children achieved around 5-6 in this test. The opposite is true or the productive vocabulary test where the mean score is 8.33 of a total 28 and a standard deviation of 6.59, which implies that subjects had particular difficulty in producing most of the words asked. The reasoning test comes as no surprise as previously discussed because the number of test items is very small (4).

Test	Minimum	Maximum	Mean	SD
Pairass3	0	6	3.27	1.73
Visperc	0	6	4.63	1.25
Phdisrep	1	5	3.83	0.96
Phdisdis	0	5	3.05	1.29
Phdisrec	0	7	3.88	1.57
Phdistot	5	17	10.77	2.90
Spatperc	0	7	6.38	1.13
Storyseq	0	4	2.22	1.57
Gatot	12	37	27.30	5.50
Recvoc	1	27	13.00	6.75
Prodvoc	0	28	8.33	6.59
Langtot	1	55	21.33	12.83
Overall	18	89	48.63	16.30

Table 8:2: mean and standard deviation of tests

Aim: *Will the cognitive qualities tested in January correlate with subsequent success in FL progress test at the end of the academic year in order to suggest that they predict language learning ability?*

Table 8:3 offers the correlations that emerged between general cognitive skills and foreign language achievement scores. There are remarkable correlations here and some of them are quite significant. All the tests except for the reasoning ability (story sequence) show correlations. The visual perception, the phonetic discrimination and the total aptitude score have given correlations of about 0.4 with the total language score. The aptitude total and the language total scores in particular have offered a correlation of about 0.5, which is remarkable. From the phonetic discrimination test the only one that seem not to be very important is the subtest of repetition of non-words.

However, there are comparatively strong correlations between the language scores in the phonetic discrimination between two non-words (0.467**, 0.383**, 0.443**), the recall of non-words (0.359**, 0.334**, 0.360**) and the total phonetic test score (0.442**, 0.393**, 0.434**). Very significant correlations emerged between visual perception and receptive vocabulary (0.379**), productive vocabulary (0.400**) and total language score (0.405**). Associative memory seems to correlate well with receptive vocabulary (0.339**) and total language ability (0.272*) but not with productive vocabulary. However, as previously discussed, the productive vocabulary proved to be quite difficult so no firm conclusions can be drawn on this matter.

	Pairasss3	visperc	phdisrep	phdisdis	phdisrec	Phdistot	Spatperc	Storyseq	apttot	recvoc	prodvoc	langtot
Pairass3	1.000	0.381**	0.087	0.224	0.032	0.146	0.223	0.250*	0.597**	0.339**	0.182	0.272*
Visperc		1.000	0.112	0.314**	0.250*	0.313**	0.287*	0.367**	0.678**	0.379**	0.400**	0.405**
Phdisrep			1.000	0.356**	0.229	0.616**	0.060	0.053	0.405**	0.117	0.124	0.125
Phdisdis				1.000	0.431**	0.799**	0.100	0.193	0.639**	0.467**	0.383**	0.443**
Phdisrec					1.000	0.810**	0.040	0.095	0.530**	0.359**	0.334**	0.360**
Phdistot						1.000	0.087	0.156	0.707**	0.442**	0.393**	0.434**
Spatperc							1.000	0.448**	0.516**	0.274*	0.175	0.234*
Storyseq								1.000	0.623**	0.160	0.153	0.163
Apttot									1.000	0.529**	0.436**	0.502**
Recvoc										1.000	0.849**	0.962**
Prodvoc											1.000	0.961**
Langtot												1.000

Scores with ** are significant to 0.01

Table 8:3: Correlations between cognitive skills and language achievement

Aim: *Will this study identify more or different cognitive skills or qualities that behave as pre-linguistic abilities? Which are these cognitive skills or qualities?*

If the correlations emerged are to be taken into consideration, this test successfully identified cognitive skills that seem to predict or even better imply language ability. These are phonetic discrimination ability, spatial and visual perception and associative memory.

This, in turn implies that learners with good ability to distinguish between sounds might have an advantage to those whose ear is not that 'sensitive'. Learners with fairly good visuo-spatial perceptions (ability to see differences, spot similarities and see things from a 'different angle') might also find word or language learning easier. Finally, associating things with schemas/designs and being able to recall this association proves to be a significant skill when learning a language.

All these make sense if somebody considers the process of language learning. It does require association skills and recall (associating or labelling a known word with the new word), while phonetic discrimination skills (with non-words for the shake of argument here) are essential for learning and getting used to pronunciation of new word items that have never been taught before. Lastly, visuo-spatial relations and perception can be important pre-linguistic skills in cases of languages that rely on case endings, derivatives and even spelling. Visuo-spatial activities are also regarded by educationalists significant in promoting and encouraging pre-reading skills.

Aim: Is there a ceiling effect or significant differences between very young and older learners when these cognitive skills are concerned?

The final aim in this experiment was to examine differences in performance on the cognitive skills between different age groups. The results presented here include tests taken place both in January and June 2004.

The age factor here concerns the changes, enhancements or aggravations that might emerge across childhood years. As some of these skills impact aptitude and foreign language learning, a pattern of cognitive development might indicate a model of foreign language learning for young learners. If this is the case, much useful information comes to light but this is comprehensively dealt in the Discussion Chapter.

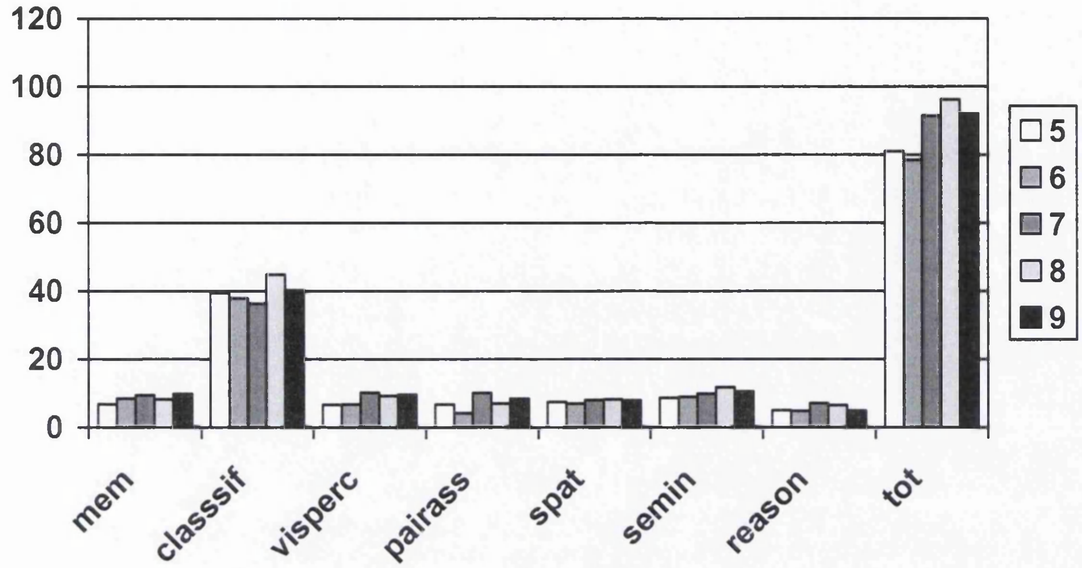

Chart 8:1: Cognitive skills across ages

	Memory	Classif	visperc	Pairassoc	spatial	Semin	reasoning	total
5	6.82	39.47	6.7	6.76	7.47	8.7	5.11	81.05
6	8.52	37.94	6.78	4.21	7	9	4.89	78.52
7	9.5	36.37	10.25	10.12	8.12	10	7.1	91.5
8	8.26	44.9	9.33	7	8.26	11.8	6.6	96.26
9	9.84	40.3	9.69	8.46	8	10.61	5	92.07

Table 8:4: Mean scores of cognitive skills across age

At a first glance the results show that cognitive skills improve with age. However, the scores indicate that there is considerable improvement in scores after age 7.

	5-6	5-8	6-7	6-8	6-9	7-8	8-9
Memory							
Associative memory	t=1.905 sig=.033						
Semantic integration					t=-1.949 sig=.022		
Visual perception			t=-2.384 sig=.001		t=-2.462 sig=.027		
Classification		t=-2.007 sig=.001		t=-2.893 sig=.013		t=-2.436 sig=.003	t=1.550 sig=.049
Reasoning ability							
Spatial ability							
Cognitive total		t=-2.758 sig=.012.	t=-1.677 sig=.031				

Table 8:5: T-Tests for cognitive skills

Starting with the memory tasks, there are no significant differences in short term memory. The only significant difference with associative memory is found between 5 and 6 year olds where the younger ones perform better. As seen in the table, t=1.905 and sig=.033. In the semantic integration task again there is only one significant difference between 6 and 9 year olds where older are better as t=-1.949 and sig=.022. In the analytic tasks, more significant differences are ensued. Especially in classification (which tests deductive abilities), there are significant differences between 5-8 year olds (t=-2.007 and sig=.001), 6-8 year olds (t=-2.893 and sig=.013), 7-8 year olds (t=-2.436 and sig=.003) and 8-9 year olds (t=1.550 and sig=.049) where 8 year olds appear to do significantly better compared to all ages.

Regarding visual perception, there are significant differences among 6-7 (t=-2.384 and sig=.001) and 6-9 year olds (t=-2.462 and sig=.027) as the older ones outperform the younger ones. There is no significant difference in the spatial ability tasks.

To take the big picture now, there are significant differences emerging among 6-7 year olds (t=-1.677 and sig=.031) and 5-8 year olds (t=-2.758 and sig=.012) when it comes to the total cognitive abilities cores. The significances indicate that on the whole at these ages, older do better. Although this is not striking for the 5-8 comparison, it is strange that significance difference emerge between 6 and 7 year olds. If a hypothesis here can be made, it would be that in Greece, formal literacy begins at schools at the age of seven which is the first year of the primary schools. This consequently verifies that the cognitive skills tested here are related to language learning. Youngers do not have any linguistic skills at their disposal thus affecting their language scores whereas older ones perform better both in cognitive skills and language achievement.

This having been said, the running of all the rest t-tests do not produce any significant differences for either ages 7-9 (which again verifies the above) or 5-9 and 5-7. The last insignificances are puzzling, but in reality no firm assumptions can be drawn before any formal standardisation of these tests.

Below the charts illustrate the performances across different ages in memory for a clearer picture. Seven year olds seem to have an advantage in memory tasks.

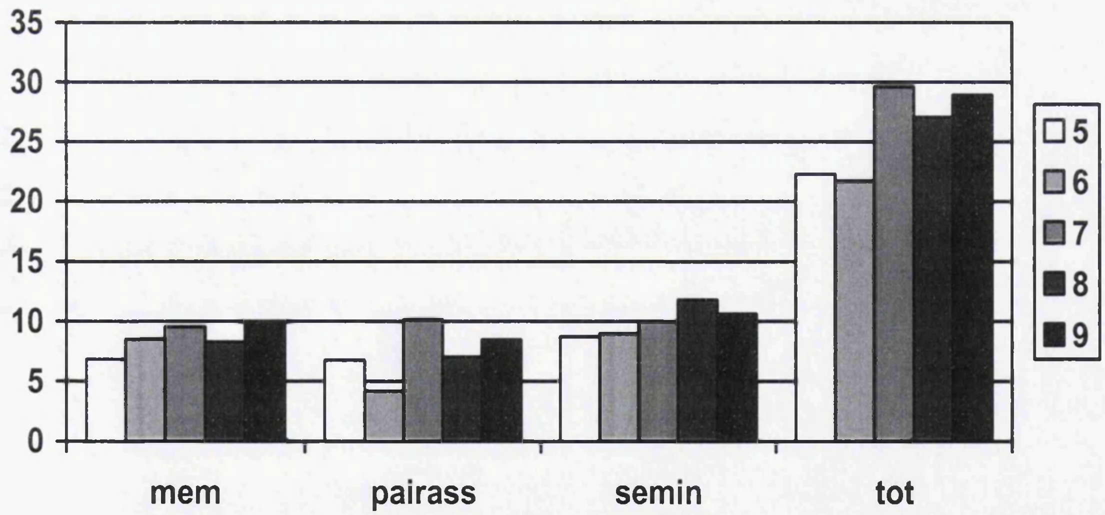

Chart 8:2: Memory tasks across age

Chart 8:3 shows the differences in analytic skills and there is a distinct advantage here for the eight year olds.

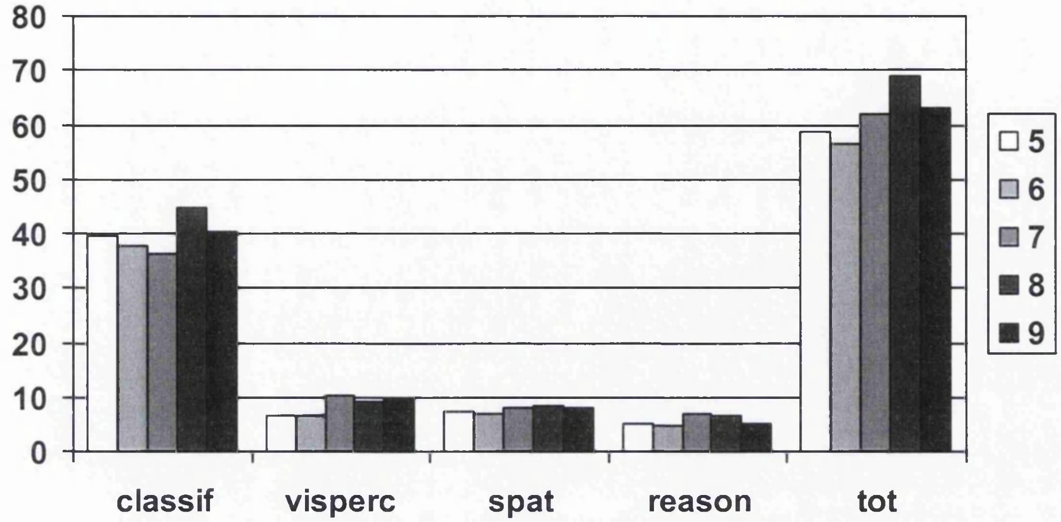

Chart 8:3: Analytic tasks across age

In the present study (January 2004) there was an initial attempt to test phonological skills. The test had three subtests, namely, phonological repetition of non-words, phonological discrimination between non-words and phonological recall of non-words. Interestingly enough and although the number of test items was small, significant correlations with language achievement (both productive and receptive vocabulary scores) of approximately 0.4 emerged with phonological discrimination and recall of non-words tasks. Where phonological skills are dealt (although this is a small scale study), seven year olds appear to enjoy an advantage as seen in Chart 4.

There seem to be no immediate significance in differences, but the numbers are too small to conclude more on this. In the language tests, seven year olds and nine year olds have obtained the highest scores.

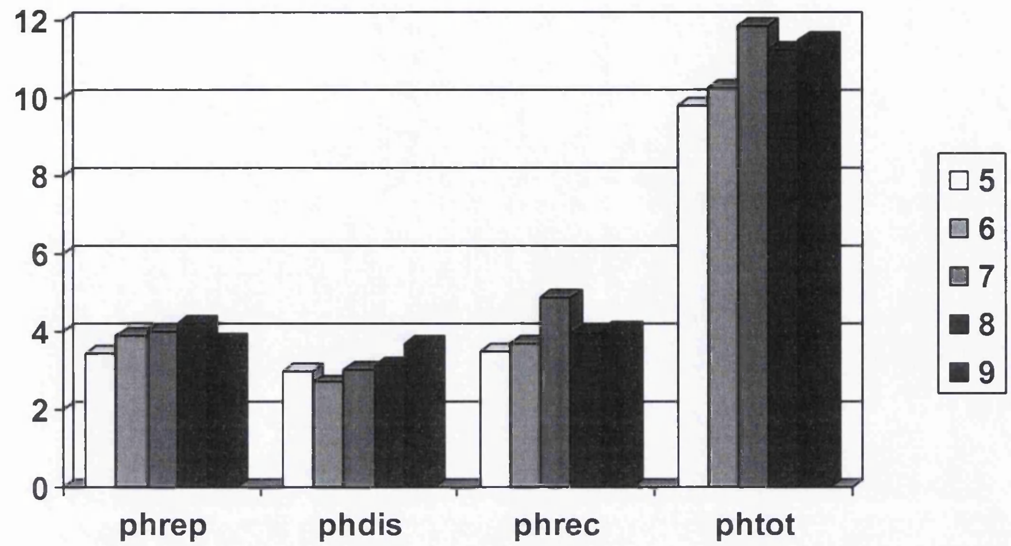

Chart 8:4: Phonetic tasks across age

	Phrepeat	phdiscrim	phrecall	Phtot
5	3.41	2.94	3.47	9.82
6	3.89	2.68	3.68	10.26
7	4	3	4.87	11.87
8	4.2	3.13	3.93	11.26
9	3.76	3.69	4.07	11.53

Table 8:6: Mean scores for phonetic task

For a more general overview Chart 8:5 presents the results in memory and analytic skills across age for comparison. It shows that older learners perform better than younger learners in the majority of tasks, which in turn means that cognitive skills do improve with age.

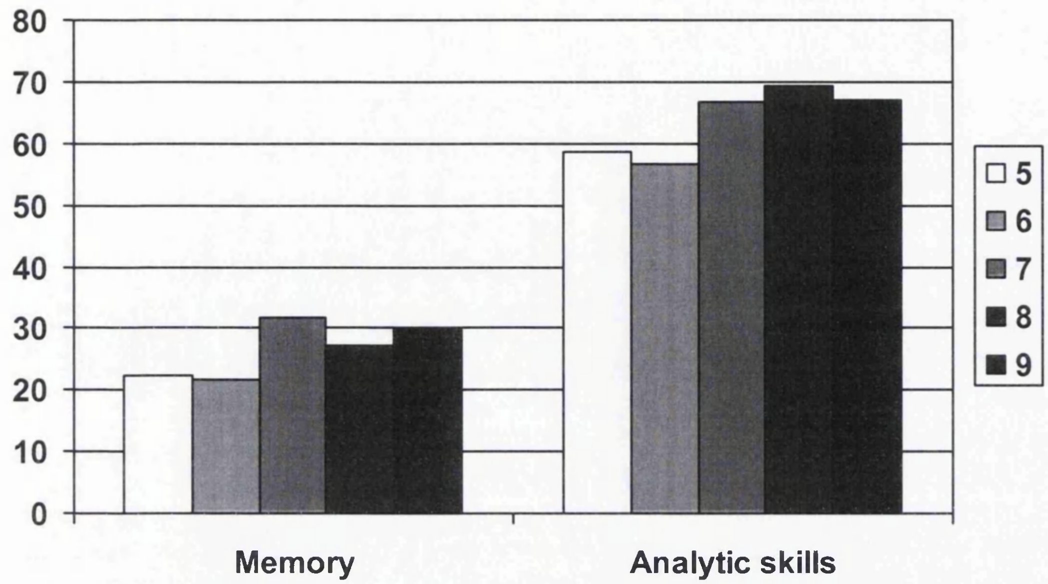

Chart 8:5: Memory and analytic skills across age

There are several implications emerging from this study. One is that we have tentatively identified a third component of aptitude in this age group. This is the phonetic component. It appears that the ability to discriminate between non-words and the ability to recall non-words influence the facility of language learning. This is not far from what Skehan has proposed (1992,1998) and it is relevant to Pimsleur's auditory component (1966). It is also quite self-evident why these abilities are important in foreign language learning. When it comes to pronunciation, reading, spelling, writing and listening, the ability to discriminate between words is of vital significance. It can also be argued that the ability to recall non-words can affect facility and effectiveness of foreign language vocabulary, hence influencing proficiency at all language aspects.

The second is the question: Are young learners better? Do they have a special aptitude? The present results suggest that cognitive skills related to language learning improve with age so aptitude should improve with age as well. This confirms observations by Munõz et al (2002) that older starters achieve better scores than younger starters. At this age the learners become, it can be argued, intellectually and academically better learners as they get older. Other factors may intrude here that means that young learners are less able to take advantage of this ability. One might be time or the affective filter.

If this is the case, what makes young learners so uniquely better in language learning? It is undeniable that children have a talent at remembering especially new words and they are renowned for their motivation at learning new things and acquiring better pronunciation. Therefore, it can be claimed that it is not aptitude itself in this age that determines children's performance and that if actually the 'window of opportunity' (Zafrana 1979;1992) for languages exists, continuous exposure in and out of the classroom and appropriate methodology might guarantee positive effects in second language learning (Munõz et al 2002) independently of aptitude at this stage.

Similarly, it can be hypothesised that the zone of proximal development and certain windows for language may exist until a later point in life. In this light, it is argued that aptitude develops or changes at the early stages but becomes fixed when the main cognitive skills have been reached with maturation.

This brings in light the question of plasticity, which is more of interest at this stage as it can enhance possibilities of success. It becomes apparent that it is very useful to know the child's aptitude and cognitive state as this will give useful indications of what and how to develop aptitude, if indeed aptitude at this stage is plastic. However, this needs further investigation and long-term studies before any firm conclusions or claims are drawn.

This might also explain why adults find it difficult to start learning a new language at age 30 and why younger learners are in the long-term better learners (Munõz et al 2002). In the first case, the affective filter hypothesis might be of greater importance and everyday routines and problems might aggravate the situation and do not aid concentration, hence limiting studying hours. It is also true that according to studies commented in the literature review, pronunciation will probably never be native-like Other external factors or even personality traits affect language learning in a later age and often negatively (inhibition, tolerance of ambiguity, attitude).

However, young learners around 7-8 years old are still children with no routine worries whereas their cognitive skills are considerably more developed than younger children. Therefore, they are certainly 'ready' to learn another language and they still have time for learning. Data of better performance in comparison to the younger ones provided above, confirm this hypothesis.

Very young learners might be very good at memory but memory alone is not as important at language learning achievement. Analytic skills are vitally important but the teaching methodology so far has taken advantage only from their memory abilities, perhaps doing them a disservice or even underestimating their abilities.

The point here is that although this is a quite complicated subject, I would suggest that very young learners are not always better than older learners. They do have the abilities to be very good and all the external factors at their side, however, if the input is discontinuous or the input is narrow-mindedly chosen, then the results will not be as impressive as hoped.

There are certain cognitive skills that influence and facilitate language learning. Since the need for a multi-languages world is evident, we should take these skills in great consideration when teaching and devising learning materials for less painstaking experiences and fruitful results that will save time and effort both for the teachers and for the young learners.

8:5. Conclusions

This study has identified a third important component, namely phonetic ability. Results show that phonetic abilities and visual perception produce significant correlations of 0.4. Spatial perception also seems to enjoy a modest correlation of approximately 0.3. The reasoning ability tested here for the first time does not show distinct relation to language learning scores but this might be due to the limited number of testing items, therefore will be revised. All in all, the cognitive test correlated strongly with the language test at 0.5 which is very satisfactory.

An important question in this study concerns the issue of age and growth. This time results from 5-9 year olds are gathered. On the whole, older learners seem to enjoy an advantage in cognitive abilities and it is also shown that these abilities improve over time. However, seven year olds appear to enjoy an advantage at memory and phonetic skills whereas nine year olds do better at analytic tasks. Seven and nine year olds obtained the highest scores but no firm claims can be made yet.

CHAPTER NINE

MULTIPLE REGRESSION ANALYSIS AND FINAL STUDY ON TYPES OF EXPLICIT MEMORY, VIUSAL/SPATIAL PERCEPTION AND REASONING ABILITIES

(JUNE 2004)

Preface

The last study seeks to verify and validate different cognitive skills or qualities that can be assumed as pre-linguistic abilities. Following that, an explicit identification of those cognitive qualities will be offered. This last study, however, mainly examines the question of the interrelation between the various elements which have been tentatively identified as components of aptitude in this study. A Regression and Factor Analysis will be applied to show how the various elements of aptitude appear to inter-relate with each other in predicting success in foreign language learning.

This chapter offers the background, the aims and the outcomes of the last study that took place in June 2004. This time a CD-ROM is created and piloted to offer realistic hands on experience of the proposed test. Some conclusions previously drawn have been taken into consideration in developing the electronic test and previous results form much of its contents.

9:1. Background

The process of the last three studies offered convincing account for the idea of testing cognitive abilities for the investigation of foreign language aptitude in young learners. Apart from the assumption that this is a more appropriate method of testing youngsters, it was found that success in language achievement and especially vocabulary learning was facilitated and strongly related to various memory, analytic and phonological skills. A workable and easily administered test in this area ought to be of use to both researchers and teachers alike. To date, the only aptitude test aimed at young learners is Carroll and Sapon's EMLAT (1967), but this is unsuitable for learners under the age of about 8 where, increasingly, foreign language now begins.

So far several cognitive skills appear to relate to language performance. While testing memory, short term memory seems to play a more important role than long term memory and associative and phonetic memory emerge as relating much more to language performance.

Phonological discrimination skills generate significant correlations with language ability as well. Discriminating sounds between non-words and recalling them in memory with cues seem to influence results in language performance. This ties well with Skehan's findings (1980,1982) where the capacity to remember material of unfamiliar phonemic structure and to be able to make meaningful analyses of material to be remembered appear to be distinct and important predictors of language learning success (Skehan 1989).

Analytic abilities are quite important even at an early stage of learning. Visuo-spatial abilities of recognizing parts or elements that have been added or taken away, spotting similarities and differences have developed strong correlations with language ability. This is particularly interesting because these skills formed an important predictor of language success according to Esser and Kossling's study. The semantic integration test (learning list of figures/shapes- recognition list) which was a direct attempt to replicate the same testing method that Esser and Kossling have used, offered significant correlations with language total score as well as with the individual receptive and productive vocabulary scores.

Finally, reception of vocabulary has been related to deductive rule acquisition as it correlated with the artificial language game (coloured tubes that represented a group, i.e red cube for animals), another replication of Esser and Kossling's former study.

However, we are assuming that these various tests fall into the separate categories of memory, analytic skill and sound discrimination. It has been noted in previous experiments that a perfect intercorrelation between subtests would be a concern and unexpected since this would indicate that two, or more, tests were testing the same factor. Nonetheless, weak intercorrelations might equally suggest that we are looking at a wide range of factors which are not necessarily connected. While these tests have been constructed with great thought and care, it is still uncertain whether, for example, the various tests which have been associated with memory really all relate to the same factor and are distinct in their performance from the tests we have associated with analytic skills. Previous researchers in this field have used factor analysis to help them identify tests which relate to the same factor. Skehan (1989) for example, was able to separate out memory skills and analytic skills in his learners. Applying this kind of analysis to the tests which predict foreign language learning success in young learners should allow us to see whether these elements can also be identified.

9:2. Aims and objectives

This last study attempts to test out the best performing cognitive elements that appear to have potent relation to foreign language learning success for a group of young EFL learners in Greece. The test is done in a CD-ROM form on laptop and pilots the skills that appear significant in language learning. The questions here are:

- Will this study verify and validate different cognitive skills or qualities that can be assumed as pre-linguistic abilities?
- Which are these cognitive skills or qualities?
- Can they be measured so as to offer a range of scores?
- Will they correlate later with subsequent success in foreign language achievement test in order to suggest that they predict/indicate language learning ability?
- How do the various elements of aptitude appear to inter-relate with each other in predicting success in foreign language learning?
- How much of the variance in learner performance can we explain?

The main aim is understandably to see how well the completed test predicts. If satisfactory correlations emerge, this will be very positive and good correlations will lead to the next question. The question will be how much of the variation in learner performance can be explained. If less than 40% can be sufficiently explained, the test might be problematic. However, if more than half of the variation is adequately explained this will validate the predictiveness of the test. After all these, a reliability measure will be applied to see whether the test can be regarded as reliable which will conclude the testing procedure.

Seven game-like activities are devised in order to test children's dexterities while two others test foreign language achievement. The activities designed here include different levels of difficulty going from easy to more difficult tests of the same qualities.

9:3. Methodology and design

72 children are tested one-to-one in June 2004 in Greek public and private schools. To be more specific, there are 17 five year olds, 19 six year olds, 8 seven year olds, 15 eight year olds and 13 nine year olds. They are all Greek native speakers with no immediate English background and they are the same children (but less for reasons of quitting the course/absence) that were tested in January 2004.

Below the activities are described in order to give an idea of the experimental procedure:

- Rote memory is tested via Kim's game.
- Deductive learning ability is tested through a classification/artificial language game.
- Visual perception is tested by spot-the-differences games.
- Associative memory is tested with paired-associates pictorial games.
- Spatial perception is tested through jigsaw games.
- Semantic integration is tested through a series of learning list of schemas/recognition list of schemas games.
- Reasoning/inductive ability is tested through story sequencing games.

All the above except for the reasoning ability are decided to be used and piloted as they have yielded correlations with language ability in former experiences. Reasoning sequence ability was tested unsuccessfully, however, it was felt that a fair retrial was in order. This is because the previous game proved to have been improperly or weakly devised (only 4 test items) so it was impossible to yield any correlations or conclusions respectively. All these tests on the CD-ROM are designed so as to become progressively more difficult to strain out the learners' abilities. Hence, there are two or three series for each test and consequently the number of testing items is bigger to allow more valid outcomes and different expectations.

Their performance in the English language is tested again through two activities played on the CD-ROM. The first test is a listening activity of the items learned during their first year's exposure to English in order to test their receptive vocabulary. The second test is a naming activity to test their productive vocabulary. This time it is arranged by the researcher that the same list of words would be tested in all schools to disable any discriminations in performance that could be dependent on the lexis' nature. The test type is a naming activity of the items learned during their first year's exposure to English in order to test their productive vocabulary and a listening activity to test receptive vocabulary. The experiment lasts about 18-20 minutes for each child tested. A detailed description of each activity is now followed.

9:4. General cognitive aptitude test

1. Rote memory (code: mem)

In the first round of this test, 8 unrelated objects are shown to the child for 30 seconds. After that, the slide disappears and the child is asked to recall as many objects as possible. Then a slide of 12 objects (all different from the first) is shown and the exact same procedure is followed.

The aim of the activity is to test short term rote memory.

One point is given for every correctly recalled object. The total score is 20 points. For more details see Appendix 18, CD ROM, test 1.

2. Deductive/classification ability (code: classif)

This test is presented as a game. There are colours that represent particular group. At the beginning, it is explained to the child that it is important to remember that red represents all animals while blue represents all flowers. So the researcher says: 'Remember: All animals are red and all flowers are blue'. When the game is sufficiently explained, picture cards on the screen appear and the child has to drag the object (rose, tiger, etc) to the appropriate colour. The test gets progressively more difficult as more colours and groups are demonstrated (i.e. yellow for food, green for drinks, purple for clothes, orange for means of transport).

This is an artificial language game, very similar to Esser and Kossling's one and exact replication of deductive reasoning games administered by several pedagogues to test this reasoning ability.

One point is awarded for each object correctly dragged to each colour and there is a total score of 48 points. For more, please see Appendix 18, CD-ROM, test 2.

3. Visual perception (code:diffs)

The child is shown two seemingly identical pictures on the screen. Then the child is asked to observe them closely and identify the differences. There are 6 differences some more obvious than others. There is a second slide with two different pictures and 12 differences.

The aim is to test visual perception, thus analytic skills. Various perception areas are included in the differences hidden, such as colours, numbers, objects, etc.

One point for each spotted difference is awarded and there is a total score of 18 points. For more, please see Appendix 18, CD-ROM, test 3.

4. Associative memory (code:pairassf)

The child is shown six different picture cards and a set of six various shape like figures on a slide. Each picture is matched to only one figure and the child is asked to look at the pairs carefully in order to be able to recall them. Then, the set of figures is given to the child while the pictures are disordered. The child is asked to match each picture with the correct figure previously shown. Then a slide of 8 pictures with their matches appears on screen following exactly the same procedure.

The aim here is to measure the capacity to retain sign pairs as conclusions about the capacity to retain foreign language vocabulary can be drawn according to Esser and Kossling (1986:96).

One point is awarded for every pair correctly matched and there is a total of 14 points. For more details, please see Appendix 18, CD-Rom, test 4.

5. Spatial perception (code: jigsawf)

A jigsaw picture with three pieces missing is shown to the child on the screen. The three pieces are left out from the puzzle but are shown dismantled on different corners of the card. The child is now asked to observe it closely and identify which pieces fit to each void left in order to finish the jigsaw. There are two more series of this sort with 3 pieces missing again (and fairly more difficult pictures) but on the second jigsaw there is one distractor piece that should not be used and in the third two distractors.

The aim is to test sensitivity to image perception and spatial ability.

One point for each correct fitting is awarded while there is a total of 9 points for this task. For more details, check Appendix 18, CD-ROM, test 5.

6. Semantic integration game (code: seminf)

A learning list of four shapes is presented to the child (square, hexagon, diamond, X) on the screen. The child is asked to look at it carefully and name the shapes. After that, the screen shows recognition list of six shapes (triangle, parallelogram, X, circle, hexagon, and star). Then, the child is asked to recognise the shapes existing as well in the learning list, then recognise the new shapes in this list (triangle, star, circle, parallelogram) and recall the shapes which are omitted from the learning list (square, diamond). There is another set of learning list with six shapes and recognition list with eight shapes.

The aim here is to measure recoding ability which serves to increase storage capacity (Esser and Kossling 1986:97).

One point for each correct shape recognised or recalled is awarded and there is a total score of 18 points. For more details, please see Appendix 18, CD-ROM, test 6.

7. Reasoning ability (code: storysf)

The child is shown four jumbled up pictures on the screen. The child is asked to put the pictures in order to tell a story (that makes sense). After that, there is again another series of six pictures in a different story and the same procedure is followed.

The aim here is to measure reasoning ability (and more particularly inductive ability) with the aid of situational clues.

The child is awarded one mark for each picture correctly placed and there is a total of 10 points. For more information, please see Appendix 18, CD-ROM, test 7.

Overall score for all activities: 137 points.

9:5. Description of foreign language achievement test

1. Listening activity (code: rec voc)

A slide of different randomly put objects is shown and the researcher pronounces the names of the objects at random. The child is asked to point to the right object name. The aim here is to test receptive vocabulary.

One point is credited for each word item correctly produced and there is a total score of 30 points.

2. Naming activity (code: prod voc)

A slide of other randomly put objects/ pictures of actions is shown and now the child is asked to name them in English. The aim is to test productive vocabulary. For reasons of time, it was not possible to devise anything but straightforward activities.

One point for each correct word is credited and there is a total score of 30 points.

Overall score for this test is 60 points. For more details, see Appendix 16.

9:6. Results and discussion

Aim: *Can the abilities tested offer a range of scores?*

Different scores are awarded for the individuals in different tasks as can be seen in Appendix 19. This consequently verifies a range of scores which is desired again in the third aim. There are children who achieved better scores in some tasks than in others and no-one has the same range of scores with the others in all tests.

As can also be seen in Table 9:1, most of the tests allow a strain among the scores that children have achieved. The memory has at last a fair amount of distribution as the mean score is 8.41 and a standard deviation of 3. Classification however, has probably been too easy (quite surprisingly) although there is some room for guessing in this test. Differences game has a mean score of 8.20 and a standard deviation of approximately 4 so it seems to be working fine. The test of associative memory is quite good as well with a mean score of 6.83 and a standard deviation of 4.27. The jigsaw puzzles on the other hand, might have been quite easy where in the semantic integration there is a fairly good distribution bearing in mind, there can be some guessing there as well. The story sequence seems to have worked fine this time developing a mean score of 5.58 out of 10 and a standard deviation of 3.10 which is quite good.

Table 1 shows the standard deviation and the mean of the tasks.

Test	Minimum	Maximum	Mean	SD
Memory	0	15	8.41	3.00
Classify	11	48	40.02	9.23
Differs	0	17	8.20	3.94
Pairassf	0	14	6.83	4.27
Jigsawf	0	9	7.68	1.75
Seminf	4	17	9.91	2.52
Storysef	0	10	5.58	3.10
Gatot	32	118	86.70	18.95
Recvoc	1	27	13.00	6.75
Prodvoc	0	28	8.33	6.59
Langtot	1	55	21.33	12.83
Overall	49	171	108.04	29.07

Table 9:1: mean and standard deviation of tests

While the language total scores and the receptive vocabulary test seem also to have worked quite well, the productive vocabulary test appears to present some weakness with a mean score of 8.3 out of 28 and a standard deviation of 6.5. Generally, the impression while administering the language test was that producing words was a lot harder than recognising them.

Aim: *Will these results correlate with other scores in foreign language development in order to suggest that they predict/indicate language learning ability?*

Correlations between the tasks are presented in Table 2 below.

The final aim concerned the possibility of correlations emerging from the results with other scores in foreign language development in order to predict language learning ability. As can be seen from Table 9:2, there are significant correlations. The correlations are about 0.4 and 0.5.

	Memory	classif	Differs	Pairassf	Jigsawf	Seminf	Storysf	Apttot	recvoc	prodvoc	langtot
Memory	1.000	0.246*	0.257*	0.190	0.068	0.133	0.162	0.426**	0.330**	0.381**	0.370**
Classif		1.000	0.445**	0.427**	0.455**	0.147	0.393**	0.841**	0.397**	0.351**	0.389**
Differs			1.000	0.534**	0.401**	0.301*	0.456**	0.737**	0.557**	0.557**	0.579**
Pairassf				1.000	0.405**	0.151	0.502**	0.713**	0.530**	0.524**	0.548**
Jigsawf					1.000	0.057	0.272**	0.553**	0.435**	0.368**	0.418**
Seminf						1.000	0.334**	0.383**	0.413**	0.386**	0.416**
storysf							1.000	0.656**	0.447**	0.427**	0.455**
Apttot								1.000	0.649**	0.621**	0.660**
Recvoc									1.000	0.849**	0.962**
Prodvoc										1.000	0.961**
Langtot											1.000

Scores with ** are significant to 0.01

Table 9:2: Correlations between cognitive activities and language achievement

Significant correlations are yielded between all the cognitive abilities tested and the language scores. Associative memory and visual perception (differences game) in particular correlate strongly with language performance at 0.548** and 0.579** respectively. Rote memory (Kim's game) and spatial ability (jigsaw) correlate with language total scores at 0.370** and 0.418**. Deductive reasoning tested through the classification game gives a good correlation of 0.397** with receptive vocabulary, 0.351** with productive vocabulary and 0.389** with the total language score. The reasoning ability tested through story sequencing activities correlates strongly with receptive vocabulary at 0.447**, with productive vocabulary at 0.427** and with total language score at 0.455**. It is obvious that the whole test of general cognitive abilities is very successful as its total score correlates impressively strong with the total language score at 0.660**. These findings are remarkable and give higher correlations than those obtained by Carroll and Sapon (about 0.4) over a similar learning period.

Aim: *Will this study verify and validate different cognitive skills or qualities that can be assumed as pre-linguistic abilities? Which are these cognitive skills or qualities?*
It seems plausible to suppose that indeed, the cognitive skills selected as predictors of language ability from past experiments and tested here verify and validate the fact that they might be assumed as pre-linguistic abilities or promising qualities for language achievement. These cognitive skills include memory types and analytic skills.

First, associative memory has proved from previous attempts to form a good predictor of language achievement and here this is verified. Rote memory has been harder to be validated as a predictor for several practical reasons already discussed. However, it becomes clear now that this quality plays a role in learning a language. It is self-evident that memory and particular types of it, are indispensable for language learning, much as it is for everything that needs to be learned or remembered. It has been taken for granted, therefore, that it plays the most important role while learning and especially at a young age, many teachers are eager to play memory games with their pupils with the hope to train them better.

However, it is obvious from the studies performed before and the study now, that analytic skills are equally if not even more important in language learning. Inductive reasoning, reasoning ability (or else problem solving) and visuo-spatial abilities are evidently very significant abilities when learning a language. They are serious factors affecting language performance in this case, therefore implying a potent dynamic role in forming language acquisition. In addition, testing young learners in that kind of cognitive skills has an interest on its own as it is worthwhile studying:

> ...whether operatively immature children can master tasks that require perceiving distinctions between vertical and non-vertical stimuli, as in discrimination learning tasks, oddity problems, match-to-sample tasks, or same-different judgements (Liben 1981:364).

Finally, phonetic discrimination ability although for practical reasons and reasons of time limitations it has not been possible to test, has proved to play a major role in language performance and ability.

Aims: *How do the various elements of aptitude appear to inter-relate with each other in predicting success in foreign language learning? How much of the variances can we explain?*

Factor analysis is applied. There are a number of tests here, some testing presumably similar qualities and others tests testing different qualities. Factor analysis looks are the correlations between these things and works out which tests appear to be so closely connected (presumably by correlation of scores) that they are really a single thing - the thing being called a component. And then works out how much of the variation in scores (in this case the variation in language learning scores) can be explained by these components.

Communalities

	Initial	Extraction
MEMORY	1.000	.269
CLASSIFI	1.000	.573
DIFFEREN	1.000	.624
PAIRASSF	1.000	.606
JIGSAWF	1.000	.661
SEMINF	1.000	.699
STORYSEF	1.000	.558

Table 9:3: Extraction Method: Principal Component Analysis. Communalities

This table shows that everything except rote memory seems to be predicting quite well. Memory either is not structured enough or there is insufficient variation over a year's learning in order for it to predict as well. There is also another possibility which will be discussed later and concerns the possibility that memory tasks may be related to analytic ability.

The Principle Component Analysis has identified 2 components which are regarded by the programme as reliable and separate. The results are shown in Tables 9:4 and 9:5.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.935	41.922	41.922	2.935	41.922	41.922
2	1.055	15.068	56.990	1.055	15.068	56.990
3	.915	13.078	70.068			
4	.664	9.486	79.554			
5	.553	7.900	87.454			
6	.469	6.693	94.148			
7	.410	5.852	100.000			

Table 9:4: Extraction Method: Principal Component Analysis. Total Variance Explained.

Component Matrix(a)

	Component	
	1	2
MEMORY	.381	.351
CLASSIFI	.721	-.230
DIFFEREN	.788	.049
PAIRASSF	.762	-.157
JIGSAWF	.619	-.527
SEMINF	.406	.731
STORYSEF	.720	.199

Table 9:5:Extraction Method: Principal Component Analysis. Component Matrix.

Component 1 appears to comprise the following tasks:

- Classification
- Differences
- Paired Associates
- Jigsaw
- Story Sequence

These tasks which make Component 1 explain 41.922% of the variation in language scores.

Component 2 has only the task of semantic integration in it and contributes a further 15.068% of variation.

A closer look at the component matrix reveals that the elements from Component 1 are not, or are even negatively, associated with Component 2 which, in turn, suggests that these are relatively unconnected components.

The success here is that Components 1 and 2 together explain more than 56% of variation in language scores which is very good, surprisingly good especially considering the age of the target group. It is, superficially at least, very reassuring, since the tests were intended to be focussed on two components of aptitude, memory and analytic ability, to find that two components have actually been identified.

A scree analysis for the Components found is shown in Diagram 9:1:

Diagram 9:1: Scree Plot

The diagram shows that only Components 1 and 2 are above 1 in Eigenvalue and therefore are taken to be reliable (or big) enough to count as separate components. The existence of the two factors identified can, therefore, be taken as a statistically reliable conclusion.

An ANOVA confirms that the predictors, the two components and some of the elements which make them up are significant statistically. The figures for the ANOVA are given in Table 9:6:

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6426.900	7	918.129	11.160	.000(a)
	Residual	5265.100	64	82.267		
	Total	11692.000	71			

a Predictors: (Constant), STORYSEF, MEMORY, JIGSAWF, SEMINF, CLASSIFI, PAIRASSF, DIFFEREN

b Dependent Variable: LANGTOT

Table 9:6: ANOVA

The details of the analysis for individual elements are shown in Table 9:7 below.

Coefficients(a)

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
1	(Constant)	-21.323	7.257		-2.938	.005
	MEMORY	.913	.378	.214	2.415	.019
	CLASSIFI	-.022	.145	-.016	-.154	.878
	DIFFEREN	.698	.360	.215	1.938	.057
	PAIRASSF	.754	.329	.251	2.292	.025
	JIGSAWF	1.390	.727	.190	1.912	.060
	SEMINF	1.291	.464	.254	2.784	.007
	STORYSEF	.270	.435	.065	.621	.537

a Dependent Variable: LANGTOT

Table 9:7: Analysis for individual elements

The semantic integration test in particular, is significant at the .01 level of statistical significance and the memory and paired associates test significant at .05.

By now, two components are separated out and consist of some of the testing tasks trialled. Component 2, namely the semantic integration task, appears to be genuinely a memory component while Component 1 consists of tasks that are mostly regarded as analytic tasks. The Paired Associates task, however, which is partly at least an associative memory task is anomalous as it appears to be included in Component 1 which is the analytic task. There may be an explanation for this, in that analytic abilities may be an aid to memory in small and simple memory tasks. The ability to rationalise beyond simple things is needed in this task and this is probably why an analytic mind is an advantage. Although there are two elements clearly identified here, it is not certain whether these are always entirely separate entities.

The statistical analysis also confirms that the tests are not merely valid predictors but are also statistically reliable. A score of 7 usually indicates that the test is reliable although 6 is often accepted.

Taking just the 5 elements which make up Component 1 (analytic tasks):

```
Reliability Coefficients

N of Cases = 72.0    N of Items =  5     Alpha =    .6866
```

Adding in the element from Component 2 (memory task):

```
Reliability Coefficients

N of Cases = 72.0    No of Items =  6     Alpha =    .6829
```

And throwing in memory for good measure:

```
Reliability Coefficients

N of Cases = 72.0    No of Items =  7           Alpha =    .6897
```

In each case the Alpha co-efficient is approximately 7.

In this last study, the main aim was to produce a test that would predict successful language learning. For this reason, a computerised version of the best performing aptitude testing qualities was devised and trialled. It now seems to be performing particularly well. A correlation of 0.66 compares very favourably to Carroll and Sapon, Pimsleur and most others' work. It is intriguing and surprising at the same time, especially since this is a first attempt to test very young learners.

There are factors here, however, that count quite differently than with other age groups. Several factors which would normally interfere with learning are absent here. Young learners are not afraid of learning a language and they are not put off by not understanding everything. They can engage in repetition in a way adults find boring. So the things which might stop real ability for languages (i.e. aptitude) shining through are not present. This might explain partly the reason we get such good results.

It seems likely also to suggest that there might be a critical period where the brain is more acceptant and flexible at the younger age (Lenneberg 1967). Since, the affective filter is low-if not absent-(Krashen 1981), young learners appear to be like 'sponges' (Munõz et al 2002). However, other factors (time, exposure, continuous input, etc) might be the 'keys' to 'unlock' and cultivate certain skills. This lies well with the study's findings since young learners appear to be very good even at complicated tasks and there are some qualities that seem to influence their learning. It can be claimed, therefore, that the way of teaching is to use methodologies (or type of exposure) that relate to those qualities.

The statistical analysis bears out what was hoped for. There are two components here, one of them is analytic and one is memory. The fact that one memory task falls into the analytic component need not be a major obstacle. To illustrate this, I will quote an example. When trialling the paired associates test with a group of adults, Prof. Paul Meara was able to memorise most of them. When asked how he managed that, he explained that he had created his own little analytic framework as an aid to memory. The square with a dot in it, which was paired with the umbrella, became a window with a raindrop on it so there was a link to the umbrella. A reasonable memory task becomes a very easy analytic one if carried out this way.

Otherwise the test predicts 56% of variance which means that there is a good explanation for more than half of the variation in language performance scores. That lends the test strong construct validity. The test also appears to be acceptably reliable with Alpha scores on around 7.

Two main components are included in this cognitive approach of aptitude for young learners. The first is the analytic component and the second, the memory one. The analytic component includes several skills that have been extensively discussed in the Literature review chapters.

One of the analytic abilities that seems to contribute to language learning and, therefore, impact on aptitude involves a classification activity which entails a deductive learning ability. It also includes a word association skill, which has been previously identified as a pre-reading skill (Vale and Freunteen 1995:4). Conceptual knowledge is supposed to be developmental. Hence, 'the ways in which stimuli are grouped, ordered and differentiated reveal systematic age-related change' (Inhelder, Piaget, Vygotsky 1962 in Rosser 1994:16).

The success in achieving very good scores at this type of activity, contradicts several notions that children at that time are merely preoperational and preconceptual. Grouping and categorising abilities are indeed important in second language learning especially when it comes to parts of speech and grammar inferencing rules as well as thematic concepts of words. What is more, as Cameron mentions categorisation is important 'with even quite young learners, as has been demonstrated by work on learner training (Ellis 1991) and on young children's metalinguistic abilities'(Cameron 1993:13).

A second analytic task that contributes to the first component of aptitude is the differences task. The differences activity is regarded as a visual perception ability as perception refers to the receiving of sensory inputs, while cognition refers to mental processes. Perceiving involves recognizing a stimulus as in differences between two pictures. Recognition of something as familiar requires making use of memory (a cognitive process) that is not required at this time. Their ability to do well at this task once again contradicts popular notions that young children resort to a holistic sorting strategy comparing objects as whole, inseparable units for overall similarity. The interpretation is that there is an age-related developmental shift in the basis for classification (Rosser 1994:127) might not be correct as children appear able to cope with the whole picture as well as with certain parts of it. This task might contribute to language learning and especially spelling, writing and reading processes.

An interesting analytic task included in the analytic component is the jigsaws, a spatial ability test. Carroll himself was right when stating that this ability although seemingly remote to language process is among others promising testing quality for aptitude. He regards spatial ability as 'the ability to perceive and mentally operate on visually presented spatial configurations' (Carroll 1979:19).
Carroll also argued that:

> ...the tests of these factors contain verbal material but these factors are independent of the two or three factors that could properly be identified as types of language abilities, that is, abilities reflecting differential acquisition of language, or differential facility in language use (Carroll 1979:19).

A spatial ability might well be involved with composition writing and reading skills in second language learning.

The story sequence task is a test of logical reasoning. It is obviously analytic and requires maturation both perceptual and conceptual. It is rather an inductive reasoning ability as there is no immediate rule but the child has to imagine (infer) rules to create the story and see the 'whole picture' from the parts. It is rather surprising bearing all that was mentioned before the fact that children were able to perform the task mostly successfully and that this sort of analysis facilitates language learning. This type of activity would probably help writing compositions (structures, etc) and listening exercises as well. Therefore, there is now ample support for the idea that children might not be merely-oriented and that second language learning involves more analytic processes than previously thought.

Paired associative memory (the ability to learn and remember a series of arbitrary associations) and recognition memory (Carroll 1979:19) is regarded according to statistics as an analytic task. Humes-Bartlo's (1989:48) conclusion that 'children with good verbal associative memory were expected to find language learning easier, while a good rote memory may or may not be helpful' might well be the answer. A good verbal associative memory includes certain rationalisation or requires several memorising techniques, which in turn need a degree of analysis.

Pimsleur's idea is that aptitude entails three main components, verbal intelligence by which is meant both familiarity with the words and the ability to reason analytically about verbal materials is not far from what is supported here. So children seem to be using more than just 'memory' when learning something new.

Associative memory is undeniably vital to second language learning, as the ability to retain labelling of one word with another in the second language aids vocabulary acquisition. Current models of the mental lexicon would support the idea that the learning of, for example, words, is not unconnected from memory for images. Concrete words, which are imaginable, are renowned for being easier to learn than abstract and non-imaginable words (Gairns and Redman 1986:92). As previously commented, there are lexical learning techniques, such as the Hookword and Linkword systems, which try to take advantage of links between visual memory and word retention (Gruneburg 1995).

Component 2 has only the task of semantic integration and it is the only memory component that seems to influence language learning so far. It has been mentioned before that memory is broadly divided in three major stages: encoding (i.e. process of information for retention), storage (retention of information in memory) and recall/retrieval, namely immediate and active retrieval of information stored (Glassman 2001:159).

A similar form of recall memory is required at this task, the one that Carroll claims as 'recognition memory (the ability to recognise which of a series of stimuli have been previously presented)' (Carroll 1979:19).

Visual memory refers to the ability to store and hold visual images or visual material (pictures, shapes, images) while Visuo-spatial working memory (VSWM) is identified as 'the system involved in short-term retention and processing of visuo-spatial material' (Vecchi et al 2001:29). Carroll (1990:24) states that factors of special ability might be useful in prediction of aptitude even if they are not immediately regarded as relevant in learning languages. This task of semantic integration requires mature categorisation which relies on three main components of knowledge earlier discussed; intention and extension of class, which implies the knowledge that 'a membership in one class precludes simultaneous membership in a mutually exclusive class' (Rosser 1994:123), therefore, an object can not be both circle and diamond. There is thirdly, the knowledge that groups can be arranged into class hierarchies, therefore certain deductions are permitted. However, it is mainly a memory oriented task which might be related to vocabulary and grammatical aspects (for example sensitivity to case-endings or tense forms).

Vygotsky has stated that each person is born with a set of elemental cognitive functions such as the ability to attend, perceive and remember (Hergenhahn 1982). It is true then that certain cognitive abilities facilitating second language learning-if cultivated and promoted- might serve as vital language learning devices.

Furthermore, the behaviouristic theory suggests that people learn by building up associations between their experience, thinking and behaviour and the more positive the experience, the more likely learning will take place (Andrews et al 2000). Consequently, appropriate methodology and continuous input are indispensable at all ages and especially at the very beginning of learning.

However, as Rosser comments (1994:126), the younger children perform in a remarkably different fashion, notable for its deficiencies, idiosyncrasies, and the absence of explicit formulations. Therefore, no generalisations can be made, all efforts are directed to enhance or facilitate second language learning, and are only indicative of possible performance bearing in mind the uniqueness of each child.

9:7. Conclusion

The last was an attempt to validate the relation between certain cognitive abilities and language learning. All the cognitive abilities that were tested yielded a strong correlation with language learning at about 0.4 while the total cognitive score correlated at a remarkable 0.66 with the total language score. Two separate components emerged that combined have succeeded in explaining 56% of the variation.

The first component is the analytic and includes reasoning abilities (inductive and inductive), spatial ability, visual perception and associative memory. The second component is the memory one which includes the semantic integration task. The finding of the existence of these components need not imply that that are completely irrelevant as there are cases in which they may overlap. This study is very successful as it validates certain cognitive skills as predictors of language learning aptitude but also proves to be statistically reliable (Alpha scores at 7).

A fruitful discussion and several implications emerge from all these findings that are comprehensively dealt in the next chapter.

CHAPTER TEN

DISCUSSION OF FINDINGS

All the findings from the last series of tests are thoroughly analysed in this chapter. First, the aims and the objectives that drove this research are discussed along with the answers that have now come to light. Some reflection and comparison from the literature and previous studies also take place. Then, initial assumptions about aptitude and young learners are reconsidered. Following that, the cognitive skills that seem to have an effect in foreign language achievement are comprehensively discussed. Then, results concerning the age and gender factor in cognitive development are provided. Lastly, the implications and some suggestions for further research emerging from this study are considered.

10:1. Overview

10.1.1. Aims and objectives revisited

- *Is aptitude a quality that can be tested in young learners?*

The impetus for research in this area stemmed from the fact that, at least to my knowledge, there has been no other attempt to test aptitude in young learners. Whereas the general consensus is that young learners are fast learners, there is neither a model of language learning at this age nor a model of language learning aptitude. This is surprising as teaching foreign languages to young learners is more a need today than a fashion. And if linguists are genuinely interested in discovering the nature of aptitude, attempts to test this ability in young learners are now more than ever in order (Sparks and Ganschow 2001).

The main problem faced at the very beginning is the difficulty or the inability of devising a test that is linguistically appropriate for young learners. Young learners have very limited capacities in handling sophisticated language even in their native language. Since they have not yet mastered reading or writing in L1 there is no way of testing it in a foreign language. This severely limits the possibility of testing aptitude in the traditional, linguistic manner. However, one could argue that the true nature of aptitude is captured before actual learning takes place and that gives this study an advantage.

Looking back at attempts of aptitude testing, EMLAT is a linguistically oriented test, addressed to young learners (not quite as young as the subjects of this study) and although MLAT had a major success, it seems that EMLAT has been scarcely used. One of the reasons for that might be Carroll's concern that the test neglects to include any cognitive skills that may impact heavily at this stage. However, children even that young are performing significantly better than what is expected from them at this stage. For this reason:

> Rather than speaking of stages, it makes more sense to speak of waves, in that waves can be visualised as moving in and out, generally moving in one direction, but receding, then moving forward again (Olsen Edwards 1994 in McLaughlin et al 1995:3).

If aptitude is tested in a more cognitively oriented fashion, Esser and Kossling were ahead of their time when they proposed after their study that aptitude should be viewed as a set of cognitive skills that influence acquisition rather than a strictly linguistic ability. Esser and Kossling's study (1986) was replicated in this thesis as it proved to be more appropriate for young learners. The cognitive approach was also largely affected by Skehan's perceptions on the three-component view of aptitude, namely memory, analytic and phonetic abilities. After the tests of general cognitive abilities, English language performance tests were also done so as to discover any potent relationship between certain cognitive skills and language performance.

The results obtained led credence to the idea that foreign language ability is related to cognitive skills and therefore, testing aptitude in young learners is achieved. Almost from the beginning, correlations of 0.4 similar to those obtained by Carroll and Pimsleur were obtained. In the last two studies, the tests appear to predict surprisingly well compared to equivalent tests for adults with correlations reaching 0.6.

- *Can general cognitive factors predict or indicate language achievement?*

Although an attempt to test aptitude under a cognitive umbrella departs from Carroll and Sapon's (1958) strictly linguistic approach, it is not a novel idea. Pimsleur (1966) has always been tying aptitude to a general intelligent factor and is a firm believer that aptitude is closely related to more general cognitive skills. Sasaki (1996) found that language learning aptitude correlates with a general intelligence factor 'g' which includes cognitive skills rather than purely linguistic ones. Esser and Kossling (1986) use a purely cognitive approach in testing aptitude and although not widely known and commercialised, their results appear to enjoy enormous success in prediction. The cognitive abilities they test, they claim to be pre-linguistic skills that are prerequisites in foreign language learning. Skehan (1998), more recently, argues that memory, analytic skills and phonetic ability form the main factors of aptitude and he goes on to suggesting a more cognitive approach in testing aptitude.

A wide proportion of the results form the general cognitive skills have correlated significantly with scores in language performance tasks leading to the thought that general cognitive factors indicate language achievement.

- *Can we identify these factors?*

A number of cognitive skills have been trialled here. At the pilot study, some of them seem to be a hit-and-miss affair but after obtaining some more promising results, a replication of Esser and Kossling's study and the results obtained, gave ample support for the relation between cognitive skills and linguistic performance. In this part I argue that the findings of correlations between certain cognitive skills and foreign language achievement are not coincidental and that they simply cannot be; therefore need adequate explanation.

There were quite a few attempts to test different types of memory (associative, short-term, long-term, recognition memory) and it proved to be difficult as in Carroll and Sapon to draw firm conclusions from the beginning. It is still an area of potential interest especially its development in the early years, however, it proved that paired associative memory is the one factor that impacts more strongly language achievement. This is not a surprising result, bearing in mind Carroll's study and the fact that language learning includes a certain re-labelling of things, words, etc (Aitkison 1987).

The interesting finding is that paired associative memory here is tested for memorising a picture with either a non-sense word or a shape. This verifies that the testing of the same quality might be tested in several different ways. Connected to that point there is an attempt to test memory in a more analytical and explicit way through semantic integration. This is a quality that includes memorising a learning list of shapes and then recognizing parts that are added, taken away or missing in a recognition list of shapes. It was first tested in Esser and Kossling's cognitive study of aptitude and yielded significant correlations so a direct replication modified for the target group was attempted here. Again, the results suggest that advantages at this type of memory facilitate foreign language performance.

Finally, phonological associative memory was also tested. In this study, subjects were asked to memorise non-words for different colours and utter the words at request. Correlations with productive vocabulary and total language scores of about 0.4 emerged, which verifies the conclusions of several researchers on the vital role of phonological memory on foreign language learning.

Several analytic skills were also trialled. Deductive learning ability was tested with a task of classification. In this test subjects had to learn a type of artificial language as colours represented different groups (all animals are red, all flowers are blue, etc) and they were tested in their ability to show the representative colour at appropriate cues. As Goswami notes:

> .... the problem solver deduces this answer on the basis of the logical combination of the premises presented in the problem... these developing modes of logical reasoning are those first identified by Piaget as requiring "concrete operational" thought. Concrete operational thought is said to be marked in part by an ability to consider multiple aspects of a situation simultaneously. Concrete operational thought is also marked by an ability to understand that any operation on an object simultaneously implies its inverse (Goswami 1998 227-228; 234).

Young learners' ability to cope with this kind of tasks contradicts Piaget's notion that their concrete and formal operations are not active at this early age. Correlations between reasoning abilities and second language performance were significant here too.

There was also an attempt to test symbol association with numbers being represented by shapes and they had to present the shapes and make additions or deductions. This again, was an analytic test closely to that of inductive ability but did not manage to offer any strong correlations.

There were also two types of visual perception tests. Finding the differences between seemingly identical pictures offered in two cases correlations of about 0.4, as did a test of recognising an identical model in a series of objects.

Reasoning/inductive abilities were tested through story sequencing activities where subjects having mixed up pictures are called to put them in order so as to tell a story that makes sense.

The simple task of classification (grouping objects under logical categories) was also trialled but it appears that children from a very early age are very good in handling this information, contrary to what has been the general belief and are not merely intuitive and pre-operational.

Spatial abilities were tried through a spatial awareness task where subjects are asked to find pairs of objects viewed from a different angle (perspective), which gave correlation of about 0.3. Spatial ability was also tested through series of jigsaw puzzles where subjects were asked to look at the empty spaces, 'see the big picture' and visualise which pieces that were left out would fit and finish the puzzle. Piaget and Inhelder (1955 in Vecchi et al 2001) had claimed that conservation needed for this kind of task comes later with growth; however, children were able to perform well at these tasks. Correlations are significant around 0.4 and verify Carroll's suspicion that skills, which are not apparently connected to language, might be worth testing. As Larsen-Freeman and Long hypothesised, the perceptual challenge of the task is to be able to:

> ...break up the visual field and keep part of it separate. This challenge was hypothesised to be analogous to a person learning a second language who has to isolate an element from the context in which it is presented (Larsen-Freeman and Long 1991:193).

Lastly, there was also an attempt to test phonological skills, namely, phonological repetition and distinction between non-words. This was tested only once for reasons of time and was rather a pilot study with small number of testing items for each skill; however they did give a significant correlation of 0.4. Cheung (1996) and Service and Kohonen (1995) in two studies had showed that phonological memory (pseudo word repetition) was important for learning foreign language vocabulary (cited in Sparks and Ganschow 2001:99), a fact that is confirmed with this study as well.

One of the most important findings though is the fact that in almost all the experiments, the general cognitive total correlated as a whole significantly from 0.4 to as much as 0.6 with productive vocabulary, receptive vocabulary and language total scores. Consequently, it can be assumed that the cognitive tests and skills devised for the experiments are relevant to language learning skills.

- *Is there a pattern of cognitive development across age?*

One of the questions in this study is the existence of a pattern of cognitive development across age in childhood. This is of particular interest especially because there is an attempt to 'marry' cognition to foreign language learning. If there is an age effect, it means that the model of foreign language learning in young learners might be qualitatively different to what has been previously thought.

The results of the present study support that certain cognitive skills develop with age and give credence to the belief that foreign language learning or better achievement is directly affected. However, the question of a 'window of opportunity' still remains open. There is evidence that eight-year-olds are significantly better at a variety of analytic skills whereas in certain types of memory 5 year olds appear to be significantly better than 6 year olds but do less well than older children. Further analysis of these results is provided in 10:3, where the age factor is thoroughly discussed. The results are not very surprising, as naturally one would expect that children get cognitively more mature with growth. However, the finding of a dynamic variety of analytic abilities and capacities to handle more complex tasks in young children suggests that children are not as memory-dominant as previously believed and that their intellectual and cognitive development is much quicker than expected.

With the help of multiple regression analysis, the role of cognitive skills influencing language achievement has been proposed. This, in turn, offers a simplified model of foreign language learning for young learners. This model should be viewed very cautiously and is merely indicative since more detailed and normalised procedures should follow in order to enable firm conclusions on this matter.

10:1.2. Assumptions revisited

- *Language learning aptitude is a fixed quality.*

Carroll was a fond supporter of the idea that aptitude is a fixed quality. He thought aptitude is at least partly innate. However, he did state that it might have developed over a long period as a result of the individual's experience and activities (Carroll 1985:84/85 cited in Robinson 2001).

Aptitude, in general was regarded as having enduring characteristics. Carroll (1981, referring to Politzer and Weiss 1969) mentions an attempt to improve learners' grammatical understanding and sensitivity, which appeared to have little or no effect on language learning success. This idea clearly has relatively mature learners in mind and is not intended to cover young learners or, one supposes, learners at the opposite extreme of age. There are various reasons for thinking that aptitude is fixed in adults. Learning style, for example, may become fixed after an initial period of learning and thus become difficult to modify or alter. However, aptitude here has been seen as a set of cognitive abilities and a multi-component notion. As cognitive skills develop with age, aptitude appears to progress, therefore aptitude is not fixed at least at that early age.

It might be possible that aptitude will become fixed after a certain period of time, where cognitive skills have reached their peak or at the point when children become cognitively mature. If this is the case, the issue of 'plasticity' becomes important. If aptitude is a flux of changes at least in the early stages of life, it is implied that certain weaknesses might be alleviated if appropriate instruction and training takes place.

- *Young learners are better learners.*

The idea that, all young learners are very similar in their abilities and are all good at foreign language learning, is not supported by the data and sounds really as a considerable oversimplification. Young learners appear to be, like adults, quite varied in the skills they have. Memory, analytic skill and sound discrimination/recall variation, which characterised adult language learning aptitude according to Skehan (1992), also seem to associate with and predict foreign language learning success in young learners. Young learners contrary to dominant belief are not mere memorisers or mimics but they do have primary analytic skills at their disposal. When learning languages, it seems that they activate them exactly like adults do. However, younger learners seem to struggle more as their cognitive skills are still developing while older learners appear to have a higher aptitude. These findings tie well with Miralpeix's (2002) results.

It is undeniable, however, that children have a talent at remembering especially new words and they are renowned for their motivation at learning new things and acquiring better pronunciation. Therefore, it can be claimed that it is not aptitude itself in this age that determines children's performance and that if actually the 'window of opportunity' (Zafrana 1979,1992,2001) exists, continuous exposure in and out of the classroom and appropriate methodology might guarantee positive effects in second language learning (Munõz et al 2002) independently of aptitude at this stage.

- *Children learn foreign languages easily and quickly. Learning is implicit.*

Young learners are willing, motivated and by nature curious. Several factors, which would normally interfere with learning, are absent here and Krashen's affective filter hypothesis explains that. Young learners are not afraid of learning a language, they are not put off by not understanding everything, they can engage in repetition in ways adults might find dull and uninteresting. So the things, which might stop real ability for languages (i.e. aptitude) shining through, are not present. It seems likely also to suggest that there is a certain time where the brain is more acceptant and flexible at the younger age at least when it comes to pronunciation and some more language aspects (Lenneberg 1967). Young learners appear to be like 'sponges' (Munõz et al 2002), however, other factors (time, exposure, continuous input, methodology, etc) form the basic predictors of language learning. The absence of the affective filter may explain why the final results from these experiments suggest a higher correlation between aptitude test scores and language learning scores than is generally observed in adults.

Krashen (1981) claims that learners acquire language rules in a fairly predictable order and the competence to product utterances in the second language stems from the subconsciously acquired knowledge. Consequently, for Krashen it is virtually certain that language is attained in only one way and that is by receiving 'comprehensible input'. For Krashen and others second language learning in young learners is regarded as implicit. However, these studies take place in formal learning settings and the achievement is measured with quantitative analysis. Here, aptitude for young learners seems similar to the adult version. It can be hypothesised, therefore, that because learning takes place in the formal and explicit learning environment of the classroom, it is possible to view the skills necessary for success in this environment, even in young children, as something similar to the explicit learning abilities in memory and analysis which have been identified in adults.

Skehan (1992) argued that analytic ability, memory and phonetic discrimination are the main components of a cognitively approached aptitude. By testing several cognitive skills here, the same components appear to determine language achievement. Therefore, it can be assumed that the learning of a second language is rather explicit than implicit which also contradicts Hyltenstam and Abrahamsson's (2000) idea that young learners acquire second language automatically from mere exposure. On the other hand, it should be clarified that not all children acquire language the same way and that 'the different pathways that they take into language provides clues to how language develops' (Shore 1995:2).

Finally, it should be kept in mind that if language is dependent on cognitive skills- some of them analytic - then teaching of routinely simplified things like colours or numbers (Cameron 2001) might not be using young learners' learning potential because

> ...if it is all that they are taught, that will be all that they can learn. Children always do more than we think they can; and the foreign language classroom does them a disservice if we do not 'exploit' that potential (Larsen-Freeman and Long 1991:207).

- *Young learners are dependent on memory.*

This has long been a cherished view and many memory games have been constructed for that reason. It seemed plausible up to now to assume that young learners have strong memory but weak analytic skills. Gathercole et al (1992) had hypothesised that memory diminishes with age as analytic skills develop. Apparently, this is not exactly the case. Young learners may be strong in memory (although not remarkably strong) but they do have primary analytic tasks. This can make them good language learners, as the principal factor that is important for language learning is analysis. In Chapters 8 and 9, there are statistics that prove the fact that the analytic skills contribution to learning success is far more salient. Memory is important but even there analytic skills underlie memory ability or seem to interfere with it.

Moreover, PSC Canadian program regarded memory ability as "a separate diagnostic factor because of its apparent differential relation to success in the various instructional approaches" (Wesche 1981:133, in Parry and Stansfield 1990). It appears unnecessary for effective learning with the Analytical Approach, which uses the learners' ability to consciously analyze and understand the organizing tenets of language systems (Orwig 1999). However, it is a vital factor for the Functional Approach, which is an approach to language description based on semantic, communicative and also grammatical elements (Milton 2002). As it is clear here that the Analytical Approach is vital for language learning, it seems like memory has a considerably smaller role to play.

Singleton (2002) proposed that since cognitive abilities are measurable in children before they begin formal literacy, it becomes possible to anticipate which of them are likely to struggle before they fail. If now there are cognitive skills revealed that indicate or facilitate aspects of second language learning, the possibilities of success rise. Teachers can then select appropriate material that best fit to the child's cognitive profile and provided that time and amount of teaching will be continuous, the results might be optimistic.

10:2. Cognitive skills related to language achievement

1. Memory components that influence foreign language learning

According to the results obtained after a series of studies, certain memory types appear to facilitate language learning. These are:

- Short term immediate memory for pictures
- Associative short term memory (pictures-shapes)
- Semantic integration (learning list-recognition list of shapes)

Memory here has not been regarded as a unitary thing. Several kinds of memories have been tested yet not all of them proved to be relevant to language learning. Memory is divided –as previously mentioned- in three major stages: encoding, storage and recall, namely immediate and active retrieval of information stored (Glassman 2001:159). To be accurate, the tasks involved mostly recall and recognition forms of memory. What is more interesting is that 'recall and recognition are both examples of explicit memory and these that the subject is unaware of having, is implicit' (Groome et al 1999:125).

The task of semantic integration is a clear example of recognition memory, which Carroll regards as a special form of recall (Carroll 1979:19). This form of memory (recognition) appears to be relevant to young learners' language learning. Groome at al (1999:122) have maintained that recognition is even superior to recall as it offers 'more feature overlap between input and output and recognition is seen as one of the sub process to recall'.

Another form of memory relating to young learners language learning is associative memory tested with the paired associates' task. However, in the analysis provided in Chapter 9, associative memory seems to be regarded as an analytic element. Humes-Bartlo (1989:48) suggest that 'children with good verbal associative memory were expected to find language learning easier, while a good rote memory may or may not be helpful'. A good verbal associative memory includes certain rationalisation or requires several memorising techniques, therefore requiring a degree of analysis. Pimsleur's idea that aptitude entails verbal intelligence by which is meant both familiarity with the words and the ability to reason analytically about verbal materials is not far from what is supported here. Children do not merely 'remember' but they seem to be using more analysis when learning something new which leads to certain automatisation.

It was argued that the size of a child's short term memory is supposed to be of great importance and a critical general-developmental factor that determines the ability to cope with linguistic complexity (cf. Bates 1976; Case 1978q; Slobin 1973, Case 1977 cited in Daneman and Case 1981:368). Furthermore, Ellis (1996 in Schmitt 2000) suggested that short term memory capacity is one of the best predictors of both eventual vocabulary and grammatical achievement. However, the studies performed here so far do not verify these statements as short term memory alone does not seem to influence language achievement. This is further verified by Conrad (in Baddeley 1986:19), who concluded that presenting a series of pictures of nameable objects and requiring recall of items 'does not seem to result in long term learning'. Therefore, the certainty of short term memory robustly relevant to language aptitude should be reconsidered.

2. Analytic tasks that have facilitative effect to foreign language learning

There seem to be certain analytic skills that facilitate, affect or give an advantage to young foreign language learners. These are:

- Reasoning/deductive learning ability (artificial language/classification)
- Visual perception (find the differences in pictures)
- Reasoning/inductive learning ability (story sequencing)
- Spatial ability (jigsaw puzzles)

These skills have been tested in different tasks but the ones mentioned above are the dominant. The deductive ability tested through an artificial game of classification requires mature categorisation relies on knowledge; intention and extension of class; hierarchical experience; therefore certain deductions are permitted. It has proved to relate to language learning and possibly affects organising in mind parts of speech and grammar inferencing rules as well as thematic concepts of words. As Cameron proposes if simple categorisation is responsible for certain meta-linguistic abilities (Cameron 1993:13) then it would be reasonable to suggest that combined with deductive learning ability the results would probably be even more remarkable.

The differences activity is regarded as visual perception ability and appears to be facilitative to language achievement where young learners are concerned. Perceiving involves recognizing a stimulus as in differences between two pictures. Recognition of something as familiar requires making use of memory (a cognitive process) that is not required here so it is a clear analytic task requiring acute sensory stimuli.

The story sequence task is a test of logical reasoning. It is obviously analytic and requires maturation both perceptual and conceptual. It is rather an inductive reasoning ability as there is no immediate rule but the child has to imagine logical rules to create the story and see the 'whole picture' from the parts. This is a task of analogical reasoning as learners are tested on:

> ...whether they can use relational reasoning to solve analogies (transfer appropriate knowledge from the familiar problem to the novel one). Related questions have been how early children are able to make relational mappings, and whether children can map relational similarities in the absence of surface similarities (e.g. Gentner, 1989 cited in Goswami 1998:222/223).

The data gathered however, do not indicate which reasoning form (inductive or deductive) is more important for language learning. It could be assumed that both play a vital role in analytic skills but it is not clear which contributes more. Further analyses and studies should follow to give a consistent answer.

Spatial ability, although bearing no obvious connection to language learning, seem to contribute greatly to language achievement, thus verifying Carroll's suspicions and confirming other similar studies by Thurstone and Thurstone (1963), Wechsler (1991) and others.

3. Reference in phonological tasks

Although there was no possibility for reasons of time and practical difficulties to test extensively these skills, there is an attempt to test:

- Phonological repetition of non-words
- Phonological distinction between non-words
- Phonological recall of non-words

Although the study has not been retested to prove the results' validity and reliability, it initially shows that Gathercole et al's (1992:888) suggestion that there are developmental associations between short term phonological memory skills and vocabulary acquisition are not far from the truth. Their findings lead them to conclude that phonological memory (recall, to be more specific) contributes critically to the long term learning of new words. The studies here lend credence also to several other studies that link phonological memory achievements to children with language problems or poor linguistic ability (Raine et al 1992; Gathercole and Baddeley 1990; Adams and Gathercole 1996 cited in Groome et al 1999:102) or future language ability (Reynolds 2002:3).

The task of phonetic discrimination between non-words in the study performed here was found to correlate strongly with language achievement whereas the task of non-word repetition did not. Gathercole et al (1992:889) claim that phonological memory skills are a prerequisite for normal native vocabulary development and it seems that the same might be the case for second language vocabulary.

10:3. The age factor

The age factor is an issue that has long concerned linguists. There is no common ground when it comes to the point one should start learning a foreign language, however, there is a widespread consensus that the earlier, the better. This thesis is not directly concerned with this matter although to my view, the starting age is not as significant as the type and amount of exposure and also the continuity that follows. Recent studies have shown that in cases late starters are more fluent while early starters have more varied vocabularies (Miralpeix 2002:22). Munõz et al (2002) suggest that early start without sufficient exposure does not guarantee positive effects in second language learning.

The age factor here concerns the changes, enhancements or aggravations that might emerge across childhood years. As some of these skills impact aptitude and foreign language learning, a pattern of cognitive development might indicate a model of foreign language learning for young learners.

In the discussion section of chapter 8, it was shown that generally, cognitive skills improve with age and so aptitude is directly affected. This has two hypotheses:

First, it can be now argued that aptitude changes over time and is not a fixed quality. This, in turn, gives credence to the hope that aptitude might not be innate and genetic but plastic at least at this early age.

The other hypothesis is rather more complex and difficult to be proved. It might be that the zone of proximal development and certain windows for language may exist until a later point in life. More specifically, it might be argued that aptitude fluctuates or changes at the early stages but becomes fixed when the main cognitive skills have been attained with maturation and growth.

10:4. The gender factor

This is a question that has not been tackled directly in the experimental materials presented here. However, the data allows for some simple analysis and discussion, which might usefully be raised here. All in all, as can be seen in the charts, girls appear to do better than boys. The differences are small and not significant according to t-tests that have been run. The results however, do suggest that girls have an initial at least advantage which confirms Farhady's (1982) and Eisenstein's (1982) studies (cited in Larsen-Freeman and Long 1991).

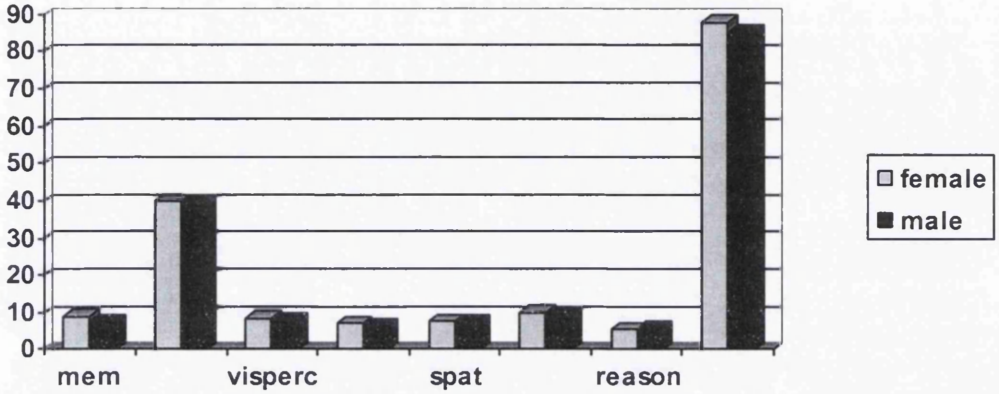

Chart 10:1: Differences in cognitive performance between genders

Test	**Female**	**Male**
Memory	9	7.69
Classification	40	40
Visual perception	8.43	7.93
Paired associates	7.17	6.42
Spatial ability	7.56	7.81
Semantic integration	10.15	9.63
Reasoning ability	5.43	5.75
Total	87.89	85.3

Table 10:1: Mean scores and standard variation of cognitive performance between genders

Table 10:1 illustrates the mean scores in several memory tasks where it is clear that girls perform overtly better than boys especially in short term memory and associative memory.

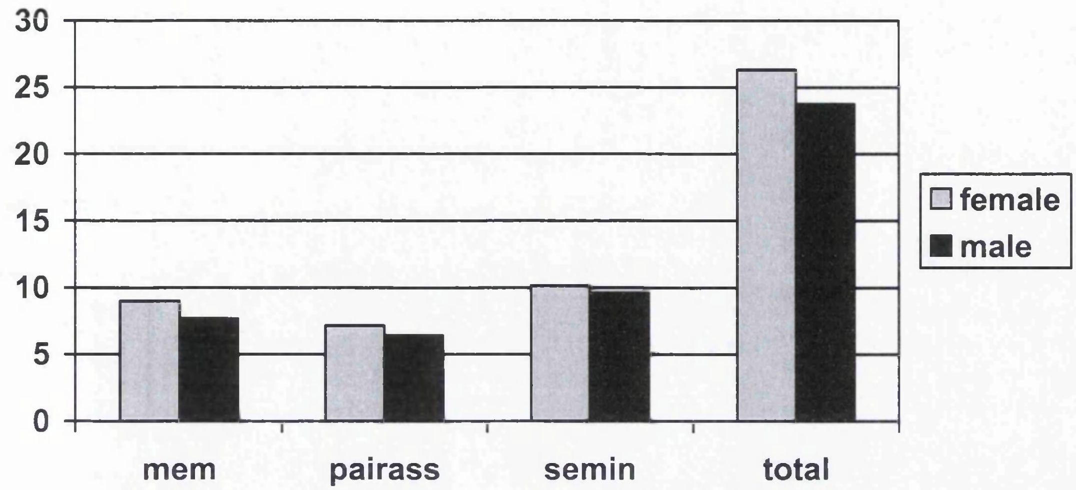

Chart 10:2 Memory tasks between genders

Chart 10:2 however, shows that boys have a slight advantage when it comes to more analytic tasks. This is true for deductive learning ability and spatial ability whereas girls appear better in visual perception (a more hands on task), which verifies findings from Vecchi et al (2001). In classification tasks, it seems that they are on the same level.

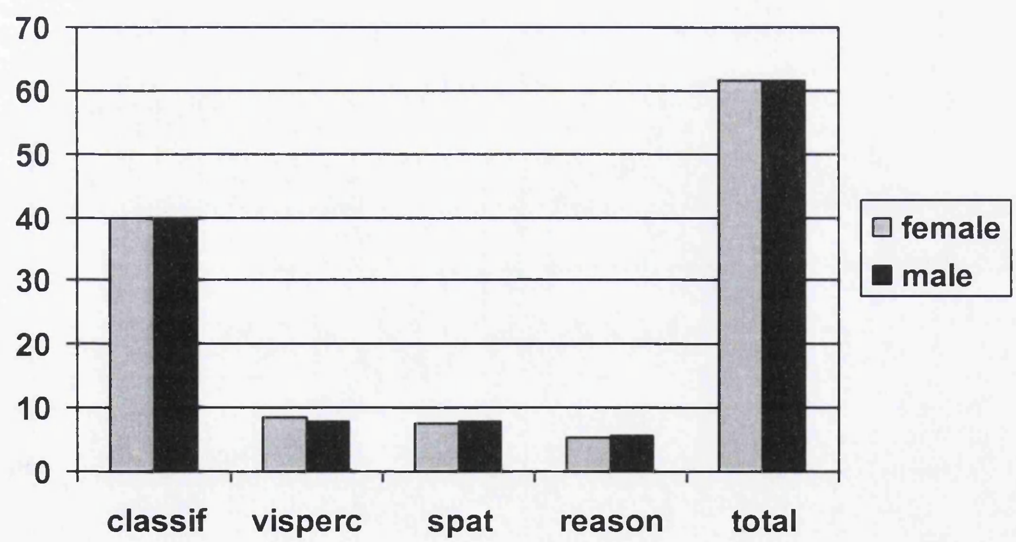

Chart 10:3: Analytic tasks between genders

In a small initial study that took place in January 2004, types of phonetic abilities were tested. For reasons of interest only, the results that are derived indicate an advantage in phonetic repetition and distinction of non-sense words whereas boys enjoy an advantage in phonetic memory/recall. However, the numbers are too small to give any firm suggestions; therefore more studies in this area are recommended. Finally when language scores are compared girls appear to get higher scores in all tests. The differences however, fell short of statistical significance.

Test	**Female**	**Male**
Phon.repetition	3.92	3.72
Phon.discrimin	3.07	3.03
Phon.recall	3.74	4
Phon.total	10.74	10.81

Table 10:2: Mean scores and Standard deviations in phonetic tasks between genders

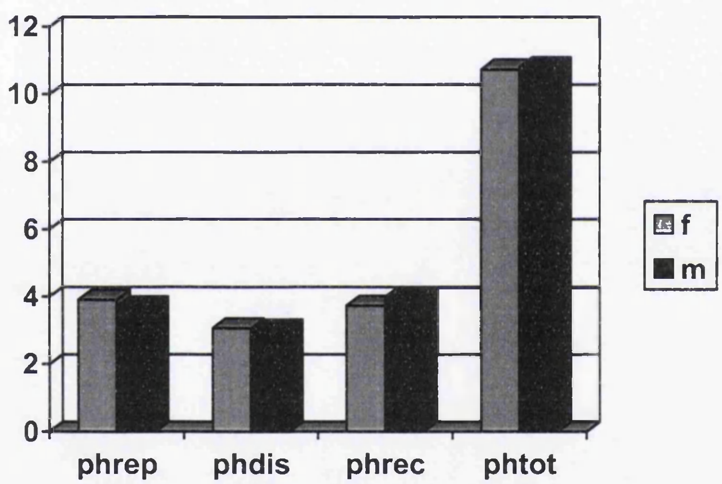

Chart 10:4: Phonetic tasks between genders

10:5. Limitations of study

There are evidently some limitations that are concerned with the present study and the test itself. The main one is that the studies carried out are restricted to classwork and so any result should be referred as the result in a second language academic context (even though the teaching is implicit and not strictly academic) and not in natural situations or bilingual environment. The nature of the language test is also limited and had to be 'played down' as the foreign language input is quite small both in amount and frequency of hours.

Apart from that, it should be said that all language tests up to now have examined listening and speaking skills and have been focused on vocabulary recall and recognition. This is perhaps the biggest limitation as results could not be generalised for all skills and grammar is also not looked at sufficiently (except for some simple structured sentences). This is because the cognitive state and the input provided so far at this age is not adequate to allow more complex tasks and the possibility of examining writing or reading since they have not acquired these skills. However, as Esser and Kossling suggest several of the present study's testing cognitive tasks relate directly to pre-linguistic skills in grammar and other skills. This is the reason, that perhaps analytic tasks could be more closely tied to grammatical aspects of a language and memory tasks to vocabulary acquisition.

Another limitation is the age itself. The results are valid for the particular age but could not be generalised -unless trialled in adults- for many reasons. This is because for children, external factors and other practicalities of life (eg. work problems, financial, personal or family worries) are less prominent than for adults and they do not affect their learning at least not as early.

However, results of the study verify that children as young as 5 or 6 are not 'tabula rasa' as previously thought since their cognitive and linguistic differences are evident form very early on. Apart from the fact that they have already acquired/inherited certain skills from their parents, they seem to have already enjoyed exposure to a variety of stimulus and environments that have impacted them. This is not to say that they have now reached their abilities but it is simply unrealistic to view them as utterly ignorant or complete starters even when starting something new.

10:6. Implications and suggestions for further research

The age factor is concerned with the changes that might emerge across childhood years. As some of these skills impact aptitude and foreign language learning, a pattern of cognitive development might indicate a model of foreign language learning for young learners. This approach to aptitude related to cognitive skills lends support to Stern's (1983 cited in Spolsky 1989:104) claim that language aptitude is 'not a single factor but a cluster of specific abilities'. These abilities appear to interact in logical ways and with certain kinds of exposure and methodology. With these in mind, several suggestions come to light.

First, knowing the strengths and dominant skills at certain ages can help creating a child's learning profile at a very early stage, which in turn, reveals learning styles and preferences. All children do not obviously acquire language in the same way and the different approaches they follow into language can offer clues to how language develops.

Language styles in that sense should be viewed 'as aspects of language at which children excel rather than as styles for different types of children' (Shore 1995:2). In order to maximise learners' potential for success,

> ...one way of taking aptitude into account is to include as an instructional objective the enhancement of learners' aptitude. Another option is to modify language instruction so that it accommodates learners' aptitude profiles in some way (Robinson 2002:345).

Second, knowing what processes take place helps a teacher as to 'what to expect' and what to take care of enlightening the aims and objectives of lessons and start from where the learners are. As Davies puts it:

> It is equally important to know just what abilities are required for learning a language well, before any prediction can be made. The more knowledge gained regarding aptitude the better the understanding of individual differences among pupils learning languages, and the more chance there is of turning these differences to advantage (Davies 1968:100).

Third, certain abilities or learning difficulties might be revealed in advance for appropriate instruction and remedial action. It would be interesting to see whether trainability on aptitude has any effect-as other researchers have suggested (Politzer and Weiss 1969; Skehan 2002; Robinson 2002)-at this age. Teachers can then alleviate weaknesses and play with the learners' strengths.

Lastly, knowing the cognitive state (not presumably stage) and the cognitive skills required for easy foreign language learning might give valuable information regarding the state of 'readiness' before embarking to start a foreign language. Gardner and McIntyre (1992 cited in Nagata et al 1999:134) 'view aptitude as a kind of cognitive 'sponge' in the sense that new skills/knowledge are naturally attracted to existing skills/knowledge with which they can be readily associated'. Bruner claims that to be 'ready' to learn a given skill means exactly to be already equipped with other prerequisite skills (Donaldson 1978).

The last, at no reason insinuates that a not as 'ready' child will not learn, it simply indicates when the child is or will be readier to 'absorb' the language quicker and more efficiently.

Resulting from all these, several implications emerge. If tests like these are normalised, an interesting perspective to follow is the role of intervention in order to see if certain cognitive skills are 'plastic' in young learners and can be enhanced with practice and training through appropriate games and activities. These studies, however should be longitudinal and might require more careful considerations on several aspects concerning ethical issues, hence sensitivity here would be important. Several studies up to date has shown for example that 'there is apparently no limit to improvements in memory skills with practice' (Chase and Ericsson 1996:186). This view is supported by other findings,

> …that children benefit from cognitive-strategy training (e.g., Bjorklund & Harnishfeger, 1987; Rabinowitz, 1984) and that under some instructional conditions, normally achieving elementary- age school children maintain use of mature memory strategies and metacognitive skills after training (e.g., Carr, Kurtz, Schneider, Turner, & Borkowski, 1989; Hall & Madsen, 1978; Leal, Crays, & Moely, 1985; O'Sullivan & Pressley, 1984; Reid & Borkowski, 1985) (Lange and Pierce 1992:453).

Humes-Bartlo (1989:52) claims also that strengthening 'verbal memory of children at risk of being slow second language learners may be helpful in preparing them for the task'. Carroll himself believes that high quality language instruction may actually nullify aptitude differences (Carroll 1965 cited in Cook 1986). Vecchi et al (2001:40) present evidence that 'young children can show performance similar to adults in tasks requiring only passive storage of visuo-spatial material when specifically trained to use effective strategies (Kosslyn 1980)'.

Research on further cognitive skills not dealt in this thesis for both reasons of space and time and their relation to foreign language learning might also be a further development for study.

Universality for languages is consequently another issue. It might be true that cognitive skills of the sort we tested have proved to impact English learning but would this be the same for learning other languages like Japanese, Hebrew or Arabic?

Another interesting way follow-up of this thesis would be to investigate differences in first language and second language aptitude. Up to now, Gathercole et al (1992:887) support:

> Vocabulary size is strongly associated with a range of abilities including general intelligence, reading ability, reading comprehension and school success (Anderson and Freebody 1981; Thorndyke, 1973).

What about adults? Do the same cognitive skills influence adults learning of foreign language at the same degree? The study here supports the view that foreign language learning is more analytic and explicit than previously thought even at young learners; however, the learning model of adults is genuinely more complicated to that of young learners. This makes research on cognitive skills and aptitude for adults a fruitful area for study.

Finally, the role of schools has not been closely looked at in this study mostly for reasons of space. Although there are differences generally between scores in all skills among different schools, it appears that significant differences emerge mainly in the spatial ability tasks where children attending private English language schools seem to have a significant advantage. This is only one finding but it suggests that socio-factors might be an interesting path for research.

CONCLUSIONS

This has been a very interesting and enlightening study. Even the fact that no other attempt of testing aptitude in young learners has been made and no previous studies posed questions on the relation between cognitive skills and foreign language learning makes the results of this study both enlightening and inspiring.

The first interesting finding concerns the main research question, namely whether it is possible to test aptitude by following a cognitive approach. From the very first pilot studies, it became feasible to test even very young learners in different cognitive skills, which in turn offered moderate at the time-existing, however- correlations with foreign language test scores. This led credence to Skehan's (1998:199) idea that 'there is no single best method but it is the combination of specific method types with specific aptitude profile which creates optimal learning conditions'. Therefore, aptitude research should not remain at a monolithic level but that profile information could be essential for designing effective interventionist techniques.

After a series of studies, several cognitive skills revealed promising relation and affects to foreign language achievement. The types of cognitive skills basically fit well with Skehan's proposal that aptitude consists of memory, analytic skills and phonological ability. For memory, short term visual memory, associative memory, recognition memory and phonological memory of non-words appear to factor in foreign language achievement.

Analytic skills that facilitate foreign language learning seem to be visual perception, inductive and deductive reasoning and spatial ability. All these offered significant correlations with language scores. These skills were chosen and trialled after contemplating previous studies in cognitive and child development. Inductive learning ability and spatial ability were also proposed earlier by Carroll although they were not included in his MLAT.

Phonological skills were trialled only once. Phonological distinction between non-words and phonological recall of previously heard non-words appear to affect positively the scores of the foreign language tests. Unfortunately, there was not much time available to retest it comprehensively, however, the results are promising and support numerous studies on the role of phonological skills on foreign language learning success.

The age and gender factor in cognitive development was examined as well. It seems that most cognitive skills improve with age. In particular seven year olds appear to enjoy an advantage in memory and phonological skills whereas eight year olds appear to do better in analytic tasks. However, five year olds surpass six year olds both in memory (where there a significant difference was marked) and analytic skills. This might indicate that the age of five is crucial and presents an advantage in very young learners and with older youngsters the age of seven seems to be promising.

Regarding the gender factor, girls generally outperform boys both in cognitive development and language scores although the differences are not significant.

Several challenging implications emerge from this study. The results of the present study support that certain cognitive skills develop with age and give credence to the belief that foreign language learning or better achievement is directly affected. Yet, the question of a 'window of opportunity' (Zafrana 1979; 1992) and the age effect still remains open. It appears that as other researchers have supported comprehensible and continuous exposure, appropriate methodology and appropriately trained teachers are more promising than the onset time.

The study here also supports the view that foreign language learning is more analytic and explicit than previously thought even with young learners.

One of the important conclusions is that the study went away from the mere role of 'predictiveness' of an aptitude test (that might actually not tell much as cognitive skills do develop). The study offers convincing evidence that the nature of aptitude or the 'talent/disposition for languages' might not be genetic or inherited and it is not fixed and unchangeable. This is not to say that one could instruct everyone to be equally good at foreign languages using the cognitive skills suggested here. This would be an overstatement and a simplified route to take. It *does* imply, however, that practice and improvement on certain abilities that relate to language may well facilitate effective learning at least to some extent.

A normalised test of cognitive skills that appear to facilitate or affect positively foreign language learning would offer a valuable source for a child's learning profile at the very beginning of learning. This can be a promising tool to provide information on learning styles and preferences as well as on particular strengths and weaknesses to be handled. Connected to this point, cognitive tests of aptitude can be a useful resource that will offer clues to the teachers when developing the curriculum and adopting teaching strategies that meet individual needs.

Finally, the issue of staring point or 'readiness' might also be dealt with through this kind of tests in order to prepare learners for the task of more effective language learning.

This thesis is concerned with young learners, cognitive development and its relation to language learning. Results support that the relation is strong and more studies in this area are now proposed to shed more light in young learners' aptitude. This prospect will be beneficial both to learners and parents for a hopefully more effective and less painstaking experience in foreign language learning.

It is hoped that the present study will be both a challenge and an inspiration for further development and a step forward in understanding the nature of aptitude, young learners' cognitive development and language acquisition in general.

APPENDIX 1

Teachers' Questionnaire

A. Profile

Teacher's name:

Teacher's age:

Teacher's experience with children:

B. Main question

Please select the qualities you find important for a successful language learner and evaluate them by grading their importance in a scale of 1-5 (5 being the most important).

1. Visual memory ....

Our example: Children are shown some picture cards for some seconds and then they are asked to recall as many as they can.

Please contribute a similar activity testing visual memory:

2. Auditory memory ....

Our example: Children are given a set of picture cards and when they listen to the prompt (i.e. teacher or cassette), they show the appropriate picture.

Please contribute another example of testing auditory memory:

3. Inductive learning ability ....

Our example: Teacher shows a set of seemingly unrelated pictures in three groups. Each of them has something in common (i.e. lemon, sun, banana: yellow colour). The children have to identify the common link. The children is given flashcards with the common thing (yellow colour, for example) and they have to put the right flashcard next to the appropriate group.

Please contribute a similar activity of testing inductive learning ability:

4. Analytic skill ....

Please contribute an example of testing analytic skill.

5. Motivation ....

Our example: The children are given problem solving games to play with. Their persistence and time of devotion might be indicative of how willing they are in learning.

Please contribute another example of testing motivation.

6. Learning type

Acoustic ....

Visual ....

Other please specify and grade:

7. Personality characteristics

a. Extro-introversion ....

b. Self- confidence ....

c. Anxiety ....

Other please specify and grade:

Can you think of an activity to test these characteristics?

8. Attitude to the foreign language ....

C. Methodology

1. Please grade the most effective methods of presenting vocabulary to children by starting with the most effective one.

a. Flashcards/picture cards ....

b. Chants/rhymes/songs ....

c. Story- telling ....

d. Story cards ....
e. Video ....
f. Miming/gestures ....
g. Role-plays ....
h. Puppet/marionette shows ....

Other please specify:

2. How do you usually revise vocabulary?

D. General discussion

a. Do you think that children will benefit from an early exposure to the foreign language? State your reasons.

b. Do the children usually have a positive or a negative attitude towards learning a foreign language? Why is that?

c. What are the main problems you meet with very young children?

d. Do you think that foreign language aptitude can be demonstrated at the age of six? How? What are the benefits in this case? State your reasons.

THANK YOU VERY MUCH

APPENDIX 2

Interview on young learners' language learning aptitude

A. Teacher's Profile

Teacher's name:

Teacher's expertise:

Teacher's experience with children:

B. Characteristics of a good language learner

1. Is it easy to tell if a child is better in languages than other? How?

2. What are the characteristics of a good language learner when he just starts learning the language?

3. Do you think there are different types of language learner or are they all the same? If they are different, how are the different?
(prompts: Akoustic-Visual)

4. Do you find that children at the age of six have analytical thought?

5. What kind of memorizers can you identify at this age?
(prompts: visual/acoustic memory/short term memory/long term memory)

6. What do you understand by the inductive learning ability?

7. How important are motivation and personality characteristics?
(prompts: Extro-introversion, self confidence, anxiety, attitude to the foreign language)

8. How can you tell if a language learner is slow?

9. How do you treat good/slow language learners?

C. Discussion on aptitude

1. What is aptitude according to your opinion?
(prompts: ability/talent/tendency/gift/capacity)

2. Teachers usually support that all children are able to learn a foreign language successfully. Do you agree with this?

3. Yet, it is true that not all children are successful in language learning. Why?

4. Whatever the case, it is obvious even from the very first lessons to distinguish a very good learner. How do you explain that?

5. Can you easily identify children with language aptitude? How?

6. Can you think of a way to evaluate their ability to the foreign language?

7. Do you think that foreign language aptitude can be demonstrated at the age of six? How? What are the benefits in this case? State your reasons.

8. Do you think that teachers or parents would benefit from an aptitude test designed especially for young learners (in a game form) before they start a second language? In what ways?

THANK YOU VERY MUCH

APPENDIX 3

Cognitive test (January 2002)

Child's name: Place:
Child's age: Date:

1.Visual memory task

Starting time:	**Words that were recalled** sun strawberry umbrella tortoise bicycle clock	End time:
Starting time:	**Position of words recalled** 1 2 3 4 5 6	End time:
Researcher's comments:		

Total time of task:

2. Word association task

Group 1	**Group 2**	**Group 3**	**Extras**
bananas grapes apple pear	dolphin duck frog	airplane car motorbike	toothbrush clock
Researcher's comments			

Total time of task:

3. Decoding

(A)

Starting time:	**First number asked**	**Second number asked**	**Third number asked**	End time:
No of attempts				
Success				
Researcher's comments				

Total time of task:

(B)

Starting time	**First addition**	**Second addition**	End time
No of attempts			
Success			
Researcher's comments			

4. Visual memory

Topic areas recognized	**10sec destructive activity**	**First missing picture identified**	**Second missing picture identified**	**Replaced picture recognized**
	Moon pencil			
Researcher's comments				

Total time of task:

APPENDIX 4

Individual scores for each task (January 2002)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)
Note: The abbreviations for each task are shortened for reasons of space

name	school	gender	age	memtotal	wa	sytotal	Vistotal	GA total
mafi	prs	f	5	10	8	1	1	20
hepsy	prs	f	5	12	4	1	3	20
panpa	prs	m	5	10	12	4	4	30
nian	prs	f	5	9	12	2	3	26
capa	prs	f	5	10	12	5	3	30
geza	prs	m	5	10	12	5	2	29
pespa	prs	f	5	9	12	5	3	29
matso	prs	f	5	10	7	5	4	26
zoma	prs	f	5	6	12	5	4	27
chvou	prs	f	5	11	4	5	1	21
viak	prs	f	5	12	12	5	2	31
mabo	prs	f	5	12	12	5	4	33
anma	pub	f	5	11	12	5	3	31
gekyr	pub	m	5	10	12	5	3	30
todi	pub	m	5	6	12	5	4	27
geter	pub	m	5	10	12	5	2	29
danar	pub	m	5	8	12	3	4	27
kotsa	pub	m	5	10	12	5	2	29
antal	pub	f	5	8	11	5	3	27
alpa	pub	f	5	8	12	4	4	28
tigia	pub	m	5	8	12	5	2	27
cada	pub	f	5	9	12	3	2	26
nigia	pub	m	5	7	12	4	3	26
zasa	prs	m	5	8	12	5	4	29
rova	prs	m	6	11	12	4	2	29
mava	prs	f	6	9	2	4	2	17
sagri	prs	m	6	7	11	2	2	22
panath	prs	m	6	9	12	5	2	28
jila	einst	m	6	10	12	2	2	26
evsi	einst	f	6	8	12	5	2	27
emma	einst	f	6	5	12	1	1	19
elka	pub	f	6	8	12	5	1	26
lydad	pub	f	6	6	11	2	1	20
roco	pub	f	6	8	12	5	3	28
vaka	pub	m	6	11	12	1	1	25
anko	pub	f	6	8	12	3	1	24
efka	pub	m	6	8	11	5	3	27
sasi	pub	m	6	9	12	5	4	30

stera	pub	m	6	10	12	3	3	28
jiar	pub	m	6	10	12	1	2	25
thefa	prs	f	6	8	9	5	3	25
jiba	einst	m	6	11	12	5	1	29
geba	einst	m	6	8	12	5	2	27
nixa	einst	m	7	12	12	5	2	31
laou	einst	f	7	12	12	2	3	29
mali	einst	f	7	12	12	5	2	31
stesa	einst	f	7	10	12	5	3	30
getza	einst	f	7	8	12	5	1	26
alko	einst	m	7	10	12	2	3	27
anant	einst	f	7	10	12	5	4	31
elan	einst	f	7	8	12	2	4	26
paka	einst	m	7	6	11	5	4	26
paak	einst	m	7	10	12	5	3	30
thesi	einst	m	7	10	12	2	4	28
gekar	einst	m	7	10	12	5	3	30
steze	einst	m	7	6	12	5	2	25

APPENDIX 5

Cognitive test (June 2002)

Child's name: Place:
Child's age:

1. Visual memory task

Target	**Pair of fruit**	**Pair of fruit**	**Pair of animals**	**Pair of animals**	**Pair of transport**
Success					
Attempts					
Researcher's comments					

Total time of task:

2. Find the differences

Target differences	**Successfully identified**
1. colour of the house	
2. colour of bus	
3. number of door	
4. number of fish	
5. number of people	
6. cat-dog	
7. dinosaur-dug	
8. girl's shoes	
Researcher's comments	

Total time of task:

3. Decoding

Target code	**Attempts**	**Success**
ani (red)		
teri (blue)		
ani-teri		
mipa (yellow)		
ani-mipa		
teri-mipa		
ani-teri-mipa		
soufo (green)		
ani-soufo		
teri-soufo		
mipa-soufo		
ani-teri-mipa-soufo		
different order		
Researcher's comments		

Total time of task:

APPENDIX 6

Foreign language achievement test (June 2002)

Child's name: Place:
Child's age: Date:

1. **Productive vocabulary- matching**

Target groups	Target words	Words successfully produced
Rainbow	5 blue, green, red, yellow, orange	
Fruit	4 orange, banana, apple, pear	
Animals	5 frog, hippo, duck, elephant, lion	
Face	3 eyes, mouth, nose	
Other objects	4 pencil, teddy bear, car, airplane	
Researcher's comments		

Total time of task:

2. Receptive vocabulary-sorting ability

Target objects	Success
cheese	
fish	
cake	
cat	
dog	
chicken	
rabbit	
milk	
schoolbag	
monkey	
mouse	
book	
train	
cornflakes	
doll	
snake	
balloons	
ball	
umbrella	
Researcher's comments	

Total time of task:

APPENDIX 7

Individual scores for each task (June 2002)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)

Name	Age	school	vismemA	Differs	decod	total GA	prodvoc	receptvoc	total LA	overall
mafi	5	prs	1	3	0	4	8	11	19	23
hepsy	5	prs	5	4	2	11	11	15	26	37
panpa	5	prs	2	4	0	6	5	8	13	19
nian	5	prs	1	2	1	4	7	16	23	27
capa	5	prs	3	5	0	8	12	17	29	37
rova	6	prs	3	5	2	10	7	17	24	34
mava	6	prs	1	1	0	2	8	12	20	22
sagri	6	prs	2	5	8	15	13	16	29	44
geza	5	prs	5	6	0	11	11	15	26	37
pespa	5	prs	2	6	1	9	11	9	20	29
matso	5	prs	4	5	6	15	18	18	36	51
panath	6	prs	3	3	4	10	7	14	21	31
zoma	5	prs	0	5	1	6	11	13	24	30
chvou	5	prs	1	2	0	3	1	9	10	13
viak	5	prs	3	4	3	10	13	12	25	35
mabo	5	prs	4	6	1	11	13	14	27	38
nixa	7	einst	4	6	2	12	14	13	27	39
laou	7	einst	4	4	7	15	9	14	23	38
jila	6	einst	4	6	9	19	17	14	31	50
mali	7	einst	3.5	5	4	12.5	18	16	34	46.5
evsi	6	einst	0	5	4	9	16	14	30	39
stesa	7	einst	2.5	6	6	14.5	15	13	28	42.5
emma	6	einst	2	6	2	10	13	9	22	32
getza	7	einst	3.5	6	2	11.5	12	14	26	37.5
alko	7	einst	2	7	1	10	17	16	33	43
anant	7	einst	5	7	3	15	15	13	28	43
anma	5	pub	3	5	2	10	5	6	11	21
elan	7	einst	3	4	6	13	15	15	30	43
paka	7	einst	5	6	9	20	17	16	33	53
paak	7	einst	4.5	6	6	16.5	18	19	37	53.5
elka	6	pub	4	6	3	13	5	8	13	26
gekyr	5	pub	3.5	4	0	7.5	10	8	18	25.5
lydad	6	pub	2.5	5	2	9.5	7	14	21	30.5
roco	6	pub	4	7	4	15	9	9	18	33
thesi	7	einst	2.5	6	4	12.5	16	14	30	42.5
todi	5	pub	1.5	6	2	9.5	17	12	29	38.5
geter	5	pub	1.5	4	2	7.5	15	14	29	36
danar	5	pub	3.5	4	2	9.5	14	14	28	37.5
vaka	6	pub	2.5	4	1	7.5	0	5	5	12.5

anko	6	pub	4	5	1	10	9	10	19	29
efka	6	pub	3	5	9	17	13	11	24	41
sasi	6	pub	3.5	6	1	10.5	8	12	20	30.5
kotsa	5	pub	3	6	9	18	12	14	26	44
antal	5	pub	2	6	9	17	6	11	17	34
stera	6	pub	1.5	6	6	13.5	8	15	23	36.5
jiar	6	pub	2	7	6	15	2	6	8	23
alpa	5	pub	3	4	9	16	9	7	16	32
tigia	5	pub	4	5	1	10	12	15	27	37
cada	5	pub	3.5	6	1	10.5	5	8	13	23.5
nigia	5	pub	3.5	5	9	17.5	18	18	36	53.5
gekar	7	einst	5	7	6	18	17	17	34	52
zasa	5	prs	5	6	0	11	6	11	17	28
thefa	6	prs	4	5	4	13	16	19	35	48

APPENDIX 8

Cognitive test (January 2003)

Child's name: Place:
Child's age:

1. Memory game

Pictures shown	Pictures recalled
1. kite	
2.car	
3.ball	
4.camera	
5.teddy bear toy	
6.cake	
7.cow	
8.iron	
9.cup	
10.butterfly	
Researcher's comments	

2. Artificial language game

Realia shown	Correct colour chosen (fruit/red,flowers/yellow,drinks/green,animals/blue)
1. orange	
2. sprite tin	
3. giraffe	
4. rose	
5. water bottle	
6. banana	
7. daisy	
8. frog	
9. grapes	
10.coca cola tin	
Reseaecher's comments	

3. Semantic integration game

Old shapes (a.cross,b.exagon)	**Missing shapes** (a.square,b.diamond)	**New shapes** (a.triangle,b.parallilogram, c.circle, d. star)
Researcher's comments		

4. Paired associates game

Pairs	**Success**
1.aeroplane- exagon with circle	
2.guitar- square with dot	
3.turtle- circle with arrow	
4.telephone- little triangle with line	
5.umbrella- circle with triangle	
6.sun- diamond with cross	
Researcher's comments	

APPENDIX 9

Individual scores for each task (January 2003)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)
Note: The abbreviations for each task are shortened for reasons of space

name	gender	age	school	shortmem	artiflang	semin1	semin2	semin3	semin total	pair asso	overall
raji	m	6	Pub	2	3	0	0	0	0	0	5
kahe	f	5	Pub	0	3	1	0	4	5	2	10
kado	f	5	Pub	4	10	2	1	4	7	2	23
alco	m	6	Pub	4	10	2	1	4	7	4	25
dico	m	6	Pub	3	10	2	1	4	7	6	26
tama	m	6	Pub	4	10	2	0	4	6	4	24
tsian	f	6	Pub	3	10	2	0	4	6	6	25
mpoza	m	6	Pub	2	10	2	1	4	7	2	21
papa	m	6	Pub	4	3	2	1	4	7	1	15
tsitho	m	5	Pub	4	10	2	1	4	7	0	21
vouar	f	6	Pub	5	7	2	2	4	8	6	26
zaal	m	6	Pub	4	9	2	0	4	6	6	25
kajo	m	6	Pub	5	7	2	1	4	7	6	25
faji	m	6	Pub	4	10	2	1	4	7	2	23
andan	m	5	Pub	2	10	2	1	4	7	3	22
moan	f	5	Pub	2	3	2	0	4	6	1	12
best	m	5	Pub	3	9	1	0	4	5	3	20
zala	f	5	Pub	3	8	2	0	3	5	0	16
pahe	f	5	Pub	0	2	2	0	4	6	2	10
zama	f	5	Pub	3	10	1	0	4	5	4	22
kyfi	m	5	Pub	3	2	0	0	1	1	1	7
fifa	m	5	Pub	3	2	1	0	4	5	3	13
poma	f	6	Prs	3	10	2	2	3	7	3	23
tsajo	m	6	Prs	2	10	2	0	4	6	6	24
alji	m	6	Prs	4	10	2	0	4	6	6	26
kage	m	5	Prs	2	9	2	2	3	7	4	22
pama	f	6	Prs	3	6	2	1	4	7	2	18
kouma	f	6	Prs	5	10	2	1	3	6	3	24
tsima	f	6	Prs	5	9	2	1	4	7	2	23
mpode	f	5	Prs	4	4	2	0	4	6	3	17
chaan	f	6	Prs	7	10	2	0	3	5	6	28
kako	m	5	Prs	3	7	1	2	4	7	6	23
agag	m	5	Prs	3	7	2	0	3	5	2	17
tsial	f	6	Prs	7	10	2	1	4	7	2	26
xeka	f	6	Prs	3	7	2	0	3	5	2	17
tzosta	f	6	Prs	2	3	1	0	4	5	3	13

kadi	f	5	Prs	4	8	2	0	4	6	4	22
kaev	m	6	Prs	4	5	2	0	2	4	6	19
tsige	m	6	Prs	5	4	2	0	2	4	6	19
koli	f	6	Prs	6	3	2	0	3	5	3	17
pasta	m	5	Prs	2	7	2	0	3	5	1	15
kouspy	m	6	Prs	6	10	1	1	2	4	2	22
antan	m	5	Prs	5	6	2	1	4	7	0	18
mpala	m	5	Prs	2	3	1	0	2	3	1	9
plias	f	5	Prs	4	8	2	2	4	8	2	22
dage	m	7	einst	7	10	2	0	4	6	6	29
sach	m	7	einst	4	9	2	1	3	6	0	19
moudro	m	7	einst	4	10	2	2	4	8	1	23
athpa	m	7	einst	3	10	2	1	2	5	3	21
aththa	m	7	einst	6	4	2	2	3	7	4	21
sile	m	7	einst	1	4	2	0	3	5	4	14
koufo	f	7	einst	3	10	2	0	4	6	6	25
mouir	f	7	einst	4	10	2	0	4	6	1	21
osfi	f	7	einst	6	2	2	0	4	6	0	14
spava	f	7	einst	3	4	2	0	3	5	0	12
stako	m	6	einst	4	4	2	1	4	7	6	21
chade	f	7	einst	4	10	2	2	4	8	2	24
mebi	m	7	einst	2	6	2	0	4	6	1	15
kyel	f	6	einst	3	10	2	0	4	6	3	22
miko	m	6	einst	3	3	2	1	4	7	1	14
kair	f	7	einst	4	10	2	0	3	5	4	23
chama	f	7	einst	6	9	2	1	4	7	4	26
mois	f	7	einst	4	9	2	0	4	6	1	20
kase	m	7	einst	2	2	2	1	3	6	6	16
peni	m	7	einst	4	7	2	0	4	6	4	21
chaar	m	7	einst	4	9	2	1	4	7	6	26
chch	m	7	einst	5	6	2	0	3	5	6	22
paste	m	6	einst	3	4	2	0	3	5	2	14
sipa	m	7	einst	6	10	2	2	4	8	6	30
tsiza	f	7	einst	1	5	2	0	3	5	2	13
mama	f	7	einst	5	10	2	0	3	5	6	26
alag	m	6	einst	6	7	2	0	4	6	3	22
made	f	7	einst	6	10	2	2	4	8	2	26

APPENDIX 10

Foreign language achievement test (June 2003)

Child's name: Place:
Child's age: Date:

1. Receptive vocabulary

Words tested	Success
1. book	
2. yo-yo	
3. girl	
4. monkey	
5. king	
6. fish	
7. umbrella	
8. lion	
9. boy	
10.octopus	
11.queen	
12.seahorse	
13.elephant	
14.drum	
15.fox	
16.violin	
17.trumpet	
18.notebook	
19.jigsaw	
20.monster	
Researcher's comments	

2. Productive vocabulary

Words tested	Success
1.red	
2.orange	
3.yellow	
4.green	
5.blue	
6.purple	
7.eyes	
8.mouth	
9.ears	
10.head	
11.hair	
12.nose	
13.giraffe	
14.zebra	
15.pencil	
16.rubber	
17.summer	
18.winter	
19.autumn	
20.spring	
Researcher's comments	

APPENDIX 11

Individual scores for each task (January-June 2003)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)
Note: The abbreviations for each task are shortened for reasons of space

name	gender	age	school	shmem	artl	Sem1	Sem2	Sem3	semtot	pa	gat	rvc	pvc	lat	oall
raji	m	6	pub	2	3	0	0	0	0	0	5	1	0	1	6
kado	f	5	pub	4	10	2	1	4	7	2	23	11	0	11	34
alco	m	6	pub	4	10	2	1	4	7	4	25	8	2	10	35
dico	m	6	pub	3	10	2	1	4	7	6	26	12	4	16	42
tama	m	6	pub	4	10	2	0	4	6	4	24	11	8	19	43
tsian	f	6	pub	3	10	2	0	4	6	6	25	11	2	13	38
mpoza	m	6	pub	2	10	2	1	4	7	2	21	5	1	6	27
papa	m	6	pub	4	3	2	1	4	7	1	15	6	5	11	26
tsitho	m	5	pub	4	10	2	1	4	7	0	21	13	0	13	34
vouar	f	6	pub	5	7	2	2	4	8	6	26	12	0	12	38
zaal	m	5	pub	4	9	2	0	4	6	6	25	8	0	8	33
kajo	m	6	pub	5	7	2	1	4	7	6	25	8	6	14	39
faji	m	5	pub	4	10	2	1	4	7	2	23	6	5	11	34
moan	f	5	pub	2	3	2	0	4	6	1	12	11	2	13	25
best	m	5	pub	3	9	1	0	4	5	3	20	12	0	12	32
zala	f	5	pub	3	8	2	0	3	5	0	16	6	0	6	22
pahe	f	5	pub	0	2	2	0	4	6	2	10	6	5	11	21
zama	f	5	pub	3	10	1	0	4	5	4	22	8	0	8	30
kyfi	m	5	pub	3	2	0	0	1	1	1	7	10	3	13	20
fifa	m	5	pub	3	2	1	0	4	5	3	13	9	0	9	22
poma	f	6	prs	3	10	2	2	3	7	3	23	7	1	8	31
tsajo	m	6	prs	2	10	2	0	4	6	6	24	8	0	8	32
alji	m	6	prs	4	10	2	0	4	6	6	26	9	4	13	39
pama	f	6	prs	3	6	2	1	4	7	2	18	8	5	13	31
kouma	f	6	prs	5	10	2	1	3	6	3	24	7	0	7	31
tsima	f	5	prs	5	9	2	1	4	7	2	23	9	2	11	34
mpode	f	5	prs	4	4	2	0	4	6	3	17	3	2	5	22
chaan	f	6	prs	7	10	2	0	3	5	6	28	9	1	10	38
kako	m	5	prs	3	7	1	2	4	7	6	23	5	0	5	28
agag	m	5	prs	3	7	2	0	3	5	2	17	13	1	14	31
tsial	f	6	prs	7	10	2	1	4	7	2	26	6	1	7	33
xeka	f	6	prs	3	7	2	0	3	5	2	17	18	4	22	39
tzosta	f	6	prs	2	3	1	0	4	5	3	13	10	8	18	31
kadi	f	5	prs	4	8	2	0	4	6	4	22	5	4	9	31
kaev	m	6	prs	4	5	2	0	2	4	6	19	7	2	9	28
tsige	m	6	prs	5	4	2	0	2	4	6	19	8	4	12	31

koli	f	6	prs	6	3	2	0	3	5	3	17	3	1	4	21
pasta	m	5	prs	2	7	2	0	3	5	1	15	12	2	14	29
kouspy	m	6	prs	6	10	1	1	2	4	2	22	14	8	22	44
antan	m	5	prs	5	6	2	1	4	7	0	18	15	2	17	35
mpala	m	5	prs	2	3	1	0	2	3	1	9	2	0	2	11
plias	f	5	prs	4	8	2	2	4	8	2	22	13	8	21	43
dage	m	7	einst	7	10	2	0	4	6	6	29	13	6	19	48
sach	m	7	einst	4	9	2	1	3	6	0	19	13	10	23	42
moudro	m	7	einst	4	10	2	2	4	8	1	23	20	14	34	57
athpa	m	7	einst	3	10	2	1	2	5	3	21	15	9	24	45
aththa	m	7	einst	6	4	2	2	3	7	4	21	16	8	24	45
sile	m	7	einst	1	4	2	0	3	5	4	14	5	4	9	23
osfi	f	7	einst	6	2	2	0	4	6	0	14	10	1	11	25
spava	f	7	einst	3	4	2	0	3	5	0	12	4	4	8	20
chade	f	7	einst	4	10	2	2	4	8	2	24	15	12	27	51
mebi	m	7	einst	2	6	2	0	4	6	1	15	5	1	6	21
kyel	f	6	einst	3	10	2	0	4	6	3	22	11	3	14	36
miko	m	6	einst	3	3	2	1	4	7	1	14	12	4	16	30
chama	f	7	einst	6	9	2	1	4	7	4	26	15	7	22	48
mois	f	7	einst	4	9	2	0	4	6	1	20	3	2	5	25
kase	m	7	einst	2	2	2	1	3	6	6	16	18	10	28	44
peni	m	7	einst	4	7	2	0	4	6	4	21	12	5	17	38
chaar	m	7	einst	4	9	2	1	4	7	6	26	15	8	23	49
chch	m	7	einst	5	6	2	0	3	5	6	22	18	12	30	52
paste	m	6	einst	3	4	2	0	3	5	2	14	3	0	3	17
sipa	m	7	einst	6	10	2	2	4	8	6	30	12	6	18	48
tsiza	f	7	einst	1	5	2	0	3	5	2	13	9	1	10	23
mama	f	7	einst	5	10	2	0	3	5	6	26	15	11	26	52
alag	m	6	einst	6	7	2	0	4	6	3	22	11	4	15	37
made	f	7	einst	6	10	2	2	4	8	2	26	15	5	20	46

APPENDIX 12

Cognitive test and foreign language test (June 2003)

Child's name: Place:
Child's age:

1. **Paired associates (short term memory)**

Pairs	**Success**
1.ship-cake	
2.car-kite	
3.butterfly-iron	
4.camera-cup	
5.fish-aeroplane	
6.policeman-apple	
Researcher's comments	

2. **Jigsaw puzzle**

Items	**Items correctly fitted**
1. bee and flower item	
2. butterfly and flower item	
3. tree item	
4. house item	
Researcher's comments	

3. **Receptive vocabulary**

Words tested	**Success**
1.book	
2.yo-yo	
3.girl	
4.monkey	
5.king	
6.fish	
7.umbrella	

8.lion	
9.boy	
10.octopus	
11.queen	
12.seahorse	
13.elephant	
14.drum	
15.fox	
16.violin	
17.trumpet	
18.notebook	
19.jigsaw	
20.monster	
Researcher's comments	

4. **Productive vocabulary**

Words tested	**Success**
1.red	
2.orange	
3.yellow	
4.green	
5.blue	
6.purple	
7.eyes	
8.mouth	
9.ears	
10.head	
11.hair	
12.nose	
13.giraffe	
14.zebra	
15.pencil	
16.rubber	
17.summer	
18.winter	
19.autumn	
20.spring	
Researcher's comments	

5. Paired associates (long term memory)

Pairs	Success
1.ship-cake	
2.car-kite	
3.butterfly-iron	
4.camera-cup	
5.fish-aeroplane	
6.policeman-apple	
Researcher's comments	

APPENDIX 13

Individual scores for each task (June 2003)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)

name	gender	age	school	shortpa	jigsaw	Longpa	gatot	recvoc	provoc	langtot	overall
raji	m	6	pub	3	1	2	6	1	0	1	7
kado	f	5	pub	2	4	2	8	11	0	11	19
alco	m	6	pub	6	4	4	14	8	2	10	24
dico	m	6	pub	6	4	6	16	12	4	16	32
tama	m	6	pub	3	4	4	11	11	8	19	30
tsian	f	6	pub	6	2	6	14	11	2	13	27
mpoza	m	6	pub	4	4	4	12	5	1	6	18
papa	m	6	pub	2	3	0	5	6	5	11	16
tsitho	m	5	pub	4	4	4	12	13	0	13	25
vouar	f	6	pub	6	4	4	14	12	0	12	26
zaal	m	5	pub	4	2	4	10	8	0	8	18
kajo	m	6	pub	3	4	2	9	8	6	14	23
faji	m	5	pub	6	2	3	11	6	5	11	22
moan	f	5	pub	3	4	1	8	11	2	13	21
best	m	5	pub	6	4	6	16	12	0	12	28
zala	f	5	pub	6	4	6	16	6	0	6	22
pahe	f	5	pub	4	4	0	8	6	5	11	19
zama	f	5	pub	6	0	6	12	8	0	8	20
kyfi	m	5	pub	6	3	6	15	10	3	13	28
fifa	m	5	pub	2	2	1	5	9	0	9	14
poma	f	6	prs	4	2	4	10	7	1	8	18
tsajo	m	6	prs	4	4	4	12	8	0	8	20
alji	m	6	prs	1	4	0	5	9	4	13	18
pama	f	6	prs	0	4	1	5	8	5	13	18
kouma	f	6	prs	1	2	3	6	7	0	7	13
tsima	f	5	prs	2	4	2	8	9	2	11	19
mpode	f	5	prs	3	1	4	8	3	2	5	13
chaan	f	6	prs	4	1	4	9	9	1	10	19
kako	m	5	prs	0	4	0	4	5	0	5	9
agag	m	5	prs	2	3	2	7	13	1	14	21
tsial	f	6	prs	4	4	4	12	6	1	7	19
xeka	f	6	prs	4	4	2	10	18	4	22	32
tzosta	f	6	prs	3	2	1	6	10	8	18	24
kadi	f	5	prs	6	0	3	9	5	4	9	18
kaev	m	6	prs	3	1	2	6	7	2	9	15
tsige	m	6	prs	3	1	3	7	8	4	12	19
koli	f	6	prs	4	0	2	6	3	1	4	10
pasta	m	5	prs	2	0	3	5	12	2	14	19
kouspy	m	6	prs	6	4	4	14	14	8	22	36
antan	m	5	prs	1	1	1	3	15	2	17	20
mpala	m	5	prs	1	0	4	5	2	0	2	7

plias	f	5	prs	4	4	2	10	13	8	21	31
dage	m	7	Einst	4	4	4	12	13	6	19	31
sach	m	7	Einst	1	3	2	6	13	10	23	29
moudro	m	7	Einst	1	4	1	6	20	14	34	40
athpa	m	7	Einst	1	4	2	7	15	9	24	31
aththa	m	7	Einst	0	4	0	4	16	8	24	28
sile	m	7	Einst	0	1	0	1	5	4	9	10
osfi	f	7	Einst	2	1	2	5	10	1	11	16
spava	f	7	Einst	2	2	1	5	4	4	8	13
chade	f	7	Einst	4	1	3	8	15	12	27	35
mebi	m	7	Einst	3	2	4	9	5	1	6	15
kyel	f	6	Einst	4	4	1	9	11	3	14	23
miko	m	6	Einst	3	1	6	10	12	4	16	26
chama	f	7	Einst	6	4	6	16	15	7	22	38
mois	f	7	Einst	2	2	2	6	3	2	5	11
kase	m	7	Einst	4	4	3	11	18	10	28	39
peni	m	7	Einst	1	2	1	4	12	5	17	21
chaar	m	7	Einst	3	4	4	11	15	8	23	34
chch	m	7	Einst	6	4	6	16	18	12	30	46
paste	m	6	Einst	1	4	0	5	3	0	3	8
sipa	m	7	Einst	2	3	2	7	12	6	18	25
tsiza	f	7	Einst	0	0	1	1	9	1	10	11
mama	f	7	Einst	2	4	4	10	15	11	26	36
alag	m	6	Einst	6	2	4	12	11	4	15	27
made	f	7	Einst	2	4	2	8	15	5	20	28

APPENDIX 14

Cognitive test (January 2004)

Child's name: Place:
Child's age:

1. Paired associates (short term memory)

Pairs	**Success**
1.aeroplane- exagon with circle	
2.guitar- square with dot	
3.turtle- circle with arrow	
4.telephone- little triangle with line	
5.umbrella- circle with triangle	
6.sun- diamond with cross	
Researcher's comments	

2. Visual perception

Objects	**Success**
1. teddy-bear	
2. butterfly	
3. frog	
4. sock	
5. snake	
6. sweater	
Researcher's comments	

3. Phonetic discrimination test

Repeat	Success
σέμι	
□μ□	
□□□□	
□□□□□σ□	
□□□ε□□μ□	
Discriminate	
□έσ□-□□σ□	
□□ι-□□ι	
μ□□□□-μ□□□□	
□□□έ□ι-□□□έ□ι	
□σ□έμε-□□□έμε	
Recall	
□μ□ **yes**	
□ι□ι **yes**	
□εμ□□σ□ **no**	
□□□έμι **no**	
□□ε□ι **no**	
σεμ□ **yes**	
□□□□□ε□□ **no**	
Researcher's comments	

4. Spatial perception

Objects	Success
1. dog	
2. armchair	
3. lamp	
4. slipper	
5. bed	
6. book	
7. train	
Researcher's comments	

5. Story sequence

Sequence	Success
1. Max wakes up	
2. Max brushes his teeth	
3. Max gets dressed	
4. Max eats his breakfast	
Researcher's comments	

APPENDIX 15

Individual scores for each task (January 2004)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)
Note: The abbreviations for each task are shortened for reasons of space

name	school	gender	age	Pair ass3	vis perc	phdis rep	phdis dis	phdis rec	phdis tot	spat per	story seq	over all
niba	Prs	m	5	4	4	3	2	4	9	6	2	25
evpo	Prs	f	5	4	5	3	3	4	10	6	2	27
elal	Prs	f	5	4	5	4	4	4	12	6	1	28
geko	prs	m	5	2	5	2	3	4	9	7	4	27
vaka	prs	m	5	4	5	1	3	2	6	7	2	24
anex	prs	f	5	1	0	3	2	4	9	6	1	17
elba	prs	f	5	4	4	3	1	5	9	6	0	23
papr	prs	m	5	4	3	4	2	2	8	5	1	21
pazi	pub	m	5	1	4	3	4	5	12	7	2	26
nepr	pub	f	5	3	5	4	5	3	12	7	2	29
thka	pub	m	5	3	6	4	4	2	10	6	0	25
niko	pub	m	5	6	4	3	3	4	10	5	0	25
jime	pub	m	5	1	5	4	5	4	13	6	2	27
vile	pub	f	5	0	4	3	2	4	9	4	0	17
mast	pub	f	5	6	6	4	1	5	10	7	0	29
pete	pub	m	5	3	4	5	4	4	13	5	0	25
heki	pub	m	5	3	4	3	3	4	10	7	4	28
jina	pub	m	5	1	3	3	1	2	6	7	0	17
acgi	pub	m	5	0	0	4	2	2	8	0	2	10
geal	pub	m	5	4	4	4	4	5	13	5	0	26
vino	pub	f	5	2	4	4	4	2	10	6	1	23
jots	pub	m	5	2	2	5	1	2	8	7	2	21
jodi	pub	m	5	4	4	4	3	5	12	5	1	26
geky	pub	m	5	3	4	2	1	2	5	7	0	19
arka	pub	f	5	1	2	4	3	2	9	0	0	12
maat	prs	f	6	0	3	4	2	2	8	7	2	20
stha	prs	f	6	3	6	3	1	2	6	7	2	24
koge	prs	m	6	4	6	3	1	4	8	4	0	22
kavi	prs	f	6	2	3	4	2	5	11	7	4	27
thtz	prs	m	6	4	5	3	3	6	12	6	4	31
dika	prs	f	6	1	4	4	4	3	11	7	4	27
evpa	prs	f	6	3	4	3	2	3	8	7	2	24
vach	prs	f	6	1	4	5	5	7	17	6	1	29
kogeb	prs	m	6	4	5	3	4	6	13	7	2	31
pori	prs	m	6	3	6	3	1	1	5	7	4	25
ilai	prs	m	6	3	6	4	4	4	12	7	4	32
thpe	prs	m	6	3	6	3	5	3	11	7	4	31

apfr	prs	m	6	2	4	5	2	5	12	7	4	29
irge	pub	f	6	2	6	3	4	5	12	7	4	31
geam	pub	m	6	4	6	4	3	6	13	5	4	32
mive	pub	m	6	6	6	5	4	6	15	6	0	33
geio	pub	m	6	3	4	4	4	2	10	7	1	25
fapo	pub	f	6	3	5	5	3	2	10	7	2	27
anpo	pub	f	6	4	6	5	4	4	13	6	2	31
anlo	pub	f	6	1	4	3	2	6	11	7	4	27
elko	pub	f	6	2	3	4	0	2	6	7	0	18
ifko	pub	f	6	1	5	4	1	2	7	7	4	24
then	einst	m	7	3	4	4	4	6	14	7	0	28
stko	einst	f	7	2	4	4	4	6	14	5	0	25
mapa	einst	f	7	2	5	5	5	5	15	7	1	30
geso	einst	m	7	1	5	3	3	6	12	7	0	25
evts	einst	f	7	4	6	5	3	6	14	7	1	32
niky	prs	m	7	3	3	3	2	3	8	5	1	20
evak	einst	m	7	2	4	3	4	6	13	7	4	30
arkab	einst	f	7	3	4	4	2	3	9	7	2	25
elpa	einst	f	7	1	6	4	1	4	9	5	0	21
elpab	einst	f	7	2	5	3	3	6	12	7	0	26
evar	einst	f	8	3	4	5	4	5	14	7	4	32
agal	einst	m	8	4	3	5	2	5	12	7	2	28
nikob	einst	m	8	6	6	4	3	4	11	7	2	32
agdo	einst	f	8	4	4	4	3	5	12	7	2	29
bimi	einst	m	8	3	5	3	2	4	9	7	4	28
ioko	einst	f	8	6	5	3	4	4	11	7	4	33
ampa	einst	f	8	6	5	3	1	2	6	7	4	28
vake	einst	f	8	6	6	5	4	5	14	7	4	37
maar	einst	f	8	6	6	3	3	6	12	7	4	35
efha	einst	f	8	1	6	5	4	4	13	7	4	31
chsa	einst	m	8	6	6	3	3	6	12	7	4	35
deki	einst	f	8	3	5	4	2	1	7	7	4	26
chka	einst	m	8	3	6	5	4	5	14	7	2	32
joka	einst	m	8	2	5	5	3	5	13	7	4	31
stpa	einst	m	8	2	5	5	5	7	17	7	4	35
kaba	einst	f	8	6	3	3	4	5	12	7	2	30
elky	einst	f	8	6	5	4	3	3	10	7	2	30
kopa	einst	m	8	4	4	5	2	2	9	7	2	26
sovo	einst	f	8	4	4	3	2	5	10	7	2	27
nila	einst	m	8	4	6	4	4	2	10	5	4	29
disa	einst	f	9	6	4	3	4	0	7	7	0	24
chpe	einst	m	9	3	5	3	2	2	7	7	4	26
pasi	einst	m	9	6	4	4	5	5	14	7	4	35
maha	einst	f	9	6	6	4	4	5	13	7	4	36
elts	einst	f	9	6	5	4	5	5	14	7	4	36
chko	einst	f	9	4	6	5	4	4	13	7	0	30
irka	einst	f	9	4	5	3	5	4	12	7	4	32
docl	einst	f	9	6	6	5	5	4	14	7	4	37
iovi	einst	f	9	6	5	5	4	4	13	7	4	35
anch	einst	m	9	2	6	5	4	6	15	7	4	34

xeto	einst	f	9	1	5	1	2	5	8	6	1	21
arha	einst	m	9	6	6	4	3	5	12	7	4	35
zats	einst	f	9	2	1	3	1	2	6	5	1	15
nibe	einst	m	9	4	4	3	2	4	9	7	2	26

APPENDIX 16

Foreign language test (June 2004)

1. Receptive vocabulary

Words tested	Success
1. jeans	
2. orange	
3. man	
4. cow	
5. lemon	
6. zebra	
7. telephone	
8. violin	
9. milk	
10. airplane	
11. woman	
12. frog	
13. open book	
14. close book	
15. elephant	
16. monkeys	
17. seahorse	
18. shoes	
19. egg	
20. apple	
21. grapes	
22. pencil	
23. hello	
24. goodbye	
25. pear	
26. milk	
27. car	
28. book	
29.giraffe	
30. fish	

2. Productive vocabulary

Words tested	Success
1. red	
2. blue	
3. yellow	
4. green	
5. orange	
6. ice-cream	
7. dog	
8. watermelon	
9. house	
10. cheese	
11. dance	
12. present	
13. umbrella	
14. bag	
15. jump	
16. horse	
17. hippo	
18.socks	
19. sit down	
20. stand up	
21. skirt	
22. drum	
23. rubber	
24. mouse	
25. cat	
26. rabbit	
27. octopus	
28. cake	
29. duck	
30. balloons	

APPENDIX 17

Individual scores for each task (January-June 2004)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)
Note: The abbreviations for each task are shortened for reasons of space

name	school	gender	age	pairass3	visperc	phdisrep	phdisdis	phdisrec	phdistot	spatper	storyseq	apttot	recvoc	prodvoc	langtot	overall
niba	prs	m	5	4	4	3	2	4	9	6	2	25	6	0	6	31
evpo	prs	f	5	4	5	3	3	4	10	6	2	27	14	6	20	47
elal	prs	f	5	4	5	4	4	4	12	6	1	28	15	9	24	52
geko	prs	m	5	2	5	2	3	4	9	7	4	27	5	4	9	36
vaka	prs	m	5	4	5	1	3	2	6	7	2	24	10	0	10	34
anex	prs	f	5	1	0	3	2	4	9	6	1	17	5	1	6	23
papr	prs	m	5	4	3	4	2	2	8	5	1	21	4	0	4	25
pazi	pub	m	5	1	4	3	4	5	12	7	2	26	17	5	22	48
jime	pub	m	5	1	5	4	5	4	13	6	2	27	18	12	30	57
vile	pub	f	5	0	4	3	2	4	9	4	0	17	5	2	7	24
pete	pub	m	5	3	4	5	4	4	13	5	0	25	19	10	29	54
geal	pub	m	5	4	4	4	4	5	13	5	0	26	5	3	8	34
vino	pub	f	5	2	4	4	4	2	10	6	1	23	3	0	3	26
jots	pub	m	5	2	2	5	1	2	8	7	2	21	1	0	1	22
jodi	pub	m	5	4	4	4	3	5	12	5	1	26	8	3	11	37
geky	pub	m	5	3	4	2	1	2	5	7	0	19	10	4	14	33
arka	pub	f	5	1	2	4	3	2	9	0	0	12	3	3	6	18
maat	prs	f	6	0	3	4	2	2	8	7	2	20	7	3	10	30
stha	prs	f	6	3	6	3	1	2	6	7	2	24	18	8	26	50

koge	prs	m	6	4	6	3	1	4	8	4	0	22	10	15	25	47
thtz	prs	m	6	4	5	3	3	6	12	6	4	31	10	5	15	46
dika	prs	f	6	1	4	4	4	3	11	7	4	27	9	7	16	43
evpa	prs	f	6	3	4	3	2	3	8	7	2	24	8	0	8	32
vach	prs	f	6	1	4	5	5	7	17	6	1	29	8	5	13	42
pori	prs	m	6	3	6	3	1	1	5	7	4	25	5	3	8	33
ilai	prs	m	6	3	6	4	4	4	12	7	4	32	10	7	17	49
thpe	prs	m	6	3	6	3	5	3	11	7	4	31	8	13	21	52
apfr	prs	m	6	2	4	5	2	5	12	7	4	29	10	7	17	46
geam	pub	m	6	4	6	4	3	6	13	5	4	32	6	2	8	40
mive	pub	m	6	6	6	5	4	6	15	6	0	33	14	3	17	50
geio	pub	m	6	3	4	4	4	2	10	7	1	25	14	4	18	43
fapo	pub	f	6	3	5	5	3	2	10	7	2	27	6	4	10	37
anpo	pub	f	6	4	6	5	4	4	13	6	2	31	10	4	14	45
anlo	pub	f	6	1	4	3	2	6	11	7	4	27	5	2	7	34
elko	pub	f	6	2	3	4	0	2	6	7	0	18	2	0	2	20
ifko	pub	f	6	1	5	4	1	2	7	7	4	24	5	2	7	31
then	einst	m	7	3	4	4	4	6	14	7	0	28	19	16	35	63
stko	einst	f	7	2	4	4	4	6	14	5	0	25	18	15	33	58
mapa	einst	f	7	2	5	5	5	5	15	7	1	30	20	20	40	70
geso	einst	m	7	1	5	3	3	6	12	7	0	25	15	12	27	52
evts	einst	f	7	4	6	5	3	6	14	7	1	32	23	20	43	75
niky	prs	m	7	3	3	3	2	3	8	5	1	20	9	0	9	29
arkab	einst	f	7	3	4	4	2	3	9	7	2	25	8	4	12	37
elpa	einst	f	7	1	6	4	1	4	9	5	0	21	11	8	19	40
evar	einst	f	8	3	4	5	4	5	14	7	4	32	17	6	23	55
agal	einst	m	8	4	3	5	2	5	12	7	2	28	22	10	32	60
nikob	einst	m	8	6	6	4	3	4	11	7	2	32	9	5	14	46
bimi	einst	m	8	3	5	3	2	4	9	7	4	28	21	23	44	72
ioko	einst	f	8	6	5	3	4	4	11	7	4	33	21	10	31	64
ampa	einst	f	8	6	5	3	1	2	6	7	4	28	13	6	19	47
vake	einst	f	8	6	6	5	4	5	14	7	4	37	15	10	25	62
maar	einst	f	8	6	6	3	3	6	12	7	4	35	17	10	27	62

efha	einst	f	8	1	6	5	4	4	13	7	4	31	18	13	31	62
deki	einst	f	8	3	5	4	2	1	7	7	4	26	7	4	11	37
chka	einst	m	8	3	6	5	4	5	14	7	2	32	15	10	25	57
stpa	einst	m	8	2	5	5	5	7	17	7	4	35	19	15	34	69
elky	einst	f	8	6	5	4	3	3	10	7	2	30	10	8	18	48
kopa	einst	m	8	4	4	5	2	2	9	7	2	26	10	5	15	41
nila	einst	m	8	4	6	4	4	2	10	5	4	29	24	20	44	73
disa	einst	f	9	6	4	3	4	0	7	7	0	24	25	20	45	69
pasi	einst	m	9	6	4	4	5	5	14	7	4	35	24	11	35	70
maha	einst	f	9	6	6	4	4	5	13	7	4	36	18	14	32	68
elts	einst	f	9	6	5	4	5	5	14	7	4	36	26	22	48	84
chko	einst	f	9	4	6	5	4	4	13	7	0	30	19	11	30	60
irka	einst	f	9	4	5	3	5	4	12	7	4	32	15	7	22	54
docl	einst	f	9	6	6	5	5	4	14	7	4	37	20	10	30	67
iovi	einst	f	9	6	5	5	4	4	13	7	4	35	15	13	28	63
anch	einst	f	9	2	6	5	4	6	15	7	4	34	27	28	55	89
xeto	einst	f	9	1	5	1	2	5	8	6	1	21	26	21	47	68
arha	einst	m	9	6	6	4	3	5	12	7	4	35	22	16	38	73
zats	einst	f	9	2	1	3	1	2	6	5	1	15	10	7	17	32
nibe	einst	m	9	4	4	3	2	4	9	7	2	26	15	14	29	55

APPENDIX 18

CD ROM

Attached in pocket a rear of thesis

APPENDIX 19
Individual scores for each task (June 2004)

Names are coded to protect the subjects' anonymity
Abbreviations: private nursery school (prs), public school (pub), English language school (einst)

name	school	gender	age	mem	classif	differs	pairassf	jigsawf	seminf	storysf	apttot	recvoc	prodvoc	langtot	overall
niba	prs	M	5	6	23	6	2	8	12	3	60	6	0	6	66
evpo	prs	F	5	8	43	7	9	7	10	10	94	14	6	20	114
elal	prs	F	5	6	48	11	14	7	9	10	105	15	9	24	129
geko	prs	M	5	8	42	10	3	8	8	8	87	5	4	9	96
vaka	prs	M	5	7	37	3	7	9	9	4	76	10	0	10	86
anex	prs	F	5	10	23	6	0	6	11	1	57	5	1	6	63
papr	prs	M	5	6	22	2	2	6	9	1	48	4	0	4	52
pazi	pub	M	5	7	46	6	7	8	10	7	91	17	5	22	113
jime	pub	M	5	9	48	15	14	9	8	10	113	18	12	30	143
vile	pub	F	5	5	47	4	10	9	5	2	82	5	2	7	89
pete	pub	M	5	5	45	17	12	9	7	9	104	19	10	29	133
geal	pub	M	5	7	29	5	5	9	7	4	66	5	3	8	74
vino	pub	F	5	4	46	2	8	9	4	5	78	3	0	3	81
jots	pub	M	5	2	44	0	1	4	10	2	63	1	0	1	64
jodi	pub	M	5	11	48	5	4	7	11	3	89	8	3	11	100
geky	pub	M	5	9	48	8	14	5	12	3	99	10	4	14	113
arka	pub	F	5	6	32	7	3	7	6	5	66	3	3	6	72
maat	prs	F	6	10	42	10	1	7	10	5	85	7	3	10	95
stha	prs	F	6	11	46	7	12	9	10	10	105	18	8	26	131
koge	prs	M	6	8	34	7	5	8	8	5	75	10	15	25	100
thtz	prs	M	6	6	27	11	4	8	10	10	76	10	5	15	91
dika	prs	F	6	10	36	5	3	8	10	1	76	9	7	16	92
evpa	prs	F	6	10	46	7	1	3	6	1	74	8	0	8	82
vach	prs	F	6	9	39	9	0	6	9	6	78	8	5	13	91
pori	prs	M	6	12	43	3	0	8	6	2	74	5	3	8	82
ilai	prs	M	6	10	35	6	5	8	11	6	81	10	7	17	98

thpe	prs	M	6	10	38	8	10	8	8	7	89	8	13	21	110
apfr	prs	M	6	5	43	12	2	7	9	4	82	10	7	17	99
geam	pub	M	6	7	47	7	4	9	8	5	87	6	2	8	95
mive	pub	M	6	7	48	4	7	8	9	10	93	14	3	17	110
geio	pub	M	6	7	33	5	4	8	10	3	70	14	4	18	88
fapo	pub	F	6	10	46	7	6	8	12	5	94	6	4	10	104
anpo	pub	F	6	7	44	7	7	9	7	1	82	10	4	14	96
anlo	pub	F	6	6	26	4	2	5	11	3	57	5	2	7	64
elko	pub	F	6	4	32	4	4	6	8	7	65	2	0	2	67
ifko	pub	F	6	13	16	6	3	0	9	2	49	5	2	7	56
then	einst	M	7	10	48	16	14	9	8	10	115	19	16	35	150
stko	einst	F	7	8	47	15	13	9	15	10	117	18	15	33	150
mapa	einst	F	7	13	41	13	12	9	9	3	100	20	20	40	140
geso	einst	M	7	14	34	7	8	9	10	10	92	15	12	27	119
evts	einst	F	7	8	48	15	14	9	12	10	116	23	20	43	159
niky	prs	M	7	0	15	4	4	7	10	1	41	9	0	9	50
arkab	einst	F	7	14	21	3	5	4	6	8	61	8	4	12	73
elpa	einst	F	7	9	37	9	11	9	10	5	90	11	8	19	109
evar	einst	F	8	9	46	9	6	9	11	4	94	17	6	23	117
agal	einst	M	8	8	45	15	5	9	10	5	97	22	10	32	129
nikob	einst	M	8	3	47	9	6	8	10	4	87	9	5	14	101
bimi	einst	M	8	9	48	8	10	8	14	10	107	21	23	44	151
ioko	einst	F	8	4	34	5	9	9	13	6	80	21	10	31	111
ampa	einst	F	8	9	48	9	6	8	14	10	104	13	6	19	123
vake	einst	F	8	11	46	11	12	9	10	5	104	15	10	25	129
maar	einst	F	8	12	48	12	12	8	15	10	117	17	10	27	144
efha	einst	F	8	11	38	4	2	9	11	6	81	18	13	31	112
deki	einst	F	8	9	46	13	5	9	12	4	98	7	4	11	109
chka	einst	M	8	9	46	9	12	9	8	5	98	15	10	25	123
stpa	einst	M	8	7	40	9	2	8	10	5	81	19	15	34	115
elky	einst	F	8	8	46	11	10	9	12	5	101	10	8	18	119
kopa	einst	M	8	6	48	9	4	5	13	10	95	10	5	15	110
nila	einst	M	8	9	48	7	5	7	14	10	100	24	20	44	144

disa	einst	F	9	8	39	16	14	9	14	10	110	25	20	45	155
pasi	einst	M	9	9	40	7	4	9	11	4	84	24	11	35	119
maha	einst	F	9	15	47	13	6	9	13	2	105	18	14	32	137
elts	einst	F	9	11	45	7	11	8	7	6	95	26	22	48	143
chko	einst	F	9	11	48	5	2	9	8	4	87	19	11	30	117
irka	einst	F	9	6	29	9	8	9	7	4	72	15	7	22	94
docl	einst	F	9	14	48	13	12	8	13	10	118	20	10	30	148
iovi	einst	F	9	10	44	7	9	7	8	2	87	15	13	28	115
anch	einst	F	9	11	48	11	11	8	17	10	116	27	28	55	171
xeto	einst	F	9	9	44	15	4	9	11	4	96	26	21	47	143
arha	einst	M	9	14	46	11	14	8	8	5	106	22	16	38	144
zats	einst	F	9	3	11	1	3	3	11	0	32	10	7	17	49
nibe	einst	M	9	7	36	11	12	8	10	5	89	15	14	29	118

APPENDIX 20 : Testing elements for all studies

First study (January 2002)

1. Short term visual memory
2. Categorisation
3. Inductive learning ability
4. Visual perception

Second study (June 2002)

1. Short term memory
2. Phonetic memory
3. Semantic integration (recall of order and missing elements)
4. Visual perception

Third study (January 2003)

1. Short term memory
2. Inductive learning ability
3. Semantic integration
4. Associative memory

Fourth study (June 2003)

1. Short term associative memory
2. Spatial ability
3. Long term associative memory

Fifth study (January 2004)

1. Associative memory
2. Visual perception
3. Phonetic discrimination
4. Spatial perception
5. Reasoning ability

Sixth study (June 2004)

1. Rote memory
2. Deductive learning ability
3. Visual perception
4. Associative memory
5. Spatial ability
6. Semantic integration
7. Reasoning/ inductive learning ability

REFERENCES

Alexiou, T. (2003) 'Greek Teachers' Preferences in ELT Methodology for the Teaching of Vocabulary', in Mela-Athanasopoulou, E. (ed) *Selection of Proceedings for the 15th Symposium of Theoretical and Applied Linguistics*, Thessaloniki, Greece: Aristotle University of Thessaloniki Press

Aitchison, J. (1987) *Words in Mind*, Oxford: Blackwell

Anderson J.R. (ed) (1981) *Cognitive Skills and Their Acquisition*, New Jersey: Lawrence Erlbaum Associates, Inc.

Anderson, J.R. (2000) *Cognitive Psychology and its Implications*, (5th Ed.), New York: Worth

Andrews, J., Hunter, M., Joyce, H., O'Brien, T., Thorp, D. and Superfine, W. (2000) *Teaching English to Young Learners*, Patra, Greece: Hellenic Open University

Asher, J. (1981) 'The Total Physical Response: Theory and Practice', in Winitz, H. (ed) (1981), *Native and Foreign Language Acquisition*, New York: New York Academy of Sciences

Asher, J. and García, R. (1969) 'The optimal age to learn a foreign language', *Modern Language Journal*, 53, 334-341

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

Bachman, L.F. (1990) *Fundamental considerations in language testing*, Oxford: OUP

Baddeley, A. D. (1986) *Working Memory*, Oxford: OUP

Baddeley, A. D. (1990) *Human Memory: Theory and Practice*, London: Erlbaum

Baddeley, A. D. and Hitch, G. (1974) 'Working Memory', in Bower, G. H. (ed) (1974) *The psychology of learning and motivation*, New York: Academic Press

Baddeley, A. D. and Hitch, G. (1996) 'Commentary on 'Working memory' in Brosnan, M. J. (ed) (1996) *Cognitive Processes: Readings in Visual Cognition, Attention and Memory*, Kent: Greenwich University Press

Bergen, D. and Mauer, D. (2000) 'Symbolic Play, Phonological Awareness, and Literacy Skills at Three Age Levels', in Roskos, K.A. and Christie, J.F. (eds) (2000) *Play and*

Literacy in Early Childhood, Research From Multiple Perspectives, London: Lawrence Erlbaum Associates

Bernstein, B. (1960) 'Language and social class', *British Journal and Sociology*, 11, 271-276

Bever, T. G. (1970) 'The comprehension and memory of sentences with temporal relations', in D'Arcais, F. and Levelt, W. J. M. (eds) (1970) *Advances in Psycholinguistics*, Amsterdam: North-Holland

Bialystok, E. (1981) 'The role of conscious strategies in second language proficiency', *Modern Language Journal*, 65, 24-35

Bialystok, E. (1991) *Language Processing in Bilingual Children*, Cambridge: CUP

Bialystok, E. (1997) 'The structure of age: in search of barriers of second language acquisition', *Second Language Research* 13(2), 116-137.

Bialystok, E., Shenfield, T. and Codd, J. (2000) 'Languages, Scripts, and the Environment: Factors in Developing Concepts of Print', *Developmental Psychology*, Vol. 36, No. 1, 66-76

Blenkin, G.M. *Assessment in early learning childhood education*, in Blenkin, G.M. and Kelly, A.V. (eds) (1992) *Assessment in Early Childhood Education*, London: PCP

Blenkin, G.M. and Kelly, A.V. (eds) (1987) *Early Childhood Education*, London: PCP

Brosnan, M. J. (ed) (1996) *Cognitive Processes: Readings in Visual Cognition, Attention and Memory*, Kent: Greenwich University Press

Brown, A.L. and DeLoache, J. S. (1983) 'Methods for observing developmental change in memory', in Donaldson, M., Grieve, R. and Pratt, C. (eds) (1983) *Early Childhood Development and Education, Readings in Psychology*, Oxford: Basil Blackwell

Browne, N. (1991) *Science and Technology in the Early Years*, Milton Keynes, Philadelphia: Open University Press

Bruck, M. (1992) 'Persistence of Dyslexics' Phonological Awareness Deficits', *Developmental Psychology*, 28, 5, 874-886

Bruner, J. (1983) *Child's Talk*, London: Norton

Bruner, J. (1983) 'Intuitive and analytic thinking', in Donaldson, M., Grieve, R. and Pratt, C. (eds) (1983) *Early Childhood Development and Education, Readings in Psychology*, Oxford: Basil Blackwell

Burstall, C., Jamieson, M., Cohen, S., and Hargreaves, M. (1974) *Primary French in the*

Balance, Windsor: NFER Publishing Company

Bullock, A. (1975) *The Bullock Report: A language for life*, Department of Education and Science (DES), London: HMSO

Cameron, L. (1993) 'From Cognitive Psychology to Vocabulary Learning', *Research News*,3

Cameron, L. (2001) *Teaching Languages to Young Learners*, Cambridge: CUP

Carr, M. (2001) *Assessment in Early Childhood Settings*, London: PCP

Carroll, J. B. (1958) 'A factor analysis of two foreign language aptitude batteries', *Journal of General Psychology* 59, 3-19

Carroll, J. B. (1971) 'Implication of aptitude test research and psycholinguistic theory for foreign language teaching', Paper presented at the XVIIth International Congress, International Association of Applied Psychology; Liege *(ERIC Document Reproduction Service No. ED 057 071)*

Carroll, J. B. (1973) *Language, Thought and Reality: Selected Writings of Benjamin Lee Whorf*, Cambridge (Mass): Institute of Technology Press

Carroll, J. B. (1979) 'Psychometric Approaches to the Study of Language Abilities' in Fillmore, C.J., Kempler, D., and Wang, W.S.-Y. (eds) (1979) *Individual Differences in Language Ability and Language Behaviour*, New York: Academic Press

Carroll, J. B. (1981) 'Twenty five years of research on foreign language learning aptitude' in Diller, K.C. (ed) (1981) *Individual Differences and Universals in Language Learning Aptitude*, Rowley: Newbury House

Carroll, J. B. (1990) 'Cognitive abilities in foreign language aptitude: Then and Now' in Parry, T. and Stransfield, C. (1990) *Language Aptitude Reconsidered*, New Jersey: Centre for Applied Linguistics and Prentice Hall

Carroll, J. B. and Casagrande, J. B. (1958) 'Language Structuring Experience: Extract from 'The Function of language classifications in behaviour', in Maccoby, E.E., Newcomb, T. M. and Hartley, E. L. (eds) (1958) *Readings in Social Psychology*, (3rd ed), Holt, Rineheart, Winston

Carroll, J. B. and Sapon, S. M. (1958) *Modern Language Aptitude Test, Form A*, New York: The Psychological Corporation

Carroll, J. B. and Sapon, S. M. (1958b) *Modern Language Aptitude Test*; *Manual,* New York: The Psychological Corporation

Carroll, J.B. and Sapon, S.M. (1967) *Modern Language Aptitude Test- Elementary*, New York: The Psychological Corporation

Carroll, J. B. and Sapon, S. M. (2000) *Modern Language Aptitude Test MLAT, Manual*, Bethesda, Maryland, USA: Second Language Testing Inc

Carroll, J. B. and Sapon, S. M. (2002) *Modern Language Aptitude Test- Elementary Version,* Bethesda, Maryland, USA: Second Language Testing Inc

Carter, R. (1987) *Vocabulary*, London: Allen and Unwin

Carton, A. S. (1971) 'Inferencing: a process in using and learning language', in Pimsleur, P. and Quinn, T. (eds) (1971) *The Psychology of Second Language Learning*, Papers from the Second International Congress of Applied Linguistics, Cambridge, 8-12 September 1969

Case, R. (1977) *Intellectual and Linguistic Development in the Pre-school Years (Final Report)*, Chicago: The Spencer Foundation

Chase, W. G. and Ericsson, A. K. (1996) 'Skilled Memory' in Brosnan, M. J. (ed) (1996) *Cognitive Processes: Readings in Visual Cognition, Attention and Memory*, Kent: Greenwich University Press

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

Coady, J. and Huckin, T. (1997) *Second Language Acquisition*, Cambridge: CUP

Cohen, G., Kiss, G. and Le Voi, M. (1993) *Open Guides to Psychology, Memory Current Issues*, (2nd ed), Milton Keynes: Open University

Cook, S. (2002) 'Going Native', *Guardian Education*, 2, 30/4/2002

Cook, V. (1986) *Experimental Approaches to Second Language Learning*, Oxford: Pergamon

Cook, V. (1986) 'Do second language learners have a cognitive deficit?' in Cook, V. (1986) *Experimental Approaches to Second Language Learning*, Oxford: Pergamon

Cook, V. (1986) 'Experimental approaches applied to two areas of second language learning research: Age and listening-based teaching methods' in Cook, V. (1986) *Experimental Approaches to Second Language Learning*, Oxford: Pergamon

Cook, V. (1986) 'The basis for an Experimental Approach to SL learning' in Cook, V. (1986) *Experimental Approaches to Second Language Learning*, Oxford: Pergamon

Craik, F.I.M. and Lockhart, R.S. (1996) 'Levels of Processing: A Framework for Memory Research', in Brosnan, M. J. (ed) (1996) *Cognitive Processes: Readings in Visual Cognition, Attention and Memory*, Kent: Greenwich University Press

Cross, D. (1992) *A Practical Handbook of Language Teaching*, Hemel Hempstead: Prentice Hall

Cross, D. (1995) *A Practical Handbook of Language Teaching*, Bath: Bath Press

Cummins, J. (1981) 'The role of primary language development in promoting educational success for language minority students', in *Schooling and Language Minority Students: A Theoretical Framework*, Los Angeles: California State University; Evaluation, Dissemination, and Assessment Center

Daneman, M. and Case, R. (1981) 'Syntactic form, semantic complexity, and short-term memory (STM): influences on children's acquisition of new linguistic structures', Ontario Institute for Studies in Education, University of Toronto, Toronto, Ontario, Canada, *Developmental Psychology*,17, 4, 367-378

Davies, A. (ed) (1968) *Language Testing Symposium: A Psychological Approach*, London: OUP

Dean, J. (1983) *Organising Learning in the Primary School Classroom*, London: Routledge

DeKeyser, R. M. (2000) 'The robustness of critical period effects in second language acquisition', *Studies in Second Language Acquisition* 22, 4, 499- 533

Denis, M., Logie, R. H., Cornoldi, C., De Vega, M. and Engelkamp, J. (eds) (2001) *Imagery, Language and Visuo- Spatial Thinking*, Sussex: Psychology Press

Diller, K.C. (ed) (1981) *Individual Differences and Universals in Language Learning Aptitude*, Rowley: Newbury House Publishers

Donaldson, M. (1978) *Children's Minds*, London: Fontana Press

Donaldson, M., Grieve, R. and Pratt, C. (eds) (1983) *Early Childhood Development and Education, Readings in Psychology*, Oxford: Basil Blackwell

Doyle, T. and Meara, P. (1991) *Lingo! How to Learn a Language*, London: BBC

Ehrman, M. (1990) 'The role of personality type in Adult Language Learning: An Ongoing Investigation', in Parry, T. and Stransfield, C. (1990) *Language Aptitude Reconsidered*, New Jersey: Centre For Applied Linguistics and Prentice Hall

Ehrman, M. and Oxford, R. (1988) *Ants and grasshoppers, badgers and butterflies: Qualitative and quantitative exploration of adult language learning styles and strategies*, Paper presented at the Symposium on Research Perspectives on Adult Language Learning and Acquisition, Ohio State University, Columbus, OH.

Ehrman, M. and Oxford, R. (1995) 'Cognition plus: Correlates of language learning success' *Modern Language Journal*, 79, 67-89

Ellis, G. and Brewster, J. (1991) *The Storytelling Handbook for Primary Teachers*, London: Penguin

Ellis, N. (1996) 'Sequencing in SLA', *Studies in Second Language Acquisition*, 18, 91-126

Ellis, N. (1997) 'The Epigenesis of Language: Acquisition as a sequence learning problem', in *BAAL Evolving models of language,* British Association for Applied Linguistics in association with Multilingual Matters Ltd, 12

Ellis, N. (2001) 'Memory for language' in Robinson, P. (ed) (2001) *Cognition and Second Language Instruction*, Cambridge: CUP

Ellis, R. (ed.) (1999) *Learning a Second Language through Interaction*, Amsterdam: Benjamins

Ellis, R. and Tomlison, B. (1980) *Teaching Secondary English*, London: Longman

Esser, U. and Kossling, B. (1986) 'A general psychological approach to the diagnosis of foreign language aptitude' in Cook, V. (1986) *Experimental Approaches to Second Language Learning*, Oxford: Pergamon

Evaluating Language Learning Potential in Missionary Candidates, http://www.cmalliance.org/missions/serve/worddocs/langu1.doc (16/12/98)

Eysenck, M.W. and Keane, M.T. (eds) (2000) *Cognitive Psychology: A Student's Handbook*, Hove: Lawrence Erlbaum

Fay, S., Isingrini, M. and Clarys. D. (2003) 'Implicit and explicit memory: Do word-system and word fragment completion memory tasks imply the same cognitive processes?', http://www.univ-tours.fr/ed/edsst/comm2003/fay.pdf

Fillmore, C.J., Kempler, D., and Wang, W. S-Y. (eds) (1979) *Individual Differences in Language Ability and Language Behaviour*, New York: Academic Press

Fillmore, L.W. (1979) 'Individual Differences in Second Language Acquisition', in Fillmore, C.J., Kempler, D., and Wang, W. S-Y. (eds) (1979) *Individual Differences in Language Ability and Language Behaviour*, New York: Academic Press

Flavell, J.H., Miller, P.H., and Miller, S.A. (1997) *Cognitive Development*, (3rd ed.), Englewood Cliffs: Prentice Hall

Florander, J. and Jansen, M. (1968) *Skolefors'g i engelsk 1959-1965*, Copenhagen: Danish Institute of Education

Foster-Cohen, S. H. (1999) *An Introduction to Child Language Development*, Essex: Longman

French, J. W., Ekstrom, R. B., and Price, L. A. (1963) *Kit of Reference Tests for Cognitive Factors*, Princeton, N. J.: Educational Testing Service

Gairns, R. and Redman, S. (1986) *Working With Words*, Cambridge: CUP

Gardner, R.C. (1990) 'Attitudes, motivation, and personality as predictors of success in foreign language learning' in Parry, T. and Stansfield, C. (1990) *Language Aptitude Reconsidered*, New Jersey: Center for Applied Linguistics and Prentice Hall

Gass, S.M. and Schachter, J. (eds) (1989) *Linguistic Perspectives on Second Language Acquisition*, Cambridge: CUP

Gathercole, S. E. and Baddeley, A. D. (1989) 'Evaluation of the role of phonological STM in the development of vocabulary in children: A longitudinal study', *Journal of Memory and Language*, 28, 200-213

Gathercole, S.E., Willis, C.S., Emslie, H. and Baddeley A.D. (1992) 'Phonological Memory and Vocabulary Development during the Early School Years: A Longitudinal Study', *Developmental Psychology*, 28, 5, 887-898

Glassman, W.E. (2001) *Approaches to Psychology*, (3rd ed.), Buckingham-Philadelphia: Open University Press

Gomes da Costa, B., Smith, T. M. F. and Whiteley, D. (1975) *German Language Attainment*, Julius Groos: Heidelberg

Goswami, U. (1998) *Cognition in Children, Developmental Psychology, A Modular Course*, Sussex: Psychology Press

Gregory, E. and Kelly, C. (1992) 'Bilingualism and Assessment', in Blenkin, G.M. and Kelly, A.V. (eds) (1992) *Assessment in Early Childhood Education*, London: PCP

Grigorenko, E. L., Sternberg, R., Ehrman, M. (2000) 'A Theory Based Approach to the Measurement of Foreign Language Learning Ability: The Canal-F Theory and Test', *The Modern Language Journal*, 84, 3, 390-405

Groome, D., Dewart, H., Esgate, A., Gurney, K., Kemp, R. and Towell, N. (1999) *An Introduction to Cognitive Psychology*, London: Psychology Press

Gruneberg, M. (1995) *Linkword Welsh*, New York: Beekman Publishers

Hadley, H. (1991) *Inspirations for English*, London: Scholastic publications

Harley, B. and Hart, D. (1997) 'Language aptitude and second language proficiency in classroom learners of different starting ages', *Studies in Second Language Acquisition* 19, 379-400.

Hergenhahn, B. R. (1982) *An Introduction to Theories of Learning*, (2nd ed.), London: Prentice Hall

Holt, J. (1964) *How Children Fail*, Middlesex: Penguin

Holt, J. (1967) *How Children Learn*, Harmondsworth: Penguin

Hoyt, E. R. (1999) 'Second Language Learning: Neuropsychological, Cognitive and Sociocultural Research Summaries', http://www.stolaf.edu/depts/cis/wp/hoyt/BilingualSummaries.htm

Hsiao, D. (2005) 'CSCL Theories', http://www.edb.utexas.edu/csclstudent/Dhsiao/theories.html#construct

Humes- Bartlo, M. (1989) 'Variation in children's ability to learn second languages', in Hyltenstam, K. and Obler, L. K. (eds) (1989) *Bilingualism Across the Lifespan, Aspects of Acquisition, Maturity and Loss*, Cambridge: CUP

Hyltenstam, K. and Abrahamsson N. (2000) 'Who can become native-like in a second language? On the maturational constraints controversy in second language acquisition', *Studia Linguistica*, 54, 2, 150-166.

James, L. (1969) *Measuring Foreign Language Aptitude and Attitude*, http://www.soc.hawaii.edu/leonj/leonj/leonpsy/leon.html

Johnson, K. (2001) *An Introduction to Foreign Language Learning and Teaching*, London: Longman

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

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

Kaulfers, W. V. (1941) 'Review of Symonds *Foreign Language Prognosis Test*' in Buros, O. K. (ed) (1941) *The 1940 Mental Measurements Yearbook*, Highland Park, N. J.: Mental Measurements Yearbook, 157-158

Kennedy, C. & Jarvis, J. (1991) *Ideas and Issues in Primary ELT*, London: Nelson

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

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

Kolsavala, H. (2001) 'Teaching vocabulary through rhythmic refrains in stories', in Rixon, S. (ed) (2001) *Young learners of English: Some Research Perspectives*, Essex: Pearson Education

Krashen, S. D., Long, M. and Scarcella, R. (1979). 'Age, rate and eventual attainment in second language acquisition', *TESOL Quarterly* 13, 573-582.

Krashen, S. D. (1981). 'Aptitude and attitude in relation to second language acquisition and learning' in Diller K.C. (ed.) (1981) *Individual Differences and Universals in Language Learning Aptitude*, Rowley: Newbury House Publishers

Krashen, S. D. (1981) *Second Language Acquisition and Second Language Learning*, Oxford: Pergamon

Krashen, S. D., Scarcella, R. and Long, M. (eds) (1982) *Child-Adult Differences in Second Language Acquisition*, Rowley: Newbury House

Krashen, S. D. (1985) *The Input Hypothesis : Issues and Implications*, London: Longman

Krumm, H.-J. und Portmann-Tselikas, P. R. (eds) (2000) *Theorie und Praxis*, Vol 4, Innsbruck: StudienVerlag Ges.m.b.H.

Kuhiwsczak, P. (2001) 'Enchantment in the classroom: Children's literature as a teaching aid' in Rixon, S. (ed) (2001) *Young learners of English: Some Research Perspectives*, Essex: Pearson Education

Landers, C. (1990) *Language Planning in Preschool Education*, http://www.ecdgroup.com/cn/cc109ali.htm (21/02/01)

Lange, G. and Pierce, S. H. (1992) 'Memory- Strategy Learning and Maintenance in Preschool Children', *Developmental Psychology*, 28, 3, 453-462

Larsen-Freeman, D. and Long, M. H. (1991) *An Introduction to Second Language Acquisition Research*, Essex: Longman

Lenneberg, E. H., Nichols, I. and Rosenberger, E. (1964) 'Primitive stages of language development in mongolism', *Disorders of Communication* 42, 119-137.

Lenneberg, E. H. (1967) *Biological foundations of language*, New York: Wiley and Sons

Liben, L.S. (1981) 'Copying and Reproducing Pictures in Relation to Subject's Operative Levels', *Developmental Psychology*, 17, 3, 357-365

Logie, R. H., Engelkamp, J, Dehn, D. and Rudkin, S. (2001) 'Actions, mental actions, and working memory' in Denis, M., Logie, R. H., Cornoldi, C., De Vega, M. and Engelkamp, J. (eds) (2001) *Imagery, Language and Visuo- Spatial Thinking*, Sussex: Psychology Press

Markman, E. M., Cox, B. and Machida, S. (1981) 'The Standard Object-Sorting Task as a Measure of Conceptual Organisation', *Developmental Psychology*, 17,1, 115-117

McCarthy, M. (1990) *Vocabulary*, Oxford: OUP

McDonough, S. (1981) *Psychology in Foreign Language Teaching*, London: Routledge

McLaughlin, B. (1978) *Second Language Acquisition in Childhood*, Hillsdale NJ: Erlbaum Associates

McLaughlin, B., Blanchard, A. G. and Osanai, Y. (1995) *Assessing Language Development in Bilingual Preschool Children*, http://www.ncbe.gwu.edu/ncbepubs/pigs/pig22.htm

McLaughlin, B. (2000) *Myths and Misconceptions About Second Language Learning*, ERIC Digest, ED350885

Meara, P. (ed) (1986) *Spoken Language*, London: Centre for Information on Language Testing

Meara, P., Milton, J. and Lorenzo-Dus, N. (2001) *Language Aptitude Tests*, Newbury: Express Publishing

Milton, J. and Alexiou, T. (2004) 'Reconsidering language learning aptitude with young learners in mind', in Kitis-Koutoupi, E. (ed) *Working Papers in Linguistics*, Department of English Language and Literature, Thessaloniki, Greece: Aristotle University of Thessaloniki Press

Milton, J. and Vassiliu, P. (2002) 'Frequency and the lexis of low level EFL texts', in Nicolaidis, K. and Mattheoudakis, M. (eds) (2002) *Proceedings of the 13th International Symposium on Theoretical and Applied Linguistics*, Thessaloniki, Greece: Aristotle University of Thessaloniki Press

Milton, J. (2002) 'REPORT 1: Literature Review in Languages, Technology and Learning', http://www.nestafuturelab.org/research/reviews/lang16.htm

Miralpeix, I. (2002) *Lexis in free written production of learners of English as an L3 with different starting ages: a computational analysis*, Unpublished manuscript, Doctoral program, English Department, University of Barcelona

Mooney, C. G. (2000) *Theories of Childhood: An Introduction to Dewey, Montessori, Erikson, Piaget & Vygotsky*, Minnesota: Redleaf Press

Moore, T. E. (ed) (1973) *Cognitive Development and the Acquisition of Language*, London: Academic Press

Mueller, T. H. (1971) 'The effectiveness of two learning models: the audio-lingual habit theory and the cognitive code-learning theory' in Pimsleur, P. and Quinn, T. (eds) (1971) *The Psychology of Second Language Learning*, Papers from the Second International Congress of Applied Linguistics, Cambridge, 8-12 September 1969

Munõz, C. (2001) 'Factores escolares e individuales en el aprendizaje formal de un idioma extranjero', in S. Pastor Cesteros and V. Salazar Garcia (eds) (2001) *Tendencias y Lineas de Investigacion en Adquisicion de Segundas Lenguas,* Estudios de Linguistica, Anexo 1,249- 270, Alicante (Spain): Universidad de Alicante

Munõz, C., Pérez, C., Celaya, M. L., Navés, T., Torras, M.R., Tragant, E., and Victori, M. (2002) 'Entorno a los efectos de la edad en el aprendizaje escolar de una lengua extranjera', *Revista Fòrum Sobre Plurilingüisme i Educació*, ICE de la UB, 1 (1)

Nagata, H., Aline, D. and Ellis, R. (1999) 'Modified input, language aptitude, and the acquisition of word meanings' in Ellis, R. (ed.) *Learning a Second Language Through Interaction*, Amsterdam: Benjamins

Naiman, N., Fröhlich, M., Stern, H. H. and Todesco, A. (1996), *The Good Language Learner*, (2nd ed.), Clevedon: Modern Languages in Practice

Nation, I.S.P. (1988) *Teaching and Learning Vocabulary*, Victoria University of Wellington: Information and Publications section

Nation, I.S.P. (2001) *Learning Vocabulary in Another Language*, Cambridge: CUP

Nelson, K. (1981) 'Individual differences in language development: implications for development and language', *Developmental Psychology*, 17, 2, 170-187

Neufeld, G.G. (1978) 'A theoretical perspective on the nature of linguistic aptitude', *International Review of Applied Linguistics*, 16, 15-25

Newport, E. L. (1990) Maturational constraints on language learning, *Cognitive Science*, 14, 11-28

Newport, E. L. (1984) 'Constraints on learning: studies in the acquisition of American Sign Language', *Papers and Reports on Child Language Development* 23, 1-22.

Nida, A. (1971) 'Problems in language mastery and retention' in Pimsleur, P. and Quinn, T. (eds) (1971) *The Psychology of Second Language Learning*, Papers from the Second International Congress of Applied Linguistics, Cambridge, 8-12 September 1969

Nolan, V (2001) 'Krashen's Theory of Second Language Acquisition', http://si.unm.edu/Web%20Journals/articles2001/VNOLAN~1.HTM

North Central Regional Educational Laboratory (NCREL) (2002) *Cognitive Skills*, http://www.ncrel.org/sdrs/areas/issues/content/cntareas/reading/li1lk23.htm (10/09/02)

Oesterreich, L. M. S. (1995) *Ages & Stages-Five-Year-Olds*, Lowa State University: National Network for Child Care (NNCC), http://www.nncc.org/Child.Dev/ages.stages.5y.html

Oesterreich, L. M. S. (1995) *Ages & Stages-Six through Eight-Year-Olds*, Lowa State University: National Network for Child Care (NNCC), http://www.nncc.org/Child.Dev/ages.stages.6y.8y.html

Olson, G. M. (1973) 'Developmental changes in memory and the acquisition of language', 145-157 in Moore, T. E. (ed) (1973) *Cognitive Development and the Acquisition of Language*, London: Academic Press

Orwig, C. J. (1999) 'Ways to approach Language Learning', http://www.sil.org/lingualinks/LANGUAGELEARNING/WaysToApproachLanguageLearning/TheAnalyticalApproachToLanguag.htm#context

Oxford, R. (1990) 'Styles, strategies, and aptitude: Connections for language learning' in Parry, T. and Stansfield, C. (1990) *Language Aptitude Reconsidered*, New Jersey: Center For Applied Linguistics and Prentice Hall

Oyama, S. (1976) 'A sensitive period for the acquisition of non-native phonological system' *Journal of Psycholinguistic Research*, 5, 261-284.

Papaefthymiou-Lytra, S. (1993) *Language, Language Awareness and Foreign Language Learning*, Athens: The University of Athens Press

Paraskevopoulos, I.(1983) *Εξελικτική Ψυχολογία (Developmental Psychology)*, Athens: University of Athens Press

Parry, T. and Child, J. (1990) 'Preliminary investigation of the relationship between VORD, MLAT and language proficiency' in Parry, T. and Stansfield, C. (1990) *Language Aptitude Reconsidered*, New Jersey: Centre for Applied Linguistics and Prentice Hall

Parry, T. and Stansfield, C. (1990) *Language Aptitude Reconsidered*, New Jersey: Center For Applied Linguistics and Prentice Hall

Parry, T.S. (1984) *The relationship of selected dimensions of learner cognitive style, aptitude and general intelligence factors to selected foreign language proficiency tasks of second year students of Spanish at secondary level*, Unpublished doctoral dissertation, Ohio State University, Columbus, OH.

Pellegrini A.D., Galda, L. (2000) 'Commentary: Cognitive Development, Play and Literacy: Issues of Definition and Developmental Function', in Roskos, K.A. and Christie, J. F. (eds) (2000) *Play and Literacy in Early Childhood, Research From Multiple Perspectives*, London: Lawrence Erlbaum Associates

Petersen, C. and Al-Haik, A. R. (1976) 'The development of the Defence Language Aptitude Battery (DLAB)', *Journal of Educational and Psychological Measurement*, 36, 369-380

Phillips, S. (1993) *Young Learners*, Oxford: OUP

Piaget, J. (1926) *The Language and Thought of the Child*, London: Routledge and Kegan Paul

Piaget, J. (1929) *Child's Conception of the World*, London: Routledge and Kegan Paul

Piaget, J and Inhelder, B. (1956) *The Child's Conception of Space*, New York: Norton

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

Pimsleur, P., Sundland, D. M. and McIntyre, R. D. (1966) *Underachievement in Foreign Language Learning*, Washington, D.C.: Modern Language Association

Pimsleur, P. (1968) 'Language Aptitude Testing' in Davies, A. (ed) (1968) *Language Aptitude Testing: A Psycholinguistic Approach*, Oxford: OUP

Pimsleur, P. and Quinn, T. (eds) (1971) *The Psychology of Second Language Learning,* Papers from the Second International Congress of Applied Linguistics, Cambridge, 8-12 September 1969, Cambridge: CUP

Politzer, R. L. and Weiss, L. (1969) *An experiment in improving achievement in foreign language learning through learning of selected skills associated with language aptitude*, Stanford: Stanford University (Eric Document Reproduction service, ED 046 261)

Ramirez, J. D., Yuen, S. D. and Ramey, D .R. (1991) *Longitudinal study of structured English immersion strategy, early-exit and late-exit transitional bilingual education programs for language minority children, Final Report*, Volumes 1 and 2, San Mateo, CA: Aguirre International

Read, J. (2000) *Assessing Vocabulary*, Cambridge: CUP

Reid, G. and Wearmouth, J. (eds) (2002) *Dyslexia and Literacy: Research and Practice*, London: John Wiley and Sons

Resnick, L. B. and Nelson Le-Gall, S. (1997) 'Socialising Intelligence', in Smith, L., Dockrell, J. and Tomlinson, P. (1997) *Piaget, Vygotsky and Beyond, Future Issues for Developmental Psychology and Education*, London: Routledge, Taylor and Francis Group

Revell, J. (1992) 'Left, right and VAK', *Practical English Teaching*, 9, June 1992

Reynolds, B. (2002) 'Phonetic coding in language aptitude: different roles for different languages', http://owls.tuj.ac.jp/tesol/press/papers0014/renyolds.html (31/01/2002)

Richards, J. and Rodgers, T.S. (1986) *Approaches and Methods in Language Teaching*, Cambridge: CUP

Rixon, S. (ed) (1999) *Young Learners of English: Some Research Perspectives*, Essex: Pearson Education

Robinson, P. (ed) (2001) *Cognition and Second Language Instruction*, Cambridge: CUP

Robinson, P. (ed) (2002) *Individual Differences and Instructed Language Learning*, Amsterdam: John Benjamins

Rogers, S. (ed) (1975) *Children and Language: Readings in Early Language and Socialisation*, London: OUP

Roskos, K. A. and Christie, J. F. (eds) (2000) *Play and Literacy in Early Childhood, Research From Multiple Perspectives*, London: Lawrence Erlbaum Associates

Rosser, R. (1994) *Cognitive Development: Psychological and Biological Perspectives*, Massachusetts: Allyn and Bacon

Rossman, P. (2000) 'Kognitive Entwicklung im Säuglings-und Kleinkindalter als Voraussetzung für den Spracherwerb' in Krumm, H.-J. und Portmann-Tselikas, P. R. (eds) (2000) *Theorie und Praxis*, Vol. 4, Innsbruck: StudienVerlag Ges.m.b.H.

Sapon, S. (1971) 'On defining a response: a crucial problem in verbal behavior' in Pimsleur, P. and Quinn, T. (editors) (1971) *The Psychology of Second Language Learning*, Papers from the Second International Congress of Applied Linguistics, Cambridge, 8-12 September 1969

Sasaki, M. (1991) *Relationships among second language proficiency, foreign language aptitude and intelligence: A structural equation modelling approach*, Unpublished PhD dissertation, U.C.L.A.

Sasaki, M. (1996) *Second Language Proficiency, Foreign Language Aptitude and Intelligence: Quantitative and Qualitative Analyses*, New York: Peter Lang (Vol. 6)

Sawyer, M. and Ranta, L. 'Aptitude, individual differences and instructional design', in Robinson, P. (ed) (2001) *Cognition and Second Language Instruction*, Cambridge: CUP

Scarcella, R. and Krashen, S. D. (1980) *Research in second language acquisition: selected papers of the Los Angeles Second Language Acquisition Research Forum*, Rowley, Mass: Newbury House

Schmitt, N. (2000) *Vocabulary in Language Teaching*, Cambridge: CUP

Schmitt, N. and McCarthy, M. (1997) *Vocabulary: Description, Acquisition and Pedagogy*, Cambridge: CUP

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

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

Shore, C. M. (1995) *Individual Differences in Language Development*, London: SAGE publications

Simpson, R. (2002) 'Implicit and Explicit memory', www. cc2.cumberlandcollege.edu/psych/r/Memory/implicit.htm

Singleton, C. (2002) 'Dyslexia: Cognitive factors and implications for literacy' in Reid, G. and Wearmouth, J. (eds) (2002) *Dyslexia and Literacy: Research and Practice*, London: John Wiley and Sons

Singleton, D. (2001) 'Age and second language acquisition' *Annual Review of Applied Linguistics* 21, 77-89.

Singleton, D. (1989) *Language Acquisition: The Age Factor*, Clevedon: Multilingual Matters

Skehan, P. (1980) 'Memory, Language Aptitude and Second Language Performance', *Polyglot*, 2, Fiche 3

Skehan, P. (1982) *Memory and Motivation in Language Aptitude Testing*, Unpublished PhD thesis, University of London

Skehan, P. (1986a) 'The role of foreign language aptitude in a model of school learning', *Language Testing,* 3, 198-221.

Skehan, P. (1986b). 'Where does language aptitude come from?' in Meara, P. (ed) (1986) *Spoken Language*, London: Centre for Information on Language Testing

Skehan, P. (1986c) 'Cluster Analysis and the Identification of Learner Types' in Cook, V. (1986) *Experimental Approaches to Second Language Learning*, Oxford: Pergamon

Skehan, P. (1989) *Individual Differences in Second-Language Learning*, London: Edward Arnold

Skehan, P. (1991) 'Individual Differences in Second Language Learning', *Studies in Second Language Acquisition*, 13, 275-298

Skehan, P. (1992) 'Foreign Language Learning Ability: Cognitive or Linguistic?' in *Thames Valley University Working Papers in English Language Teaching*, 1, 151-191

Skehan, P. (1998) *A Cognitive Approach to Language Learning*, Oxford: OUP

Skehan, P. (1999) *Aptitude*, Paper presented at the conference on Individual Differences in Foreign Language Learning: Effects of Aptitude, Tokyo, Japan.

Skehan, P. (2002) 'Theorising and Updating the Concept of Foreign Language Aptitude' *Abstract in BAAL*, Thames Valley University, November 2002

Slobin, D. I. (1971) *Psycholinguistics*, London: Scott Foresman

Smith, L., Dockrell, J. and Tomlinson, P. (1997) *Piaget, Vygotsky and Beyond, Future Issues for Developmental Psychology and Education*, London: Routledge, Taylor and Francis Group

Smith, T. K. (2000) *Early Childhood Development*, (2nd ed.), USA: Merrill and Prentice Hall

Snow, C. and Hoefnagel-Hoehle, M. (1977) 'Age differences in the pronunciation of foreign sounds, *Language and Speech*, 20, 357-365

Soars, J. and Soars, L. (1989) *Headway Advanced, Student's Book*, Oxford: OUP

Sparks, R.L. (1995) 'Examining the Linguistic Coding Differences Hypothesis to Explain Individual Differences in Foreign Language Learning', *Annals of Dyslexia*, 45, 187-214

Sparks, R. and Ganschow, L. (2001) 'Aptitude for learning a foreign language', *Annual Review of Applied Linguistics*, 21, 90-111

Spolsky, B. (1989) *Conditions for Second Language Learning*, Oxford: OUP

Spolsky, B. (1995) 'Prognostication and language aptitude testing, 1925-62', *Language Testing*, 12, 321-340

Stansfield, C. W. (2000) *Language Aptitude Reconsidered*, ERIC Digest, Washington DC: ERIC Clearinghouse on Languages and Linguistics, http://www.ed.gov/databases/ERIC_Digests/ed318226.html (15/10/01)

Stern, H. H., Burstall, C. and Harley, B. (1975) *French From Age Eight or Eleven?*, Toronto: Ontario Institute for Studies in Education.

Sternberg, R. (1985) 'General intellectual ability' in Sternberg, R. (ed) (1985) *Human Abilities: An Information-Processing Approach*, New York: W. H. Freeman and Company

Sternberg, R. (1997) *Successful Intelligence*, New York: Plume

Sternberg, R. (1998) 'Abilities Are Forms of Developing Expertise', *Educational Researcher*, 27, 3, 11-20

Sternberg, R., Grigorenko, E. L., Ferrari, M., and Clinkenbeard, P. (1999) 'A Triarchic Analysis of an Aptitude- Treatment Interaction', *European Journal of Psychological Assessment*, 15, 1, 3-13

Sternberg, R. and Grigorenko, E. L. (2002) *Dynamic Testing: The Nature and Measurement of Learning Potential*, Cambridge: CUP

Stevick, E. (1976) *Memory, Meaning and Method*, Rowley: Newbury House

Sunderland, J. (2000) 'Issues of language and gender in second and foreign language education', *Language Teaching*, 33, 203-223

Symonds, P. M. (1930) *Foreign Language Prognosis Test*, New York: Teachers College, Bureau of Publications

Taylor, L. (1990) *Teaching and Learning Vocabulary*, Hertfordshire: Prentice Hall

Thanasoulas, D. (2002) 'The Classroom: Forum or Arena?', http://www.chass.utoronto.ca/french/as-sa/ASSA-6-7/DT7.html (17/11/02)

Thanasoulas, D. (2002) 'Constructivist Learning', http://www3.telus.net/linguisticsissues/constructivist.html

Thurstone, L. L., and Thurstone, T. G. (1963) *Primary Mental Abilities Test*, Chicago: Science Research Associates

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

Vale, D. and Feunteun, A. (1995) *Teaching Children English: A Training Course for Teachers of English to Children*, Cambridge: CUP

Valette, R. M. (1971) 'Mastery learning and foreign language students' in Pimsleur, P. and Quinn, T. (editors) (1971) *The Psychology of Second Language Learning*, Papers from the Second International Congress of Applied Linguistics, Cambridge, 8-12 September 1969

Vecchi, T., Phillips, L. H. and Cornoldi, C. (2001) 'Individual differences in visuo-spatial working memory', in Denis, M., Logie, R. H., Cornoldi, C., De Vega, M., Engelkamp, J. (eds) (2001) *Imagery, Language and Visuo- Spatial Thinking*, Sussex: Psychology Press

Vygotsky, L. (1962) *Thought and Language*, Cambridge, Mass: MIT Press

Vygotsky, L. (1978) *Mind in Society*, Cambridge MA: Harvard, University Press

Wechsler, D. (1991) *Wechsler Intelligence Scale for Children*, (3rd edition), New York: Psychological Corporation

Wells, G. (1985) *Language Development in the Pre-school Years*, Volume 2, Cambridge: CUP

Wells, G. (1986) *The Meaning Makers: Children Learning Language and Using Language to Learn*, Portsmouth, NH: Heinemann

Wesche, M. B. (1981) 'Language aptitude measures in streaming, matching students with methods, and diagnosis of learning problems', in Diller, K.C. (ed) (1981) *Individual Differences and Universals in Language Learning Aptitude*, Rowley: Newbury House

Wesche, M. B., Edwards, H., and Wells, W. (1982) 'Foreign language aptitude and intelligence', *Applied Psycholinguistics*, 3, 127-140

Wilkins, P. (1972) *Linguistics in Language Teaching*, London: Edward Arnold

Winitz, H. (ed) (1981), *Native and Foreign Language Acquisition*, New York: New York Academy of Sciences

Wood, D. (1988) *How Children Think & Learn*, Oxford and Cambridge: Blackwell (Open University)

Yule, G. (1985) *The Study of Language*, Cambridge: CUP

Yussen, S.R. and Berman, L., (1981) 'Memory predictions for Recall and Recognition in First-, Third-, and Fifth- Grade Children', University of Wisconsin, Madison, *Developmental Psychology*, 17, 2, 224-229

Zafrana, M. (1979) *The Implications of Brain Functioning for Learning and the Process of Educating*, Unpublished Doctoral Dissertation, The Ohio State University

Zafrana, M. (1992) *The Physiology of Learning I: Matter and the Brain,* Thessaloniki, Greece: Kyriakidis Press

Zafrana, M. (2001) *Εγκέφαλος και Εκπαίδευση (Brain and Education)*, Thessaloniki, Greece: Kyriakidis Press