THE RELATIONSHIP BETWEEN PERCEPTUAL AND SOCIAL LEARNING STYLES AND MULTIPLE INTELLIGENCES AND THEIR EFFECTS ON ENGLISH PROFICIENCY OF TURKISH YOUNG ADULTS LEARNING ENGLISH AS A FOREIGN LANGUAGE

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ABSTRACT

THE RELATIONSHIP BETWEEN PERCEPTUAL AND SOCIAL LEARNING STYLES AND MULTIPLE INTELLIGENCES AND THEIR EFFECTS ON ENGLISH PROFICIENCY OF TURKISH YOUNG ADULTS LEARNING ENGLISH AS A FOREIGN LANGUAGE

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The purpose of the present study was to investigate the relationships between preferences of multiple intelligences, perceptual and social learning styles, and English as foreign language proficiency. Two self-report questionnaires were administered to a total of 123 participants.

The results showed that dominant intelligence preference was inter-personal and major learning-style preference was kinesthetic. Pearson correlation results revealed statistically significant positive relations between interpersonal intelligence and group learning style; linguistic intelligence and individual learning style; logical-

mathematical intelligence and individual learning style; intra-personal intelligence and individual learning style; inter-personal intelligence and kinesthetic learning style in addition to negative relations between interpersonal intelligence and individual learning style; musical intelligence and individual learning style, and bodily-kinesthetic intelligence and tactile learning style. This indicates that pedagogical implications should consider individuals' intelligences and learning style preferences, and further studies are needed to investigate the interactions among preferences of styles and intelligences. Finally, multiple regression results showed that logical-mathematical intelligence preference and visual learning-style preference were the primary contributors to the English proficiency.

Since no previous research was found comparing preferences of multiple intelligences and perceptual and social learning styles of foreign language learners, this study provided data-driven evidence for the interrelations between them. Those relationships as well as factorial structure for preferences for multiple intelligences and learning styles were discussed. Moreover, the need for further development of the questionnaires and the need for mixed method data collection were emphasized. Implications for interactions among learning styles and multiple intelligences were discussed.

Keywords: Perceptual and Social Learning Styles, Multiple Intelligence Preferences.

ÖZ

ÖĞRENME STİLLERİ TERCİHLERİ İLE ÇOKLU ZEKA TERCİHLERİ ARASINDAKİ İLİŞKİ VE BUNLARIN İNGİLİZCE ÖĞRENEN GENÇ TÜRK ÖĞRENCİLERİNİN İNGLİZCE YABANCI DİLDEKİ BAŞARILARINA ETKİSİ

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Bu araştırmanın amacı öğrencilerin çoklu zeka tercihleri ve algısal ve sosyal öğrenme stilleri tercihleri arasındaki ilişkiyi ve ayrıca bu degişkenlerle öğrencilerin yabancı dil başarıları arasındakı ilişkiyi araştırmaktır. Bu amaçla iki envantör 123 katılımcıya uygulanmıştır.

Birinci araştırma sorusu ile öğrencilerin çoklu öğrenme tercihleri araştırılmıştır. Sonuçlar kişiler arası zeka tercihinin en baskın olduğunu göstermiştir. İkinci soruya yanıt olarak baskın öğrenme stili hareketsel olarak saptanmıştır. Pearson correlation sonuçlarına göre sosyal zeka ile grupsal öğrenme stili; dil zekası ile bireysel öğrenme stili; mantıksal matematiksel zekayla bireysel öğrenme stili;

öze-dönük zekayla bireysel öğrenme stili; sosyal zekayla hareketsel öğrenme stili arasında pozitif ilişki ve sosyal zekayla bireysel öğrenme, müzikal zekayla bireysel öğrenme stili ve bedensel-kinestetik (devinduyumsal) zekayla görsel öğrenme stili arasında negatif ilişki bulunmuştur. Sonuçlar pedagojik uygulamaların bireylerin öğrenme stillerini ve çoklu zekalarını da gözönüne alması gerektiğini, ve öğrenme stilleri ve çoklu zeka arasındaki etkileşimlerini inceleyen araştırmalara gerek olduğunu göstermektedir.

Daha önce çoklu zeka, algısal ve sosyal öğrenme stilleri tercihlerini ve yabancı dil başarısını karşılaştıran bir araştırma bulunamadigıı için, bu çalışma verilere dayali olarak değişkenlerin birbiriyle ilişki içinde olduğunu göstermektedir. Bulunan ilişkiler ve faktör yapısı yorumlanmıştır. Envantörlerin geliştirilmesi ve bu tür çalışmalarda niteliksel araştırma tekniklerinden de faydanılması gerektiği vurgulanmıştır. Öğrenme stilleri ve çoklu zeka arasındaki etkileşimleri için uygulamalar önerilmiştir.

Anahtar kelimeler: Algısal ve Sosyal Öğrenme Stilleri, Çoklu Zeka Tercihleri.

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LIST OF ABBREVIATIONS

L1: First language

L2: Second Language

MI: Multiple Intelligences

NSs: Native speakers

SLA: Second language acquisition

PLSPQ: Perceptual Learning Style Preference Questionnaire

TIMI: Teele Inventory for Multiple Intelligences

GPA: Grade Point Average

ELT: English Language Teaching

CHAPTER 1

INTRODUCTION

1.1 Background to the Study

Second language acquisition (SLA) is used as a super ordinate term for second language acquisition, second language learning, bilingualism, and foreign language learning (Larsen-Freeman & Long, 1991). SLA means "the acquisition of any language(s) other than one's native language" (Larsen-Freeman & Long, 1991, p.7). A second language (L2) learner is different from a first language (L1) learner in that an L2 learner starts learning the language generally when he/she has already acquired the L1 and therefore has a language system (Ritchie & Bhatia, 1996).

The difference between a second language and foreign language is that the former is acquired in an environment where the language is spoken as a native language and it is often picked up without instruction whereas the latter is learned in an environment in which the language is not spoken as a native language and it usually takes place in a classroom setting (Larsen-Freeman & Long, 1991).

The cognitive/functionalist approach to SLA views language acquisition as data driven and as "a case of cognitive problem solving" (Butler & Hakuta, 2004, p. 123). This approach is concerned with rule-governed structures, attention, strategies, metacognition, and internal representations (Butler & Hakuta, 2004).

While the cognitive/functionalist approach views language as a part of general cognition, the formal linguistic approach views language acquisition as innate and different from general cognition (Butler & Hakuta, 2004). The formal linguistic approach has been influenced much by Chomsky's theories. According to Chomsky (1965), human beings are endowed with an innate and unconscious knowledge of language universals called Universal Grammar (UG). UG consists of a set of linguistic principles which are universal to all human languages and parameters that vary in certain ways from one language to another.

There are different perspectives about the availability of UG in L2 acquisition. The argument is that if L2 learners observe UG constraints, UG is available to them. Based on the role of UG in SLA, there are three theoretical positions. Position one asserts that L2 learners and native speakers (NSs) arrive at the same competence level by the same means. According to this *theist* perspective, UG is available to L2 learner. Strong theism claims that UG directly operates in L2 acquisition whereas weak theism holds the belief that UG is indirectly available since L1 is a part of L2 acquisition (Gregg, 1996). Position two claims that L2 learners and NSs arrive at different competence levels by different means, which is a *deistic* perspective. According to this perspective, UG is not available to L2 learners. Position three assumes that L2 learners and NSs arrive at different competence by the same means. L2 learners end up with L2 grammars which are different from L1 grammar but constrained by UG (White, 1996).

No matter which perspective is considered, there is still a wide range of language proficiency among L2 learners (Larsen-Freeman & Long, 1991). Although all human beings master their first language effortlessly and successfully under

normal conditions, only a few people manage to learn a second language as well as their first language. L2 learners differ both in the speed of acquisition and in ultimate level of achievement (Ellis, 2004). Since the individual differences and the extent to which they affect SLA are important for theoretical and practical purposes, these differences have been investigated (Robinson, 2002). Early research in SLA focused mostly on the teacher side which included teaching methods and techniques, classroom activities and materials, and other pedagogical or instructional matters. However, recent studies are more student-centered taking into account motivation, anxiety, attitude, intelligence, abilities, styles, personality, self-esteem and so forth (Krashen, 1981; Skehan, 1991; Skehan, 1998; Beebe, 1988; Wenden and Rubin, 1987; Larsen-Freeman & Long, 1991; Ellis, 2004; Segalowitz, 1997). Robinson (2001), for example, compared individual differences in IQ, memory, aptitude and awareness in the contexts of explicit and implicit foreign language learning. He found that incidental foreign language learning was uninfluenced by individual differences. Related to this argument, it was suggested that implicit L2 acquisition is unaffected by individual differences since UG is available to L2 learners (Schwarts & Sprouse, 1994). However, in a follow up study, Robinson (2002) found that "adult incidental learning of natural L2 grammar during processing for meaning is sensitive to measures of IDs in cognitive capacities, but only where these are relevant to the consciously regulated processing demands of the learning task" (p. 129). In conclusion, he noted that the hypothesis of unavailability of UG alone cannot explain the variations among attainments of the language.

Of the individual differences, learning styles took much attention both in the field of psychology and education. A number of learning styles have been defined,

but only a few of them have been investigated for SLA implications (Larsen-Freeman & Long, 1991). Yates (2000), Riding (2000) and Reid (1995) stated that the studies of learning styles are complex and disjointed as different definitions of learning styles exist with different terminology and contrasting aspects. Some researchers use learning style and cognitive style terms interchangeably, and others define cognitive style as a broader concept than learning style while others do just the opposite. For Merriam and Caffarella (1991), the distinction is that learning style is more concerned with the learning environment than is the cognitive style.

Boyatsiz and Kolb (1995) used a holistic definition of learning styles within the experiential learning theory framework, which includes affective, perceptual, behavioral and cognitive strategies. According to them, individuals' learning styles rely on four learning modes, namely, concrete experience, reflective observation, abstract conceptualization and active experimentation. For them, learning styles refer to 'higher order heuristics for "learning how to learn" and represent the deep structure of the knowledge that is imparted in specialties and professions' (1995, pp. 3-4). Perceptual learning styles, which are also called sensory preferences, are based on perceptual modalities, which reflect biological responses to the physical environment. Perceptual modalities include the eye, ear, nose, tongue, and skin. Information is received by the brain through a network of these modalities. People generally prefer one mode to take in information (Letteri, 1988).

According to Brown (1994), "cognitive, affective, and physical domains merge in learning styles" (p.105). The study of learning styles significantly contributes to theories of second language acquisition (Brown, 1994). Another interesting but very controversial issue in the area of individual differences is

intelligence. In 1904, Alfred Binet, a French psychologists, and his colleague Theodore Simon designed a test to predict success in school in response to a request by the French Ministry of Education. In 1912, the German psychologist Wilhelm Stern developed the intelligence quotient (IQ), which is the ratio of one's mental age to one's chronological age and multiplied by 100 (cited in Thorndike and Lohman, 1990). Since the time of Binet and Simon's tests, intelligence tests have measured verbal reasoning, numerical reasoning, logical ability, and ability of solving daily life problems. Intelligence tests have been criticized by several researchers because the definition of intelligence has been dependent on the capacity to answer the questions on the Intelligence Quotient (IQ) tests that focuses on mathematical and linguistic abilities (Gardner, 1999). According to Thorndike, Bregman, Cobb and Woodyard (1973), IQ tests "greatly favored words, numbers, space-forms, and pictures, neglecting three-dimensional objects and situations containing other human beings" (p.20). For Reber, Walkenfeld, and Hernstadt (1991), IQ does not represent different abilities: "Various forms of intelligent behaviors are displayed by individuals who might not be expected to be capable of such behaviors if IQ scores from standard tests are taken as diagnostic" (p. 891). Ceci and Liker (1988) suggested that IQ reflects academic knowledge and skills but not other complex cognitive abilities. Raab and Gigerenzer (2005) argued that IQ does not describe how an individual solve a problem; it does not predict the counterintuitive behavior; it does not reveal information about social intelligence.

Gardner (1983) proposed a theory of intelligence called Multiple Intelligences (MI). MI theory is multifaceted, that is, intelligence is not unitary, but composed of several independent and modular intelligences. Gardner (1983) defined

intelligence as "the ability to solve problems or to create products that are valued within one or more cultural settings" (p. x). In this theory, Gardner identified eight types of intelligences. These are verbal-linguistic, musical, logical-mathematical, spatial, bodily-kinesthetic, interpersonal, intrapersonal and naturalist intelligence.

Multiple intelligence theory has become very popular with its applications to education (Sternberg, 2002; Kornhaber, 2004; Armstrong, 1999, 2000; Haley, 2004; Christison & Kennedy, 1999). It has been argued that general ability (g) was found not to be important in predicting foreign language learning performance and there are probably "multiple intelligences" for learning a foreign language (Robinson, 2002; Grigorenko, Sternberg, & Erhman, 2000; Sternberg, 2002). Foreign language aptitude and motivation produced the most consistent predictors of second language learning success (Dörnyei & Skehan, 2003; Robinson, 2002). Although applications of learning style theories to education is also common, the possible interactions between learning styles and multiple intelligences have not been investigated (Armstrong, 2000; Renzulli and Dai, 2001; Robinson, 2002; Segalowitz, 1997).

Renzulli and Dai (2001) emphasized the importance of investigating the complex relationships among abilities, learning styles, cognitive styles, and interests. They proposed that "by looking into these intricate ability-style relationships, we can see that at least some individuals' stylistic approaches are the result of their capitalizing on their strengths and compensating for their weaknesses" (p. 30-31).

Riding (2001) found that students tend to prefer materials which are compatible with their dominant learning styles and abilities. Ehrman (1996) explained the connection between style preference and ability:

> We tend to do more of what we find comfortable, and the more we do something, generally the better we get at it. It is also true that we also may

> come to prefer things that come easily to us, whose performance adds to our sense of self-efficacy. Thus, there is probably a reciprocal relationship between ability and preference. (p. 87)

Therefore, this study was intended to investigate perceptual and social learning styles preferences and multiple intelligence preferences of learners of English as a foreign language and to investigate whether there is a relationship between learners' preferences of multiple intelligences, learning styles and their English language proficiency.

1.2 Purpose of the Study

The purpose of the present study was to expand the knowledge base of information related to perceptual and social learning style preferences, multiple intelligences and success in learning English as a foreign language by identifying the multiple intelligences and learning style preferences of the foreign language learners in the Basic English School of Middle East Technical University (METU). In addition, the study aimed to determine whether there was a relationship between learners' multiple intelligences and learning styles preferences and between these two independent variables and English language proficiency.

Student success in this study was determined by grade point average (GPA) records. GPA records were based on the first term overall assessment, which included quizzes, midterms, classroom activities, and performance grade, and they were out of 45. Since the study took place in the second term of the academic program, students' GPAs from the previous semester were of interest.

Specific relationships to be examined included:

1) Perceptual and social learning styles preferences as identified by Perceptual Learning Style Preference Questionnaire (PLSPQ) (Appendix)

and multiple intelligence preferences as identified by the Teele Inventory of Multiple Intelligences (TIMI).

2) The relationship among learning style preferences, multiple intelligence preferences and success in learning English as a foreign language

1.3 Research questions

The research questions considered in this study included the following:

1) What are the multiple intelligence preferences of the English language learners at Basic English School at Middle East Technical University as identified by TIMI?
2) What are the perceptual and social learning style preferences of the English language learners at Basic English School at METU as identified by PLSPQ?
3) What is the nature and strength of the relationship between multiple intelligence preferences and the perceptual and social learning style preferences?
4) What is the factorial structure of multiple intelligence preferences and perceptual and social learning style preferences?
5) What is the nature and strength of the relationship between foreign language achievement, on the one hand, multiple intelligence preferences and the perceptual and social learning style preferences, on the other?

1.4 Significance of the Study

This study was designed to address the issues which had not been adequately addressed in the previous literature. Individual differences in cognitive abilities in SLA have theoretical and practical importance for cognitive psychology and SLA

research (Robinson, 2002). Research carried out in Turkey mostly focused on identifying either students' learning styles or multiple intelligence preferences (Isisağ, 2000; Baran, 2000; Tabanlıoğlu, 2003). There has been no study found addressing the relationship between these variables as well as between them and foreign language learning.

Relating Multiple Intelligence theory to one of the learning style theories is an interesting project because learners "expand their knowledge base by linking new information, in this case, Multiple Intelligence to existing schemes or models, the learning-style model they are most familiar with" (Armstrong, 2000, p. 10). McMahon, Rose, and Parks (2004), Denig (2004), and Silver (1997) also suggested the possible correlational research on multiple intelligences and learning styles.

Brown postulated that 'our language-learning "IQs" are much more complicated', that is, intelligence in terms of traditional meaning could not prove that people with greater intelligence were successful language learners (Brown, 1994, p. 93). He argued that it was easier to discern a relationship between intelligence and second language learning with Gardner's and Sternberg's intelligence theories than with the traditional intelligence theories. He proposed that musical intelligence might have a role in learning intonation patterns of language, bodily-kinesthetic intelligence in the learning of the phonology of a language, interpersonal intelligence in communicative aspects of a language and finally, spatial intelligence in adopting the target culture, "growing comfortable in new surroundings" (p. 94).

This study is concerned with two disciplines in the field of cognitive science, namely, psychology and second language acquisition. Gregg (2003) situates SLA within the scope of cognitive science. Long and Doughty (2003) also emphasized

that SLA researchers have become involved in multidisciplinary studies and SLA and cognitive science share this focus:

> grammatical nativists, general nativists, connectionists, processing researchers, those studying individual differences in such attributes as age, aptitude, intelligence memory, or cognitive style, and those investigating such processes as implicit, explicit, incidental and intentional learning, and automatization, among others. (p. 869)

Therefore the results of the study does have further implications by its possible contributes to the field of individual differences in learning styles, multiple intelligences and the relationships between them and foreign language learning. In addition, comparing the relations between learning styles and language achievement, between MI and language proficiency and the relationship between MI and learning styles would contribute to the understanding of learning and performance in second language learning. The research results may yield further fruitful research areas as well as educational applications.

1.5 Limitations of the Study

This study was an exploratory study; therefore the findings derived from the collected data should be useful for further research but cannot be generalized beyond the population being studied. Some limitations to the present study are listed below.

1) The sample was composed of the volunteer learners at Basic English School at METU. This limited the generalizability of the results.
2) GPA was used as the only determiner of the foreign language success.
3) The effect of gender, age, and field of study was not considered.

1.6 Organization of the study

Chapter 1 introduces the study; presents its purpose and significance, the research questions to be explored, its limitations and defines the terms to be used.

Chapter 2 provides a review of the related literature. This review addresses learning styles, perceptual and social learning styles, Perceptual Learning Style Inventory, intelligence, Multiple Intelligence theory, and Teele Inventory of Multiple Intelligences. Chapter 3 contains details of the procedures utilized in this study and the analytical and statistical procedures. This includes the research questions, sample selection, methods, data collection, and analysis. Chapter 4 presents the details of the findings of the study and the analytical and statistical procedures. Chapter 5 summarizes the study, interprets the findings and outlines the conclusions of the study. Implications are presented along with recommendations for application of the study findings and suggestions for further research.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

2.1 Approaches to understanding intelligence

The definition and dimensions of intelligence showed some changes by time. Sternberg (2000) compared the definitions of intelligence proposed by the experts in the 1921 symposium on intelligence with those in the 1986 intelligence symposium. Similarities across two symposia include the issues of "adaptation to the environment, basic mental processes, and higher order thinking"; whether intelligence is a single entity or composed of several entities, and the breadth of definition which is about whether intelligence is defined only within cognitive and biological array or within a broader range including motivation and personality (p. 8).

In the second symposium, metacognition played an important role, it did not take place in the first one. Furthermore, the second symposium put much more emphasis on "the role of knowledge and the interaction between knowledge and mental processes" as well as the role of context and culture, whereas they were absent in the first symposium (p. 9).

Moreover, the definition and dimensions of intelligence also show changes depending on the approach. There are generally four different approaches to

understanding intelligence mentioned in the literature; Psychometric approach, Developmental progression approach, Information-processing approach, and Psycho-biological approach.

2.1.1 Psychometric approach

The first one is the psychometric approach, which is primarily concerned with the measurement of intelligence. The psychometric approach is considered synonymous with the factor analytic approach. Factor analysis has been utilized widely for testing and understanding intelligence. Factor analysis offered a rationale for various testing methods. It was the primary paradigm until the 1970s (Embretson & Mccollam, 2000).

This approach is thought to have been initiated by Galton (Kail & Pellegrino, 1985). The emphasis is on differences between people in terms of their cognitive abilities in solving complex problems that mostly rely on inductive reasoning processes like analogies, series completions and classifications (Lohman, 2005; Necka & Orzechowski, 2005). In this approach intelligence is considered as a single entity reflecting a general ability. It is determined as the common variance in factorial analyses of several abilities (Brody, 2000).

In 1884, to find out individual differences, Galton started administering tests of reaction time, vision, and hearing such as rate of movement, time for naming colors, number of letters remembered on one hearing, reaction time for sound, pressure causing pain and so on. (cited in Kail and Pellegrino, 1985; Thorndike & Lohman, 1990). Galton believed that there were two qualities that differentiate individuals. The first quality was energy. The level of energy characterizes individuals in many fields. The second quality was sensitivity. Galton observed that

information passes through the senses to reach individuals and "that the more perceptive the senses are of differences in luminescence, pitch, odor, or whatever, the larger would be the rage of information on which intelligence could act" (Sternberg, Lautrey, & Lubart, 2003, p. 4).

Similar to Galton, Cattell was also interested in individual differences. He administered many tests to students and used the term 'mental test' first in 1890 (Brody, 2000). Therefore, the modern area of measurement of personality and human abilities is thought to begin with Cattell (Thorndike & Lohman, 1990).

For Sternberg (2004), among the classical intelligence theories, the most influential theory is Spearman's g theory, proposed in 1904. Spearman's factor analyses showed two factors: a general factor (*g)* and special factors (*s)*. The g factor is the general factor that is influential in all mental ability tests and common tasks and s factor is influential in a single test or specific task.

During the second part of the nineteenth century, the interest in individual differences was high, and the influential researchers in this area were Binet and Simon. In 1905, Binet, known as the creator of the first intelligence test, built the first scale based on the assumptions that intelligence correlated with age and that intelligence is necessary for success in school (cited in Brody, 2000; Thorndike & Lohman, 1990). These two assumptions "continue to form the basis for the development and selection of test items for the measurement of intelligence today" (Thorndike & Lohman, 1990, p. 18). Binet found out that the universal development of intelligence in childhood formed the basis of constructing a measurement scale (Anderson, 2001). That is, the difficulty of a test item depends on the child's age. Binet's views on intelligence set the basis of many intelligence tests developed

thereafter, such as Stanford Binet and Wechsler. Then, together with Simon, Binet published the successor scales in 1908 and in 1911 (Thorndike & Lohman, 1990). The following year, Stern proposed the Intelligence Quotient (IQ) as the ratio of mental age to chronological age. In 1916, Lewis Terman at Stanford University modified the Binet scales and the new form was dunned the Stanford-Binet scale. This spawned a multitude of various scales to be developed throughout the years that followed. Some of these include Thurstone's Primary Mental Abilities (PMA), published in 1936, Wechsler's Wechsler Bellevue Intelligence test, published in 1939, Wechsler's Adult Intelligence Scale (WAIS), published in 1955, Wechsler 's Intelligence Scale for Children (WAIS), published in 1949, and Wechsler Preschool and Primary Scale of Intelligence (WPPSI), published in 1967.

Thurstone's Primary Mental Abilities Test is associated with the multiple factor theories. Thurstone argued that there are nine independent factors: space, verbal comprehension, word fluency, number facility, induction, perceptual speed, deduction, rote memory, and arithmetic reasoning. He found out that among the nine independent factors verbal comprehension, reasoning, and induction factors had the highest second order general factor loadings, which might be Spearman's g at work (cited in Kail & Pellogrino, 1985).

According to Sternberg (2004), although it is not often used today, Thurston's Primary Mental Abilities theory forms the basis of several current theories such as Gardner's Multiple Intelligence (1983, 1993) and Carroll's Hierarchical Model.

2.1.2 Developmental progression approach

The second approach to understanding intelligence is the developmental progression. Sternberg, Lautrey, and Lubart (2003) called it a cognitive-processing

approach and divided the developmental progression into three sections based on the Piagetian, Vygotskian, and the information-processing theories. The Piaget's theory of intellectual development provides rich source on the growth of intelligence.

Two different concepts of intelligence were developed by Piaget and Vygotsky. According to Piaget (1972), intelligence consists of a state of an adaptive equilibrium between the individual and his or her environment and it is a dynamic and continuous process of organization and reorganization of schemata. For Piaget, individuals develop continually at different ages and at different rates. Piaget was interested in the development of human intelligence, instead of the differences among individuals. Beginning from infancy, human beings create mental representations through acting on the world, which is central to intelligence. They go through stages of development such as sensory-motor, preoperational, intuitive, concrete, operational, and finally, formal operational stage. Following the mental actions on objects and on other mental actions, all individuals, some rapidly and some others slowly, achieve the end-state of human intellect.

On the other hand, Vygotsky (1978) put forward that intelligence has a social origin and functions in zones of proximal development (ZPD), which is a level of development gained through social interaction. Internalization is basic to intelligence. It is internal reconstruction of external operations through long developmental events. As a result of internalization, what individuals observe in the social environment becomes a part of the individual over time.

2.1.3 Information-processing approach

This approach is "concerned with constructing macro theories of intelligent-human or nonhuman-systems at a very detailed level, that is, at a level where theories

can be implemented and run on computers" (Sternberg, 1990, p. 130). Moreover, the information-processing approach provides information about the mental activities or processes of intelligent thinking. Mental phenomena are divided into cognition and metacognition by cognitive psychologists. Cognition refers to "regular information processing, which is directly responsible for the execution of cognitive tasks, whereas the latter involves the processes of monitoring and control" (Necka & Orzechowski, 2005, p. 131). Tiberghien (1989) defines cognition "in a general manner as the category of phenomena resulting from the encoding and manipulation of information by the system called the central nervous system" (p. 14). Metacomponents, which are crucial to understand intelligence, are higher-order cognitive processes responsible for executive functions such as attention operation, attention switching, updating of the content of the short-term memory, and restraining irrelevant information or undesired behavioral tendency (Necka & Orzechowski, 2005). Cognitive psychologists tried to relate information processing components to the scores on the intelligence tests. However, the causal relationship between intelligence and cognition has not been fully described (Pretz & Sternberg, 2005). Behavioral and neuroscientific research on the relationship between lower-order cognitive processes and the scores on the intelligence tests revealed that "processing speed, neural efficiency, functional connectivity, and frontal lobe activation" are related to intelligence (Pretz & Sternberg, 2005, p. 308). Moreover, the research on the relationship between higher-order processes and the intelligence test scores showed that "working memory and attention, cognitive flexibility of strategy use, learning ability, and context-based knowledge are strongly related to intelligence" (Pretz & Sternberg, 2005, p. 310).

Lohman (2005) carried out a study on the relationship between individual differences in information-processing and performance on intelligence tests and found that individual differences in performance in information-processing are responsible for some part of intelligence. He argued that although abstract and analytical reasoning strongly related to intelligence, they also depend on attentional resources (willing and affect), context, experience, specific skills, and prior knowledge.

Keil (1982) emphasized that the perception of the relation between cognition and intelligence depends on the perspective considered. According to the constraint approach intelligence is viewed as "closely related to a special subset of all of our cognitive abilities and as having unique distinguishing properties" (p. 1). The constraint approach focuses on domain specific knowledge and aspects of cognition that do not show variation during cognitive development. Cognitive psychological approach fails to clearly explain the difference between cognition and intelligence as it focuses on domain-general mechanisms of cognition, general strategies, metaskills, and principles of representation across domains and situations, which are very close to intelligence. Therefore, the evaluation of cognitive abilities "depends crucially on a prior specification of the formal constraints on the domain or domains of knowledge from which that ability originates" (Keil, 1982, p. 1).

2.1.4 Psycho-biological approach

This approach is based on brain research, which attempts to explain intelligence by studying the brain and the operations of central nervous system (Sternberg, 1990). This approach involves research on neurophysiology, which includes the studies of brain size (the correlation between head circumference and

intelligence), global theories of brain function, hemispheric corporation and specialization, and electrophysiological recordings (ERP) of electrical activity on the scalp and its relationship to intelligence, functional magnetic resonance imaging (fMRI), and diffusion tensor imaging (DTI) (Newman & Just, 2005; Sternberg, 1990; Eysenck, 1988).

According to Eysenck (1988), biological intelligence is related to a large portion of psychometric intelligence. In Eysenck's biological theory, cognitive processing speed is taken as the primary variable for explaining individual differences in general intelligence (Eysenck, 1988). Similarly, Vernon's neural efficiency theory emphasizes the speed and efficiency of neural systems to explain intelligence (Vernon, Wickett, Bazana, & Stelmack, 2000). Ceci, (1990) developed a bio-ecological theory of intelligence which suggests that intelligence includes metacognitive, biological, motivational, and environmental variables. According to this theory, processes depend on a particular domain of knowledge and operate only within that domain. For instance, when a 3-year old child is asked how many pieces it would make if an apple is cut in half, he or she gives correct answer. However, when the question is asked about rugs, the child asks how big the rug is. That is, "some assessment of the elaborateness of knowledge within a given domain is necessary in order to make inferences about the causes of individual differences in cognitive processing" (Barnett & Ceci, 2005, p. 214). Additionally, Goleman (1996) and LeDoux (2004) pointed out the importance of the emotions for learning. Newman and Just (2005) argued that intelligence "does not lie in any particular brain region, but is instead a function of a more distributed, dynamically configured set of areas" and *g* "may be the product of an adaptive, flexible neural system" (p. 100).

2.1.5 Multiple forms of intelligence

The last approach is the multiple forms of intelligence theory, which proposes that intelligence is not unitary, but multifaceted. The new trends in computer science, artificial intelligence and neuroscience have had a negative effect on the view of intelligence as a single property. Among the proponents of this approach are Sternberg and Gardner. Sternberg's Triarchic theory of intelligence consists of the three subtheories; componential, experiential, and contextual, whose elements are interrelated (Sternberg, 1990). First, the componential subtheory refers to the cognitive processes underlying the whole intelligent behavior. There are three types of information-processing components, which are metacomponents, performance components, and knowledge acquisition components. Metacomponents refer to "the higher order, executive processes" which are used to plan what to do, monitor the activity and evaluate it at the end (Sternberg, 1990, p. 268-69). Metacomponents include, for example, recognizing the existence of a problem, deciding the nature of the problem, selecting lower order processes, selecting a strategy to combine the components, and so forth. Performance components, on the other hand, are lower order processes which carry out the commands of metacomponents. Finally, knowledge acquisition components are exercised to "learn how to do what metacomponents and performance components eventually do" (p. 269). However, the experiential subtheory, claims that these components may not assess intelligence uniformly at different levels of experience. Thus, according to the experiential subtheory, intelligence can be best assessed at the levels of experience, which may involve relatively novel tasks or tasks becoming automatized. To observe automatization of a performance, problems or tasks that are asked to the testee

should be at the limit of one's understanding. Third, the contextual subtheory relates intelligence to individuals' cultural context. According to Sternberg (1990), intelligence entails adaptation to an environment, shaping of an environment or selection of environment, and the nature of intelligence shows variety depending on the culture. Moreover, intelligence is "purposefully directed toward the pursuit of these three global goals, all of which have more specific and concrete instantiations in people's lives" (Sternberg, 1990, p. 278).

Sternberg (1997; 2004) developed his Triarchic theory of intelligence into the theory of Successful Intelligence. Successful intelligence is the ability to adapt to, shape, and select environments so as to accomplish one's goals and those of one's society and culture. Successful intelligence involves analytical abilities, creative abilities, and practical abilities. According to this theory, in educational settings, students' multiple abilities are not exercised; instead analytical abilities are exploited at the expense of creative and practical abilities.

Although the theory of general intelligence or g factor was widely accepted in psychological literature (Jensen, 1999; Hunt, 2005; Gottfredson, 1997), current theorists such as Detterman (2000), Anderson (2001), Cattell (1987), Gardner (1983; 1993) Horn (1989) and Sternberg (1990, 1997; 2004) are opposed to it. They proposed that *g* factor could only be found in the tests of some academic and artificial tasks and would disappear when a wider range of tasks is used (Sternberg, 2004).

In the related literature, it has been observed that the existence of g factor is accepted by the majority of researchers. It is found predictive of academic achievement. However, although it is good at predicting, it is not good at

differentiating (Detterman, 2000). In other words, g factor does not differentiate two people with the identical IQ levels as they may perform very differently in similar tasks. G factor, although not denied, has been challenged by many researchers, and the notion that intelligence is multifaceted has gained support (Gardner, 1983; Detterman, 2000; Sternberg, 2004).

2.2 Multiple Intelligence Theory

One of the intelligence theories in the multiple forms of intelligence is Gardner's Multiple Intelligence theory. Similar to Sternberg's triarchic theory, Gardner (1983) believes in multiplicity of intelligence. In addition, both theories view intelligence "in terms of a complex interaction of various cognitive and other systems" (Sternberg, 1990, p. 262). Moreover, giftedness and retardation are viewed as multiple kinds. Again both theories argue that intelligences can be teachable or modifiable to some degree.

Gardner (1983) came advocated that people have different capacities and potentials. To define intelligence, Gardner (1999) collected data from different sources. One of the sources comes from the development of skills in normal children and another source comes from brain damage studies, as well as studies investigating prodigies, idiot savants, autistic children, and children with learning disabilities. They also took into account two kinds of psychological evidence correlations among psychological tests, and the outcomes of efforts of skill training.

Multiple intelligence theory asserts seven intelligences, each of which can be subdivided or rearranged. Intelligence types are also independent to a significant extent, as brain-damaged people demonstrate that certain faculties can be lost while others remain unchanged. However, any complex act necessitates using a

combination of intelligences. Gardner argued that "intelligences always work in concert, and any sophisticated adult role will involve a melding of them" (1993b, p. 17). For example, being a successful dancer requires skills in bodily-kinesthetic, musical, interpersonal, and spatial intelligences in different degrees (Gardner, 1993b).

Some intelligence types are closer in some settings. Dominance or weakness in one intelligence type does not necessitate this in the other types (Gardner, 1999). This was also stressed by Armstrong when he said, "There is virtually no activity in life that can be undertaken with only one intelligence" (1999, p. 63). Research on assessment of intelligences, therefore, is still ongoing process and "until it becomes possible to designate neural circuitry as representing one or another intelligence in action," it is difficult to assess which intelligences coordinate in specific occasions (Gardner, 1999, p. 95).

Basing his findings on evolutionary biology, anthropology, developmental and cognitive psychology, neuropsychology, and psychometrics, Gardner (1983; 1993b) defined eight different criteria to judge whether a type of ability can be counted as intelligence:

1) Potential isolation by brain damage:

Gardner proposed that any intelligence theory should be biologically based. He argued that "the mind/brain consists of many modules/organs/intelligences, each of which operates according to its own rules in relative autonomy from the others" (2003b, p. 14). If a specific part of the brain receives any damage, a specific capacity is lost or retarded, showing that the capacity is independent from others. He stated that "To the extent that a particular faculty can be destroyed, or spared in isolation, as

a result of brain damage, its relative autonomy from other human faculties seems likely" (Gardner, 1993, p. 63).

2) Existence of savants, prodigies, and other exceptional individuals:

Prodigies who are gifted in one or more areas of competence and idiot savants like autistics and mentally retarded people and who have low intelligence as assessed with IQ tests but have exceptional abilities in some areas show that intelligences are relatively in isolation.

3) An identifiable core operation or set of operations:

Gardner argued intelligences operate in rich environments so that a group of intelligences operate in conjunction. However, for analytic purposes, it is necessary to identify central abilities to intelligence. For instance, sensitivity to pitch is at the core of musical intelligence. It is essential to identify the core operations to 'locate their neural substrate and to prove that these "cores" are indeed separate' (Gardner, 1993b, p. 64).

4) A distinctive developmental history, along with a definite set of "end-state" performances:

Intelligence should have a developmental history that all normal individuals including gifted pass trough. Intelligences have a certain starting point in childhood; develop at different periods during life.

5) An evolutionary history and evolutionary plausibility:

The roots of current intelligences date back millions of years in the history of species. One should be able to locate evolutionary antecedent of the intelligence. According to Garner (1999), "evidence about the evolution of our species is crucial to any discussion of the contemporary mind and brain" (p. 36). Armstrong (1999)

mentioned the tracking abilities of Himalayan sherpas, classification methods of Kalahari Bushmen, musical genius of the Anang Culture in Nigeria, and mapping systems of Polynesian navigators.

6) Support from experimental psychological tasks:

Experimental psychology reveals operation of intelligences. The relative separateness of an intelligence type can be studied in detail by using the methods of cognitive psychology. Studies of memory, attention, and perception that can be related to the specific kind of input can reveal whether certain abilities are signs of the same intelligences or not (Gardner, 1993).

7) Support from psychometric findings:

If standard tests show that tasks that measure one type of intelligence correlate with certain tasks but not with the others, the idea that a particular ability is independent from others is supported. Gardner (1999) argued that "studies of spatial and linguistic intelligences, for example, have yielded persuasive evidence that these two faculties have at best a weak correlation" (p. 40).

8) Susceptibility to encoding in a symbol system:

Knowledge representation and communication of knowledge takes place by symbols, which are "culturally contrived systems of meaning which capture important forms of information" (Gardner, 1993b, p. 66). Intelligence may develop without symbols but a natural gravitation to symbolic system can be a core feature for an intelligence type. Each intelligence type can be symbolized in different ways. For example, linguistic intelligence makes use of linguistic symbol system; mathematical thinkers use numbers and Greek letters; musical intelligence can be symbolized by notes as bodily-kinesthetic by gestures and bodily expressions.

Key points of the MI theory can be summarized as the following:

1) Every person possesses all eight intelligences, but they differ in their profile of intelligences.
2) Most people can develop each intelligence type to an adequate level of competency.
3) Intelligences usually work together in complex ways. No intelligence exists by itself.
4) There are multiple ways to be smart within each intelligence type.
5) Each intelligence modality meets the eight criteria identified by Gardner.

2.3 Intelligence Types in Multiple Intelligence Theory

2.3.1 Linguistic Intelligence

Linguistic intelligence "entails sensitivity to different spoken and written languages, to shades of meanings, and to interactions among linguistics connotations" (Granott & Gardner, 1994, p. 174). It involves using language effectively and being sensitive to the nuances, order, and rhythm of words. "Students who enjoy playing with rhymes, who pun, who always have a fun story to tell, who quickly acquire other languages -including sign language- and who write copious notes to their friends in class all exhibit linguistic intelligence" (White, Blythe, and Gardner, 1995, p. 181). This intelligence is consistent with the traditional psychology. Neurolinguistic and aphasic studies show that different parts of the brain are specialized for language (Obler & Hannigan, 1996; Patterson & Bly, 1999). Special parts of the brain are responsible with the different processes of language. Just, Carpenter, Keller, Eddy, and Thulborn (1996, p. 114) investigated the modulation in the amount of neuronal activity for sentence comprehension:

> The modulation of the volume of activation by sentence complexity was observed in a network of four areas: the classical left-hemisphere language areas (the left laterosuperior temporal cortex, or Wernicke's area, and the left inferior frontal gyrus, or Broca's area) and their homologous right-hemisphere areas, although the right areas had much smaller volumes of activation than did the left areas.

Linguistic intelligence is a universal ability and its development follows the same route in all children. Even deaf children acquire sign language without explicit teaching. This shows that intelligence can perform independently of a specific input modality or output channel (Gardner, 1993). Moreover, language is not a spatial form of intelligence as linguistic capacity is robust to injury to the visual-spatial location of the brain (Gardner, 1983).

Certain parts of the brain are specialized for linguistic intelligence. Linguistic intelligence demands “a different set of neural mechanisms than does spatial or interpersonal processing” (Gardner, 1999, p. 99).The core operations of language include phonology, semantics, syntax, and pragmatics; in detail, sensitivity to grammar, sounds, rhythms, inflections, and meters of words.

The development of linguistic skills follows a specific developmental route. Gardner (1993b) gives examples of writers, poets, and novelists as the expert end states for linguistic intelligence. In case of evolution criterion, Gardner believed that linguistic intelligence “results from a coming together of a number of discrete systems, whose evolutionary history dates back many thousand years” (1993b, p. 91). Moreover, pragmatic features might have evolved from emotional expressions and gestural capacities just as the evolution of the vocal tract led to the articulation ability. Patterson and Bly (1999) summarized the evolutionary linguistics theories. Finally, the symbol system for linguistic intelligence is language.

The role linguistic intelligence plays in L2 learning has been questioned by several researchers. There are different and opposing ideas. It is proposed that language aptitude tests show a relationship to intelligence scores, as they assess both oral communicative fluency skills that are not related to intelligence and the abilities to perform on decontextualized language that are related to intelligence (Segalowitz, 1997; Skehan, 1991). Skehan put forward that language aptitude should reflect communicative abilities along which individuals show differential abilities.

Waterhouse claimed that exceptional language learning ability does not reflect a domain specific intelligence, such as linguistic intelligence, but instead specific sensory processing systems may promote language abilities (cited in Segalowitz, 1997). However, implications of this view have not been investigated for L2 learning (Segalowitz, 1997). Similar to Newman's and Just's (2005) intelligence view, Schneiderman and Desmarais (1988) put forward that exceptional language learners are those with greater neurocognitive flexibility (cited in Segalowitz, 1997). According to their argument, all people possess innate endowment, referred to by linguists as like Universal Grammar, which enables learning language, but for L2 learning, parameter setting loses its flexibility. These arguments bring the perspective that individual differences in L2 learning are not the result of one single factor such as linguistic intelligence, but a reflection of learning environment, complex human performance, perceptual, cognitive, affective, processes and neuropsycohological flexibility (Segalowitz, 1997).

2.3.2 Logical- Mathematical Intelligence

Logical-mathematical intelligence is related to numbers and logic and the ability to reason deductively or inductively (Armstrong, 1999). Among the people

whose logical-mathematical intelligence is high are scientists, accountants, philosophers and computer programmers. This type of intelligence includes "the ability to reason, sequence, think in terms of cause-and-effect, create hypotheses, look for conceptual regularities or numerical patterns, and have a rational outlook on life" (Armstrong, 1999, p. 10).

Among the core operations of logical-mathematical intelligence are abstract reasoning, solving problems, pattern making, and discovering analogies. This intelligence is well- investigated from psychometric approach. It provides the basis for IQ tests, as "raw intelligence" or the problem-solving faculty. First, certain parts of the brain are prominent in mathematical calculation. Moreover, there are examples of idiot savants, as well as child prodigies doing great calculations rapidly and accurately and keeping long sequences of numbers in their heads, but who are deficient in other areas. In addition, Piaget and other psychologists documented the development of this intelligence in children (Gardner, 1993b). The symbolic system of the logical-mathematical intelligence is mathematics.

For the developmental criteria, Gardner (1993b) accepts the development stages described by Piaget, which starts with appreciation of simple cause and effect relation, intuition of number and after other stages finally reaches logic, mathematics and science. This development is found parallel to the evolution of logical-mathematical intelligence in the evolution of science. Logicians, scientists, and mathematicians are among the people showing expert end states (Gardner, 1993b).

2.3.3 Spatial Intelligence

Spatial intelligence includes thinking in "pictures and images and the ability to perceive, transform, and re-create different aspects of the visual-spatial world"

(Armstrong, 1999, p. 10). Pilots, photographers, mechanical engineers and architects are dominant in spatial intelligence. Those people also visualize well, draw or sketch their ideas graphically and can easily find their way in three-dimensional space. Thomas Edison, Pablo Picasso, and designers of Pyramids had a lot of spatial intelligence.

Seeing is very important for spatial information, however even blind children have spatial intelligence. Moreover, spatially intelligent persons have great observational skills. Armstrong (1999) named German student Veronica Seider, who has super visual perception, and Eskimo hunters, who pay attention to details of the ice, as examples of highly spatially intelligent people.

The core operations include depiction and drawing of forms, creating mental images, visual-spatial thinking, perceiving visual world accurately, performing transformations and modifications upon initial perceptions, and recreating stimuli even the absence of physical object. Moreover, based on many intelligences tests, Gardner considers spatial intelligence as a discrete form of intelligence.

The right hemisphere of the brain plays a greater role in spatial processing than does the left-hemisphere. Damage to right parietal regions leads to special deficits related to the ability to find one's way, to recognize faces and scenes, or to notice details (Gardner, 1993b). Blind people illustrate the difference between the spatial intelligence and visual perception. They compensate for visual modality with tactile modality. It is also possible to see this in the examples of child prodigies and idiots savants.

The evolution of spatial intelligence is more continuous than with the case of other intelligences. Spatial intelligence played a crucial role for primates especially

in finding their way, and in hunting, and gathering. Symbolic representation of spatial intelligence is carried out with a map, sketches, or language.

Gardner's criterion of the development of spatial intelligence follows Piaget's explanations on development of spatial ability. Individuals follow a regular progression from:

> the infant's ability to move around in space, to the toddler's ability to form static mental images, to the school child's capacity to manipulate static images, and finally, to the adolescent's capacity to relate spatial relations to propositional accounts. (1993b, p.180)

2.3.4 Musical Intelligence

Musical intelligence is related to the capacity to perceive and produce rhythms, sound pattern, pitch, beat and melodies. Examples of people who have a high degree of musical intelligence include those that can sing in tune, keep the rhythm, and be a composer. Mozart, Bach, Beethoven and Brahms are among the people with high musical intelligence (Armstrong, 1999).

Gardner (1993b) showed violinist Yehudi Menuhin, who was attracted to the violin at the age of 3 and became an international composer at the age of 10, as evidence for biologically preparedness for musical intelligence. Moreover, autistic children who can play a musical instrument very well, but who cannot speak, support the independence of musical intelligence. Furthermore, specific parts of the brain in the right hemisphere play important roles in perception and production of music. Recently neurology studies revealed:

> MR morphometric studies have demonstrated that certain portions of the brain, such as the corpus callosum, motor cortex, and cerebellum, differ between musical professionals and musically unsophisticated persons. These studies can be explained by either innate developmental differences or changes induced by plasticity with hypertrophy of certain areas in response to the rigorous practice necessary for performance. (Popp, 2004, p.899)

Musical intelligence is supported with many different sources and empirically justified (Gardner, 1983). In order to think musically, one does not need to be a musician. Music is in people's daily life most of the time and it influences how people think in powerful ways (Armstrong, 1999).

The evolutionary history of musical intelligences dates back thousands or a million year ago. Based on the findings of Merriam and Nettl, Gardner argued that musical instruments date back to Stone Age and the important role of music in group organizations, hunting, and religious rites is evident (cited in Gardner, 1993b). The core operations of musical intelligence are being sensitive to pitch or melody, rhythm, and timbre, which is "the characteristic qualities of a tone" (Gardner, 1993b, p. 105). Gardner also proposed a rough developmental portrait for musical intelligence in infants by referring to the studies of Mechthild and Hanus Papousek and Davidson, McKernon, and Gardner (cited in Gardner, 1993b). During infancy, under normal conditions, children can sing, produce undulating patterns and imitate tones and prosodic patterns. Children in the middle of second year show a transition. They produce series of punctuate tones exploring small intervals. By the age of three, some approximate pitch while others may have difficulty in producing exact melody even at the age of five or six. By age school, children have a schema for what a song is. Then, individuals differ so much in their types and degrees of musical intelligence.

2.3.5 Bodily-kinesthetic Intelligence

According to Armstrong, it is the intelligence of the "physical self" (1999, p. 10). People having high level of intelligence can control their body movements successfully. They are good at carpentry, sewing and model building. They may have

hobbies such as hiking, dancing, jogging, camping, swimming or boating. They have tactile sensitivity. Athletes, craftsman, mechanics, and surgeons have bodily-kinesthetic intelligence a lot.

The core operations are stated by Gardner as "control of one's bodily motions and capacity to handle objects skillfully" (1993b, p. 206). Control of bodily movement is localized in the motor cortex and each hemisphere controls movements on the contra-lateral side. That is, left hemisphere controls the movement on the right of the body while the right hemisphere controls the movement on the left of the body (Gardner, 1993b; Fromkin & Rodman, 1998). The apraxias are a set of related disorders of the inability to perform some movements even though a person understands the request and is physically capable of doing it (Gardner, 1993). Gardner considered apraxias as one bit of the evidence for bodily-kinesthetic intelligence being separate from linguistic, logical- mathematical and other intelligences. By referring to Beck and Marshack, Gardner believed that body movement evolved in humans (cited in Gardner, 1993b). Moreover, Gardner proposed that "evolution of human beings over the past three or four million years can be described in terms of increasingly sophisticated use of tools" (1993b, p. 218). Neanderthal man, one-hundred thousand year ago, was fully in human physique. The original symbolic behavior was observed among Neanderthals. They buried their dead members and placed followers on their graves. Gardner (1993b) argued that the development of human symbolic functioning affects the development of bodily-kinesthetic intelligence. Symbolic functions help individuals communicate diverse messages as representation (denoting an entity, like a person or an object) and expression (communicating a mood, like gaiety or tragedy). Individuals progress

from simplest reflexes such as sucking and looking to reaching objects, goal directed acts, using tools and finally to complex skills.

2.3.6 Interpersonal Intelligence

Interpersonal intelligence includes talent in understanding and working with others, as well as responding to feelings and intentions of others (Sternberg, 1990; Rosnow, Skleder, Jaeger, & Rind, 1994). Religious or political leaders, teachers, directors, administrators, therapists, negotiators and parents show high interpersonal intelligences. Gardner (1993a) mentioned Anne Sullivan's experiment of training Helen Keller, who is a blind and deaf seven-year old child. At the end of the training, Helen grasped the language and progressed well. The key was Sullivan's interpersonal intelligence, which does not depend on language.

Interpersonal intelligence builds on a core capacity to "notice and make distinctions among other individuals and in particular, among their moods, temperaments, motivations, and intentions" (Gardner, 1993b, p. 239).

Brain research suggests that the frontal lobes have an important role in interpersonal knowledge. Any damage to this area may cause great changes in interpersonal knowledge without disturbing any other kinds of problem solving (Gardner, 1993b).

Basing his arguments on the findings of such researchers as Baldwin, Meltzoff and Moore, Simner, Borke, Davidson, Kagan, Kolberg, Freud, and Erikson, Gardner concluded that interpersonal intelligence includes two biological factors (cited in Gardner, 1993b). The first factor is the close attachment of the child to the mother. Without this relation during early development, child's interpersonal development is disturbed. The second factor is the importance of social interaction

(Gardner, 1993b). In the evolutionary past of the species, it is known that effective hunting requires group work, leadership, cohesion, and solidarity. Moreover, social arrangements, gatherings, starting nuclear family, and having strong parent-offspring ties might have evolved as well. In its initial stage, interpersonal intelligence reflects the capacity to discriminate among the individuals and understand their moods. Infants react to different affective expressions, which show first signs of empathy. In the next stage, infants begin to gain self-knowledge.

During the age two and five, children use symbols to refer to self or others such as personal pronouns, words, pictures, numbers, and gestures. They gradually start using terminology and interpretative system of their society. First-level social knowledge starts at the school age. At this level, acquisition of competence and building up industry (feeling of being skilled) and a decline of egocentrism are observed. From school age to adolescent period, there is a gradual process of getting greater social sensitivity, appreciation of other's motivations, having fuller sense of one's own competence and incompetence, and carrying mental manipulations about interactions among people. By the adolescence, social orientation becomes more psychological. Understanding of the social world and gaining a better self identity are crucial at this stage. The final stage is the mature sense of self, however, 'the accent in the "sense of self" falls much more on interpersonal knowledge and know-how' (Gardner, 1993b, p. 252). Some examples of individuals who arrived at the end state include Socrates, Jesus Christ, Mahatma Gandhi, and Eleanor Roosevelt.

2.3.7 Intrapersonal Intelligence

Intrapersonal intelligence is the ability to understand inner self. It refers to "cognate faculties that are involved when we turn our curiosity or attention inward in

order to understand ourselves (i.e. toward the personal realm of behavior, feelings, and motivations)" (Rosnow et all., 1994, p. 94). They can appreciate their feelings and guide their life trough self-understanding. They may be very introspective, independent, goal-directed and self-disciplined. They enjoy mediation as well as working alone. Theologians, introspective novelists, counselors, and self-employed business people are dominant in this intelligence (Armstrong, 1999).

Intrapersonal intelligence helps people access to their own feelings, emotions, discriminate among emotions, label them and guide their behavior. It is the most private intelligence. Therefore, it needs symbolic evidence from music, language or other expressive forms of intelligences (Gardner, 1993b).

As in the case of interpersonal intelligence, the frontal lobes play important role for the intrapersonal intelligence. Damage to the orbital area of the frontal lobes may cause problems such as hyperactivity, irritability, insouciance, and euphoria and damage to the convexity of the frontal lobe may cause a depressive personality. However, other cognitive functions remain preserved; although those individuals perform other cognitive performances, they lose the sense of self, personal motivation, personal goals, and so on. Moreover, the autistic child with impaired intrapersonal intelligence may exhibit great abilities in other areas.

The evolutionary and developmental history of intrapersonal goes in hand with that of interpersonal intelligence. Therefore, the explanations for the latter above are also true for this intelligence. Intrapersonal intelligence, in its primitive form, refers to the ability to distinguish a feeling of pleasure from pain and based on this discriminated to act accordingly. At its advanced level, intrapersonal knowledge is the capacity to detect and symbolize one's highly complex feelings and attentions.

2.3.8 Are there additional intelligences?

Gardner (1999) discusses the possibility of additional intelligences including naturalist, spiritual, existential, and moral ones. However, among them only the naturalistic intelligence meets the stated criteria for intelligences. Most people find different ways to use naturalist intelligence trough interests and hobbies. Naturalist people can recognize and classify species, the flora and fauna of their environment (Gardner, 1999). Armstrong suggested that the naturalist intelligence reveal the intelligence of the "green thumb" which leads some people to have gardens or household plants and to be attentive to nature flora and animals (1999, p. 225). Every culture values such ability. In scientific orientation, naturalist is a biologist who categorizes specimens according to formal taxonomies. In Western culture, naturalist is someone with extensive knowledge of the living world (Gardner, 1999). The core operations of naturalistic intelligence are to recognize members of species; to distinguish among members of a species; to recognize the existence of other neighboring species; to identify relations among species. Some individuals at the end state of naturalistic intelligence are Charles Darwin, Louis Agassiz, and Rachel Carson.

Evidence for its evolutionary history comes from roles of hunting, farming, and fishing, which all required people to understand, interact with, and care for nature and its species. A developmental history is proposed from a novice stage where no formal training is necessary to an expert stage which generally requires knowledge of botany and entomology. Children at early age start to interact with nature and even some of them show more interest in animals or plants. At later stages, they can identify and classify species. For the neurological evidence, Gardner

(1993b) gives examples of gifted people in recognizing naturalistic patterns although they have some impaired brain regions. Moreover, there are examples of brain-damaged people who cannot identify living things as well.

Brain regions involved in naturalistic perception have not been identified yet (Gardner, 1999). Representation of species recognition can be in different ways depending on the interaction type with the naturalistic patterns.

Gardener argued that no psychometric tests include naturalistic intelligence. Finally, naturalist intelligence has a symbol system. Linguistic and taxonomic systems are used for the classifying of plants and animals.

However, the naturalist intelligence has not been studied much by psychological research and it is not included in most of the tests.

2.4 Critiques of Multiple Intelligences

One of the critiques of Gardner's MI theory is done by Carroll, who is a student and a follower of Thurstone. Carroll (1985) supported the idea of multiple intelligences. For the criteria of intelligences that Gardner used, Carroll stated that they went beyond other criteria used in psychometric approach and added that "The utility of an intelligence for a society, and the evolutionary basis for that utility, are criteria that have seldom been recognized by intelligence theorists" (p. 68). However, he argued that "there are somewhat more kinds of cognitive abilities than Gardner recognizes. Abilities tend to group themselves into domains; the intelligences Gardner recognizes generally correspond to at least some of these domains" (p. 69). In linguistic intelligence domain, for example, there are cognitive abilities as

> verbal comprehension, lexical knowledge, expressional fluency, ideational fluency, phonetic coding ability, grammatical sensitivity, and something often called "word fluency" -- a facility in thinking of instances of words that have specified formal characteristics based on their sound and spelling (p. 69)

Carroll (1985) also noted that Gardner might have neglected the area of memory as psychometric evidence shows that there are important abilities in this domain. Morgan (1996) argued that seven human performances in the theory of multiple intelligences were cognitive styles, but not intelligences. He added that Gardner was not consistent in his definitions of intelligences as he used different terms to describe them; such as, *capacity* and *sensitivity* for logical-mathematical intelligence, *abilities* and *skills* for music and bodily-kinesthetic intelligence, capacities for spatial and interpersonal intelligence, and *access to one's own feelings* for intrapersonal intelligence.

However, in his interview with Kirschenbaum (1995), Gardner clarified the terms intelligence, competence and talent as the following:

> I think intelligence and talent refer to the potential to think and act. However, a potential by itself is meaningless until it is expressed in a social setting… Competence is a term to use after a person has had the opportunity to be trained or to practice a skill. Potential is latent until a measure of competence is obtained. Potential, talent, and intelligence are there (so to speak) ahead of time and can only be seen once a crystallizing moments has occurred and a person's competence is then observed. (pp. 7-8)

Sternberg (2004) pointed out some points to consider in Gardner's Multiple Intelligence Theory. To start with, he asserted that there was a need for empirical tests of the theory. Second, Gardner's literature review was selective and not intended to support his theory. Third, there might be other intelligences as well and some of them might be better labeled talents. Lastly, in order to validate the theory, there should be psychometrically strong assessments of the different intelligences.

Scarr (1985) criticized Gardner's assertion that the intelligences are autonomous. She asserted that research showed positive correlation among abilities. Gardner's counterargument to this criticism was that correlations were obtained

because of the psychometric measures which were not intelligence-fair (Gardner, Kornhaber, & Wake, 1996). Gardner noted that "only careful clinical or experimental investigation can help to specify which intelligences are in fact being used by a particular individual in a particular situation" (2003a, p. 48).

Nettelbeck and Young (1996) criticized one of the criteria Gardner used. They argued that savant skills are not intelligence as those skills do not require g factor, but depend on declarative (rote) memory. Moreover, they asserted that Gardner fails to recognize psychometric evidence for a general intelligence although there is overwhelming evidence from factorial analyses.

Bates and Rock (2004) argued that although mind is modular system, it is not composed of only seven or eight modules as proposed in MI theory, but rather many dozens of neuropsychologically dissociable modules in all areas of psychological function from vision to executive functions. Though these modules are dissociable, many functions require several modules working together. The evidence gained through blood glucose levels, brain pH, and neuronal volumes shows that "each of these general factors leads to a unification of processing ability, while in no way diminishing the functional modularity of the system" (2004, p.43).

Gardner's criteria for intelligences have received criticism (Klein, 1997). In his selection of criteria, Gardner (1993b) admits using a subjective judgment, but he claims that since the theory is open to investigation, this makes the theory scientific. However, Klein (1997) argued that Gardner's use of support from psychometric findings as one of the criteria does not support the theory, instead findings from such tests reveal that factors such as linguistic, spatial and logical correlate and reveal the existence of a general ability. Gardner does not provide an explanation for those

correlations, except that the assessment tools do not differentiate among intelligences. Moreover, Klein (1997) questioned how intelligences work together. For example dancing requires both bodily-kinesthetic and musical intelligence, but how they work productively is vague. This also applies to use of logic for many acts: "Many intending acts express logical-mathematical intelligence: inferring, classifying, hypothesizing, counting, calculating, and so on" (Klein, 1997, p. 381). These acts are shared by other intelligences such as spatial, interpersonal, intrapersonal, musical, naturalistic, and bodily-kinesthetic. As a result, this problem also affects the core operations of intelligences, which necessitates be reexamination (Klein, 1997).

Similar to the core operations problem, another criticism to Gardner comes from Raab and Gigenrenzer (2005). Although they support relatively autonomous multiple intelligences, they believe that the heuristics that people use in real life situations are not explicated in MI theory. That is, many acts cannot be explained with a few operations because context and heuristics play a crucial role on problem solving ability. Although they found MI theory valuable, within a counter Cartesian perspective, Kincheloe (2004) and Nolan (2004) criticized Gardner's linguistic intelligence. She argued that Gardner disregards the importance of discourse and the asymmetric relations among languages. She further added that it is not clear which standards are necessary to determine linguistic intelligence. She expanded the implications of linguistic intelligence in order to emphasize multiculturalism and minority students' linguistic and cultural backgrounds.

MI theory received support from some researchers as well. Davidson and Downing (2000) analyzed contemporary theory-based intelligence models whether

they met four criteria that were similar to those used in the literature on theories. The four criteria include explanation of the range, flexibility, and complexity of intelligence; how mental abilities develop and change by time and contexts; how psychological, biological, cognitive and developmental research is included; and if the theory is compatible with other theories. They reported that complex system models, including Gardner's multiple intelligence theory, Ceci's biological theory, and Sternberg's thriarchic theory highlight these criteria.

Posner (2004) argued that MI theory has an important role in psychology because it linked cognitive psychology and psychometrics by embedding tow approaches; approach to common mental processes and behavior and approach to psychometrics of individual differences in intelligences. The theory receives support from neuroimaging and humane genome studies. Neuroimaging studies reveal that distinct anatomical networks are activated by different tasks such as visual, auditory, spatial, arithmetic, music, understanding others or self. However, it has not been proved that these anatomical networks are separate since real-world tasks necessitate activation of different networks simultaneously. Gardner's assumption that the higher ability in a domain corresponds to more efficient use of required neural networks received support from developmental studies, which compare neural activations of children and skilled adults when they are performing the same task (Posner, 2004).

Shearer (2004) reported that although it is sometimes argued that MI is questioned because of flexibility of the brain. She pointed that this does not invalidate MI theory, because MI theory claims that neural processing for each intelligence require different set of neural mechanisms. Only when two intelligences,

for example, were found to have the same representation, it would suggest that they were not separate. Shearer (2004) pointed out that MI theory provides construct validity with its effective applications in education in different countries.

Chen (2004) investigated the credibility of MI theory. She referred to Kuhn's arguments that methodology by which a theory is developed is one of the most crucial criteria for the establishment of the theory and argued that MI theory is grounded on empirical data from several fields such as neuropsychology, anthropology, biology, and developmental psychology. She added that MI theory better accounts for special people as prodigies and savants than IQ based intelligence theories. Moreover, it better explains learning styles and differential abilities that are required in different professions. She pointed out that another way to validate MI theory is to evaluate the results of its applications in educational settings. Several studies reported positive effect of MI theory on education. For example, Project Zero at Harvard University studied forty-one elementary schools that applied MI theory to their curriculum for more than three years. Results showed improvements in standardized test scores, student discipline, parent involvement, and student performances.

Chen (2004) also reported that a theory needs to have high explanatory power to account for observations and high generative power to offer new frameworks and contributions to the field. MI theory has high explanation power with its empirical data provided for criteria and generative power with its stimulating new ideas, and practitioners in different fields.

Although Gardner's theory of Multiple Intelligences is not the first model suggesting different intelligences, his theory had received great attention and became

powerful. This could be because of the research data received from cognitive psychology, anthropology, developmental psychology, psychometrics, biographical studies, animal psychology, and neuro-anatomy (Armstrong, 1999).

2.5 Multiple Intelligence Research in SLA

Multiple intelligence preferences are identified mostly by self-report inventories developed by such researchers as Teele (2000), Armstrong (1999), and Silver, Strong and Perini (2000). Although Gardner (1993) emphasized that each intelligence should be assessed with the material specific to each intelligence type, such assessments require complex tools and longitudinal research designs. Since this is not feasible and practical, questionnaires assessing multiple intelligence preferences are often used by researchers (McMahon, Rose, & Parks, 2004).

Loori (1995) administered TIMI inventory to 90 international ESL learners in the United States in order to investigate the multiple intelligences preferences of male and female students. The results showed that there were significant differences between males and females in terms of their preferences of intelligences. Male students showed strong preference for logical-mathematical intelligence while the female students preferred intrapersonal intelligence. Moreover, the dominant preferences were for interpersonal, logical-mathematical, and linguistic intelligences.

Some other researchers investigated the relationship between intelligence that is taken as unitary property and second language aptitude. Among them Wesche, Edwards and Wells (1982) and Skehan (1991) found out that intelligence and aptitude were related and language aptitude was consisted of certain components of intelligence which were linked to learning contexts (Skehan, 1991). Studies on multiple intelligences in the field of second language acquisition are mostly on the

application of theories to teaching although Gardner did not propose any application model of the theory to foreign language teaching. Christison and Kennedy (1999) reported that the implementation of MI theory in ESL/EFL pedagogy showed promising results in students' learning.

Applications of MI theory to second language learning were investigated by Haley in a quasi-experimental research (2004). Applications included instructional strategies, curriculum development, and assessment. Haley collected both qualitative and quantitative data form different schools in six countries including 650 students in grades K-12 and 23 English as a Second Language (ESL) and foreign language teachers. Students' achievements before and after MI application were compared. The results revealed that student achievement was greater after MI application. Haley (2004) concluded that application of MI theory to second language and foreign language learning has positive impact on both students and teachers.

A similar research carried out by Kornhaber (2004). The results showed improvement in at least two of the four areas including curriculum, assessment, school structure, and pedagogy. Kornhaber (2004) also reported that The Project on Schools Using MI Theory (SUMIT), which took 3,5 years and included 41 schools that had been implementing MI theory for more that 3 years. SUMIT provided a detailed report on practices in classrooms and frameworks in schools. Approximately 80% improvement was found in students' test scores, behaviors, parental involvement, and success of students with learning disabilities.

Eisner (2004) examined whether MI theory fits current educational policies and applicable to education. She mainly focused on education policies in American schools. Current policies demand uniformity, standardization in curriculum and

assessment, and predictability in outcome. However, she argued that current policies do not value individual differences and their unique abilities and they help little predict real life performance. By looking at the performances of students in different study areas and valuing their unique abilities, a curriculum based on MI theory can be created. Therefore, learning can be enhanced (Eisner, 2004).

2.6 Definitions of Learning Styles

The idea of style, in psychology, was introduced by Allport in 1937 for identifying personality and behavior types (cited in Sternberg and Grigorenko, 2001). The learning style concept derived from the field of individual differences in information processing (Curry, 2000).

Keefe defined learning styles as "cognitive, affective, and physiological traits that are relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (Keefe, 1979, p. 4). According to Keefe, the basis of learning styles lies in neural organization and personality, and it is shaped by human development and learning experiences. Based on his experiential learning theory, Kolb (1984) introduced two dimensions of learning style, which formed four types of learning styles.

The first dimension, *perceiving* refers to how people perceive new information and it includes concreteness versus abstractness. The second dimension, *processing* refers to how people process what they perceive and it includes action (preferring doing) versus reflection (preferring watching and abstract thinking). According to this model, four types of learning styles are: *diverging style* implies perceiving input concretely and processing it reflectively; *converging style* refers to perceiving input abstractly and processing it actively, *assimilating style* shows

perceiving input abstractly and processing it reflectively, and *accommodating style* refers perceiving input concretely and processing it actively.

Skehan (1991) also defined cognitive style as 'a general predisposition, voluntary or not, towards processing information in a particular way' (p. 288). For Sternberg, "a style is not a level or even a kind of ability, but rather a way of utilizing an ability or set of abilities" (Sternberg, 1994, p. 225). In other words, it is not a talent but a strong tendency, and style functions without individual consciousness. According to Saracho (2000), cognitive styles are "systematic modes of processing information that develop into a sociable process around underlying personality trends" and therefore, they are inherently entwined with personality (p. 297). Moreover, Riding and Rayner (1998) defined cognitive styles as an individual's consistent method of perceiving, organizing, and representing information. Riding (2002) argued that style can be inbuilt or developed with experience, but it is apparent at an early age. He predicted that a style might result from a difference between two complementary abilities. To illustrate, if there were one processor for verbal information and one for pictorial in the brain, an individual having unequal speed and process capacity, he/she would prefer the one whenever possible and this would create a style. Moreover, style is distinct from personality and gender (Riding, 2002).

In Reid's definition, learning styles refer to "an individual's natural, habitual, and preferred way(s) of absorbing, processing, and retaining new information and skills" (1995, p. viii). Although at least twenty-one learning styles have been identified by Dunn, research indicates that generally people have six to fourteen major preferred learning styles (Cheng and Banya, 1998; Dunn, 1999). Moreover,

learning styles are not dichotomous, but exist on wide continuums (Reid, 1998). They are influenced by factors such as gender, age, culture, context, motivation and background knowledge, and subject matter (Cheng and Banya, 1998; Dunn, 1999). Learning styles are value-neutral and often linked to learning strategies, which are defined as "specific methods of approaching a problem or task, modes of achieving a particular end, planned end, planned designs for controlling and manipulating certain information" (Brown, 1994, p. 104). Sternberg and Grigorenko referred that "styles operate without individual awareness, whereas strategies involve a conscious choice of alternatives (2001, p. 3).

As in the case of intelligence, there is wide range of definitions of learning styles in the literature. The terms learning style and cognitive style, and sometimes instructional preferences or studying approaches are interchangeably used. However, some authors make a distinction among them. Curry (Curry, 1983; Curry, 2000) categorized them in a three-layered "onion model". In the onion model, each layer represents a particular construct. The outer layer stands for the instructional preference, which is the most flexible over time, the middle layer consists of information processing models or learning styles, which are more time stable than the preferences. The center of the onion shows the personality level measures which are the most time stable and called as cognitive styles by Sadler-Smith and Riding (1999). All layers of the onion model are subconscious and automatic while studying approaches are conscious and intentional.

Similar to Curry, Sadler-Smith (1999; 2001) also emphasized the importance of distinguishing between constructs of cognitive style and learning style in order to have progress in the field. According to his study, these constructs are independent

from each other. According to Snow (1992), abilities, interests, and styles represent cognitive and affective aspects of general human functioning and learning.

Another definition of learning style is made by Dunn and Dunn, and Dunn, Dunn and Perrin as "the way each person begins to concentrate on, process, internalize, and retain new and difficult academic information" (cited in Dunn, 1999, p. 11). Rita Dunn (1999) noted that most part of learning style is biological while a small part of it is developmental, which change more predictably. Learning styles differ with age, achievement level, gender, culture, and global versus analytical brain processing (Dunn, 1999).

Sternberg and Grigorenko (2001) categorize styles as; a) cognition-centered styles, b) personality centered styles, and c) activity centered styles. First, cognition-centered styles try to explain the relation between cognition and personality. They involve Witkin's field dependence/field independence (Witkin and Goodenough, 1981), Gardner's equivalence range, Pettigrew's category width, Kagan, Moss and Sigel's conceptual style, Klein's cognitive controls, and Kagan's reflection-impulsivity (1966). In their evaluation of cognitive styles, Sternberg and Grigorenko find them too close to abilities. When styles are referred as abilities, the notion of style becomes totally different. Another problem they mentioned was the classifications of individuals into categories, which they found as arbitrary. Styles are not dichotomous. People have each style to some degrees.

Second, personality-centered styles try to explain styles in reference to "conceptualization and measurement of personality" (2001, p. 14). Among personality-centered styles are Myers & Myers' theory of psychological types, and Gregorc's energic theory of mind styles. Personality-based theories are very close to

personality traits. Some examples are Myers and Myers' theory of psychological types and Gregorc's theory of mind styles. Although they are more comprehensive than the cognitive-based theories, validations based on "statistical analysis of the structure underlying the data from the tests used to measure the constructs" are not strong. In addition, they do not consider the flexibility or changes related to tasks and situations (Sternberg and Grigorenko, 2001, p. 16).

Third, activity-centered styles deal with learning and teaching styles. Some examples of learning styles come from Dunn and Dunn's and Kolb's theories. The first limitation of the activity centered approaches, argued by Sternberg and Grigorenko (2001), is the lack of clear definition of style in their frameworks and lack of information about the development of styles. Third, they are not integrated with more general theories of psychological functioning.

Learning styles are argued to be interrelated with the exposed learning environment and teachers' teaching style (Reid, 1995; Ehrman, 1996; Dunn, 1999; Cheng and Banya 1998; Peacock, 2001). Reid, (1998) suggested that in spite of the teaching styles and classroom atmospheres that they encounter, generally students retain their preferred learning styles and by time, they may acquire additional styles as their preferred styles with experimentation and practice. Studies show that a mismatch between teaching style and student's preferred learning style interferes with learning. Ehrman (1996) pointed out that these "mismatches are at the root of many learning difficulties" since learning styles have a direct effect on choice of learning strategy, material and activities (p. 50). Moreover, research shows that highly successful students usually have multi-style preferences (Reid, 1995; Ehrman, 1996). Multi-style preference leads to be flexible, which is called style flexing by

Ehraman (1996), and this refers to shifting one's style preference to make the most of the learning circumstance.

In short, styles are generally defined and studied in terms of three main components; physiological, cognitive, and affective. Learning style is generally referred as one's unique approach to learning. Learning styles interact with learning environment as well.

2.7 Learning Style Research in Second Language Acquisition

In the field of SLA, learning styles have been investigated in order to explain learner differences in foreign language learning efficiency (Robinson, 2002; Reid, 1995; Peacock, 2001). Moreover, learning style applications to language teaching methodology have been addressed (Ehrman, 1996; Reid, 1995; Brown, 1994, Oxford, 1995, 2002; Ehrman, Leaver, and Oxford, 2003; Felder and Henriques, 1995). Quite many cognitive and learning styles have been defined by researchers up to now but very few of them drew the attention of the second language researchers. Among them are Witkin and Goodenough (1981), Dunn (1999), Riding (2002), Kolb (1984), Reid (1987) and Honey and Mumford (1992). For Witkin and Goodenough (1981), field dependent (FD) or global cognitive style refers to paying attention to the whole instead of the parts of the total field or stimuli while field independence (FI) or analytic cognitive style refers to perceiving the parts of the field distinctly from the ground. FI and FD have been considered very much related to language learning and studied by many researchers (Ehrman, 1996). However, although Birgen (1989) found that Turkish FI learners were more successful in language learning than FD learners were, Skehan (1991) concluded that according to correlational studies carried out by Naiman et al, Genesse and Hamayan, Bialystok

and Frohlich, Tucker et al., and Reves, the relation between FI and language performance was too weak.

Skehan (1991) suggested that learning styles are related to modality preferences and foreign language aptitude as well as learning strategies is tied to styles. Moreover, they all affect language learning as seen in the Figure 1.

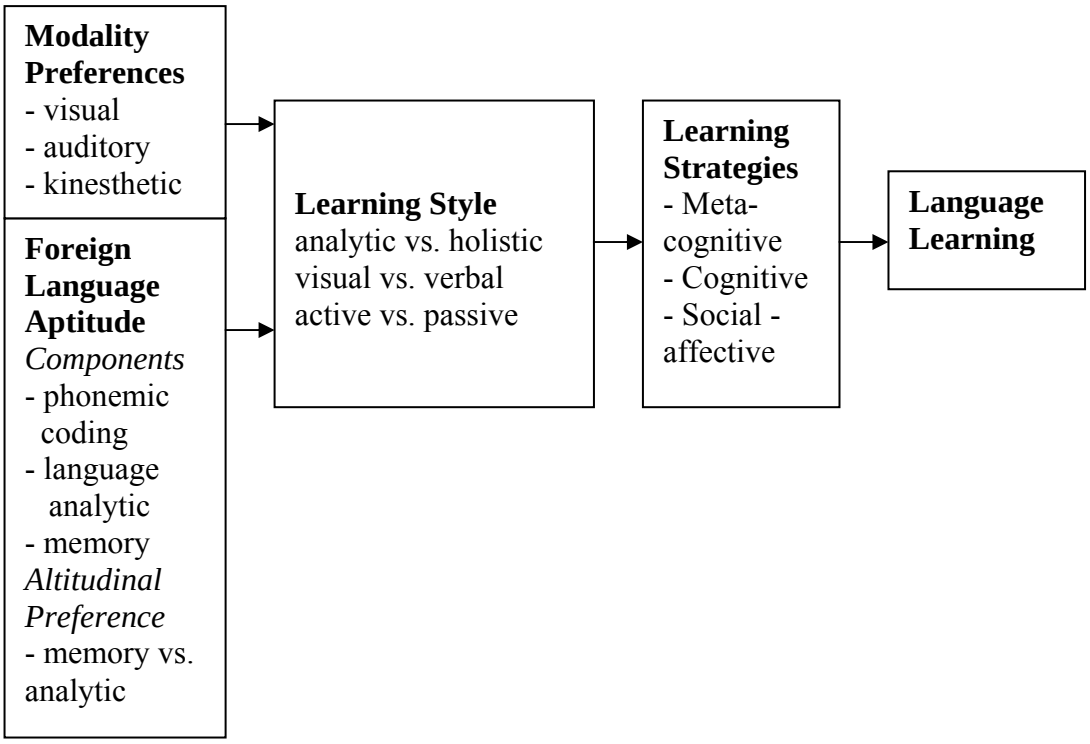

Figure 1: Learner differences and language learning (Skehan, 1991, p. 268)

Research on learning styles utilizes primarily self-reporting questionnaires and shows that they are effective (Kolb, 1984; Reid, 1987; Dunn, 1999). Learning style inventories were also found useful by Merriam and Caffarella (1991) and Ehrman (1996). Ehrman (1996) argued that there is a relationship between what and how people prefer to do and what their real learning style is. Various learning styles

instruments for native speakers of English have been developed so far, however, a few of them are designed for specifically for non-native speakers of English (Wintergerst, DeCapua, & Verna 2003). The most recent and widely used instrument for ESL learners is Reid's PLSPQ (see Appendix), which was developed by Joy Reid.

Reid (1987) developed the Perceptual Learning Style Preference Questionnaire (PLSPQ) (see Appendix) in 1984 which was designed specifically for students studying English as a second or foreign language (ESL/EFL). Based on the learning styles categorization of Dunn (1999), perceptual and social learning styles addressed in this questionnaire included four physical modalities as visual, auditory, tactile, and kinesthetic, and two sociological modalities as group and individual:

Visual learning

Visual learning style refers to preferring to learn through seeing, that is, visual channel. Oxford reports that "Visual students need the visual stimulation of bulletin boards, videos and movies" (1995, p. 36). They like reading, computers, pictures and written instructions (Oxford, 2002). Learners whose dominant learning style preference is visual can visually recall what they have read or observed (Wooldridge, 1995). In PLSPQ, items related to visual learning style refer only reading textual material. Reid (1990) explained that non-textual items, pictures, photographs and graphics caused ambiguity among ESL students and decreased the construct correlation coefficient.

Auditory learning

Auditory learners prefer to learn through "oral-aural learning channel" and to "engage in discussions, conversations, and group work" (Oxford, 1995, p. 36). They

"may need to hear written text material, ask for tapes or passages to be read out, prefer oral practice without books, and so on" (Erhman, 1996, p. 61).

Kinesthetic learning

Kinesthetic learners prefer to learn through "experiential learning, that is, total physical involvement with a learning situation" (Reid, 1987, p. 90). They need body movement to absorb and retain what is learned (Wooldridge, 1995). They prefer learning through activity and they cannot focus on challenging information passively (Dunn, 1999). In PLSPQ, the tasks included in the statements of this domain reflect overlapping preferences among kinesthetic and group learning styles. Some statements are open to interpretation.

Tactile learning

Tactile learners prefer to learn through hands-on activities. They "need to touch and handle objects" (Oxford, 1995, p. 35). Those students generally underline when they read and take notes while listening. They keep their hands busy (Wooldridge, 1995). They need to use manipulative and models (Dunn, 1999). This style is vaguely represented in PLSPQ. The tasks included in the statements reflect overlapping preferences among kinesthetic and group learning styles. Some statements are vague to interpret.

Individual Learning

Individual learning is one of the sociological styles that included in PLSPQ by Reid. It refers to preferring to learn through working alone (Reid, 1995). Learners whose primary learning style is individual learn more efficiently by themselves (Dunn, 1999). They want to pace themselves and become critical with the presence of an authority.

Group Learning

Group learning style is also one of the sociological styles. Group learners prefer learning through working with others and participating group works (Reid, 1995). They like working in small groups, teams, or with a peer (Dunn, 1999).

Wintergerst, DeCapua and Itzen stated that PLSQ was "one of the only three known normed instruments in survey instruments in the ESL/EFL field" and compared to "the other two survey instruments (O'Brien's Learning Channel Preference Checklist and Oxford's Style Analysis Survey), the PLSPQ was neither long nor time-consuming to complete" (2001, p. 389).

Reid (1987) carried out research with an approximately 1300 ESL students including Japanese, Arab, Korean, Chinese, Malay, and Spanish across the USA in 1987. The results were as the following:

ESL students and native speakers of English showed significant differences in terms of their perceptual and social learning style preferences. Most of the ESL students preferred kinesthetic and tactile learning while native speakers of English were less tactile than all ESL students and less kinesthetic than Korean, Arabic, Chinese and Spanish speakers. Most of the ESL students did not prefer group learning and native speakers of English rated group learning less than all the other groups.

Based on the scoring of PLSPQ, scores range from 0 to 50. Reid (1987) provided three cut-off scores for major learning style preference (38-50), minor learning style preference (27-37), and negligible learning style preference (24 or less) to analyze the data received from the PLSPQ. According to such analysis, students showed differences in their major, minor, and negative learning styles according to

their language, educational and cultural backgrounds. For example, Korean students were the most visual and more visual than the U.S. and Japanese students. In addition, Japanese learners were the least auditory of all the groups and less auditory than Arabic and Chinese students who were strong visual learners.

Students' gender, major field and level of education showed relationship to various learning styles preferences. To illustrate, while graduate students were visual and tactile oriented, undergraduates were more auditory. Moreover, male students were more visual and tactile than female students.

ESL students who stayed in the U.S. for a longer time tended to adapt their learning styles to the educational culture in the U.S. For instance, the longer the students stayed in the U.S., the more auditory they became. This results show that ESL learners adapt their learning style preferences to the learning environment.

Reid (1998) also reported on the results of the research carried out by several teachers in EFL programs in different countries by using PLSPQ. She noted that many EFL teachers-in-training in Egypt indicated preferences for multiple learning styles. She explained that it might be a cause or result of their being successful university students.

In Hungary, auditory learning style was preferred most as a minor perceptual learning style by EFL teachers-in-training. This is parallel to Reid's findings that as the students study English for a longer time, they prefer auditory learning style more. This may indicate that learners accommodate their learning style preferences. In Russia and including the other two groups, kinesthetic and tactile were chosen as major learning styles. Moreover, in all groups, auditory learning was not chosen as a strong major learning style. All groups indicated multiple learning style preference.

That is, they had strong preference for several learning style types, instead of preferring only one type.

Stebbins (1995) replicated Reid's 1987 research with 660 adult ESL students and graduate and undergraduate 121 native speakers of English at the University of Wyoming in 1993. Students' TOEFL scores were taken into account. Sixty three countries, 43 language backgrounds, and 92 major fields were represented in the sample. The results of the study were parallel to the results of Reid's 1987 study (Stebbins, 1995):

1) Kinesthetic and tactile learning styles were strongly preferred by ESL students when compared to native speakers of English.
2) Group learning was again chosen as the least preferred mode by most native speakers and ESL students; the only ESL students with low (300-349) TOEFL scores indicated a preference for the group learning style.
3) Spanish speakers again showed strong preferences for the kinesthetic mode.
4) Arabic and Korean students were stable in their choice of multiple learning styles.
5) Japanese students again did not strongly show any style preferences.

Rossi-Le administered PLSPQ to 147 adult immigrant ESL students in the U.S. with backgrounds of Chinese, Laotian, Vietnamese, Spanish, and a sampling of Cambodian, Japanese, Polish, and Korean. The results that paralleled previous findings showed that language background or culture had a role on perceptual and social learning style and major learning style preferences were tactile and kinesthetic modes. However, group learning preference was higher than the previous findings. Moreover, there was a relationship between kinesthetic learning style and language

proficiency. Language proficient students preferred kinesthetic learning mode more strongly than those with low language proficiency.

Park (1997; 2001; 2002) conducted several studies on cultural differences in the learning style preferences of ESL students. In 1997, in her study she included Vietnamese, Korean, Chinese, Filipino, and Anglo-American students and used PLSPQ. Results of multivariate analysis of variance (MANOVA) showed that Korean, Chinese, and Filipino preferred visual learning more than Anglos and while Korean, Anglo, and Chinese students did not prefer group learning and Filipino preferred less, Vietnamese strongly preferred. The univariate F tests showed main effects of achievement. There was a strong relationship between students' learning styles and their achievement level. High achievers preferred visual learning the most while the low achievers preferred the least. In addition, high achievers showed a negative preference for group learning. Moreover, middle and low achievers demonstrated minor preferences.

In another study, Park (2002) included 183 Armenians, 126 Hmong, 90 Koreans, 80 Vietnamese, and 378 Mexicans ESL students and used PLSPQ to investigate students' learning style profiles in relation with their sex, foreign language achievement level (GPA), and length of residence in the U.S. The findings confirmed previous studies (Park, 1997; Park, 2001; Reid, 1987) and revealed very strong relations between ethnicity and learning style preferences, in addition to between achievement level and the learning style preferences. Multiple comparisons of means tests revealed that middle achievers showed statistically significantly higher preference for auditory learning style than did low achievers. Moreover, high and middle achievers had statistically significantly higher preference for individual

learning style than did low achievers. Finally, similar to the previous findings, all the groups preferred for kinesthetic and tactile learning as either major or minor preferences and visual learning style was preferred by all groups.

Peacock (2001) investigated the correlations between learning styles, proficiency, and discipline (science or humanities). He collected data from 206 EFL students through PLSPQ. The results showed that EFL students mostly preferred kinesthetic and auditory learning styles while preferring individual and group learning styles the least. Students who showed group learning style preference had significantly lower EFL proficiency level. While humanities students chose auditory style as major, science students chose it as minor. Humanities students showed minor preference for individual learning style whereas science students showed negative preference. Finally, science students had a significantly higher preference for group learning style while humanities students had a negative preference for it.

From the previous research, it can be observed that kinesthetic and tactile learning styles were major preference of the ESL/EFL students in most of the studies (Reid, 1987; Reid, 1998; Stebbins, 1995; Rossi-Le, 1995; Park, 2001; Park, 2002) visual was minor preference in all of the studies, and group learning style was preferred the least in most of the studies (Reid, 1987; Reid, 1998; Stebbins, 1995; Park, 1997; Peacock, 2001). As stated by Stebbins (1995), the stability of the results between Reid's 1984 findings and Stebbins' 1993 findings as well as other findings in the literature gives evidence to the reliability of PLSP questionnaire.

2.8 Intelligence and Learning Style Research in Turkey

Gülgöz and Kağıtçıbaşı (2004) presented the history and current state of research on intelligence, and cognitive skills in Turkey. According to their survey,

the tests that were developed or adapted after 1980 were Alexander Practical Ability Test, Analytical Intelligence Test, General Aptitude Battery, General Aptitude Test, Healy Picture Completion Test, Logical Reasoning Test, Revised Visual Retention Test, Torrance Tests of Creative Thinking, Visual Motor Gestalt Test, Gesell Development Test, Visual Auditory Digit Span, Wechsler Intelligence Scale for Children-Revised, Wechsler Memory Scale-Revised, Wechsler Preschool and Primary Scale of Intelligence-Revised, and Wisconsin Card Sorting Test.

Except for two of those tests, they were adaptations and most of them were performance tests that were less vulnerable to cultural differences. 62% of the studies were related to pathology; about 12% was related to education; 10% of the studies focused on individual differences; nearly 7% were on biological and genetic factors and 6% were on psychometric qualities. Lastly, 3% of the studies were on the relationship between intelligence measures and cognitive tasks. Gülgöz and Kağıtçıbaşı (2004) pointed out that there was little concern in the underlying conceptualization of intelligence or understanding intelligence.

In Turkey, much of the research on multiple intelligences and learning styles was carried out for the purpose of Master's or Ph.D. thesis requirement, and focused on practical applications (Demirel, 1998; Demirel & Şahinel, 1999). There are some similarities and differences between the findings of EFL learners, speakers of languages other than Turkish, and the findings of the study done with Turkish EFL learners. Similar to other studies, Tabanlioğlu (2003) administered PLSPQ to 54 Turkish EFL students at college level. The results showed that group learning was the least preferred learning style of Turkish EFL learners. Different from the other findings (Reid, 1987; Reid, 1998; Stebbins, 1995; Rossi-Le, 1995; Park, 2001; Park,

2002), auditory and individual learning styles were the major learning styles of Turkish EFL students participated in the study. Nevertheless, the sample size in this study was 54, which prevents generalizing the findings to the Turkish EFL student population.

Işısağ (2000) identified multiple intelligence preferences of in EFL classes in the English Language Teaching (ELT) department of Gazi University. A self-statement based inventory was created by the researcher and administered to 200 students. He found out that interpersonal followed by intrapersonal and linguistic intelligences were dominant among EFL students. Naturalistic, logical and musical intelligences were preferred the least. Işısağ (2000) argued that it is reasonable to conclude that self-reports of intelligences reflect a relationship between the major field, in this case EFL, and intelligences. EFL students are in-service teachers and their interest in teaching may reflect their interpersonal and intrapersonal intelligences. Their preference for linguistic intelligence may also show that they do well in language learning and social studies rather than in science and mathematics.

Baran (2000) examined the relationship between university students' major study fields and their dominant intelligence preferences. Self-statement based Multiple Intelligences Inventory, which was developed by Gardner and adapted to Turkish by Abaci was administered to 233 students from 6 departments. The results of ANOVA and LSD analyses showed that students of mathematic department had higher mathematical-logical intelligence; counseling students had higher interpersonal and intrapersonal intelligence; art students had higher spatial intelligence than the other student groups at the significance level of .01. Based on these relations, Baran(2000) argued that individuals tend to prefer in a study area that

they believe they are strong. However, neither Turkish linguistic nor foreign language education students showed statistically significant preference for linguistic intelligence. Baran (2000) suggested several possible reasons for those students not showing higher linguistic intelligence preference compared to other groups in the study. First, students were admitted to the university based on their achievement on university entrance exam, which assess students' linguistic knowledge but not their ability to use the language. Second, there might have been chance factors affecting students' choice of their major field. Third, students might not have been able to choose their department based on their ability and interests. Replicating this study with a mixed method, that is using both qualitative and quantitative techniques could provide deeper information related to students' dominant intelligence and preference of study area. However, further study is needed to understand the effects of these possible reasons.

2.9 Relationship between intelligences and styles

According to Renzulli and Dai (2001), abilities refer to whether the individual is capable of learning or performing certain cognitive tasks. Cognitive and learning styles question in which ways the individual approaches learning tasks. Thus, by this definition, "styles reflect more generalized and pervasive aspects of personal functioning than do abilities" (2001, p. 34).

Stenberg and Grigorenko also emphasized the distinction between styles and abilities: "styles do not represent a set of abilities, but rather a set of preferences. The distinction is important because abilities and preferences may or may not correspond" (2001, p. 2). According to Sternberg and Grigorenko (2001), styles can account for the variance in performance that cannot be accounted for by variance in

ability tests. Gardner (1999) pointed out the difference between a style and intelligence:

> The concept of style designates a general approach that an individual can apply equally to an indefinite range of content. In contrast, an intelligence is a capacity, with its component computational processes, that is geared to a specific content in the world. (1999, pp. 83-84)

To make the difference clear, he gave the example that when a person is said to be reflective, that person can be reflective with music or with mathematic or spatial thinking. He added that the relation between style and intelligence should be studied empirically on a style-by-style basis (Gardner, 1999; Kirschenbaum, 1995). He pointed out that "Perhaps, the decision about how to use one's favored intelligences reflects one's preferred style" (Gardner, 1999, p. 85).

Krechecsky and Seidel (2001) made distinction between intelligences and learning styles as well. According to them, learning styles are the different approaches people apply to understand content while intelligences are capacities related to neurological functions and structures that respond to content. For example, if a person is a tactile learner, he/she prefers learning any content material by using hands or sense of touch.

Suh and Price (1993) investigated the learning styles of academically gifted and academically non-gifted Korean adolescents and compared them to American students. They found out that academically gifted Korean students showed greater preference for visual and kinesthetic and more structured learning than their non-academically gifted peers. Korean students preferred to learn in more formal and less social design than did American students. American students were more persistent and preferred to learn in several ways socially than the Korean students.

Similarly, Ingham and Price (1993) also found out a significant relationship between students' learning style preferences and their achievement levels. They studied the learning styles of academically gifted and academically non-gifted Filipino adolescents and compared them to American students. The Filipino students were more visual and kinesthetic than American students who were more tactile and auditory. Academically gifted students were more visual and less auditory than non-gifted students.

Ingham and Price further examined the students' learning style patterns in relation to their domain of giftedness, and they noted that learning style patterns should not be investigated "without considering the students' cultural background and without identifying a specific domain of giftedness" (1993, p. 159). According to the results, students gifted in science and drama preferred tactile learning style; students gifted in leadership preferred kinesthetic and auditory; those gifted in dance and art preferred kinesthetic and tactile; those gifted in music preferred kinesthetic and those gifted in literature preferred auditory and visual learning style.

Price and Milgram (1993) examined the findings from seven countries that investigate learning styles of gifted and non-gifted students in several domains. They reported that kinesthetic learning style discriminated the most between gifted and non-gifted students over six cultural groups and it was followed by tactile. In all countries, gifted students preferred kinesthetic and tactile more than non-gifted students. Findings also revealed that most of gifted students do not prefer group learning style; instead they prefer individual learning style.

Treffinger and Selby (1993) emphasized the connections among learning styles, creativity, and giftedness. Learning styles help individuals to understand their

strengths and limitations that they may experience in problem solving and applying thinking strategies; under which conditions they are most likely function effectively; and to become independent. Students' learning styles may also inform educators "about the areas or directions in which they are likely to invest their creative efforts and attention" (p. 99).

Riding and Agrell (1997) investigated the possible relationship between style and intelligence as assessed with the Canadian Test of Cognitive Skills. The results revealed that style is more critical for students with lower intelligence. The effect of style on performance increases if the presentation of subject matter does not suit their style. Generally those students do not have compatible learning style with the subject matter provided.

Silver, Strong, and Perini (1997; 2000) argued that learning styles and multiple intelligences complement each other by responding to each other's limitations. While MI theory is focused on the content of learning, it does not pay attention to the perception and process of information. On the other hand, learning style is centered on the process of learning while it is not directly concerned about the content of the learning. Therefore, Silver, Strong, and Perini (1997; 2000) created a model integrating both theories for pedagogical purposes. Silver (1997) proposed a possible relation between intelligence and style. For him, one's preferred style reflects the decision about how to use favored intelligences. To illustrate, a person whose dominant intelligence is linguistic may write poetry or novels, take place in debates or learn foreign languages and if the person's learning style is individual learning, he or she probably writes poets or does crosswords puzzles. However, if learning style is group, the person is likely to attend at group debates, and forums.

Denig (2004) as well as other researchers (Dunn, Denig & Lovelace, 2001) emphasized the difference between multiple intelligences and learning styles. Denig (2004) claimed that the distinction between multiple intelligences and learning styles and a complementary framework for applications of both need to be made.

Similarly, Martin (2005) argued that individuals have a natural tendency to be engaged in activities and processes which necessitate use of their strongest intelligences.

In the context of individual differences, the relation between abilities (intelligences) and styles is interesting according to Renzulli and Dai (2001) as well. However, they asserted that abilities are not the only factor affecting cognitive and learning styles and they are not the only factor for successful learning as well. The dynamic interaction between environment and the individual is an integral component of developmental view of styles.

Renzulli and Dai (2001) inferred that abilities might shape styles and styles might be improved by instruction and evaluation. Moreover, they are adaptive, and certain styles may facilitate the development of abilities while others retard. If their argument is valid, individual differences in styles partly reflect different responses to the environment and their different action models (Renzulli and Dai, 2001).

Skehan showed the relationship between intelligence and learning styles among other factors affecting individual differences in foreign language learning within the following figure (1991, p. 227).

According to the figure, learning styles are product of aptitude, motivation, personality, age, and intelligence. Moreover, both learning styles and learning strategies mediate the effects of these variables on the learning outcome.

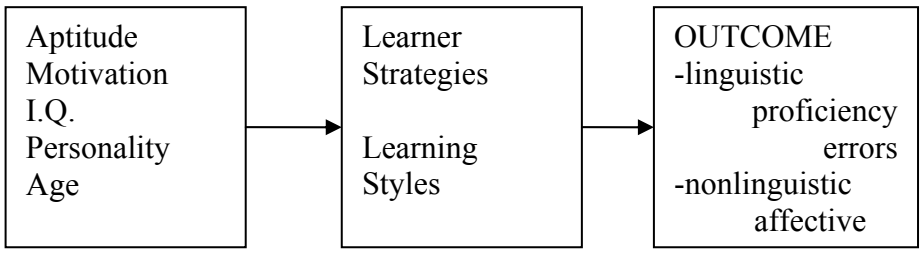

Figure 2: Relationships among individual differences in second language acquisition (Skehan, 1991, p. 227)

According to Sternberg and Grigorenko (2001), styles have not received the attention they deserve and they should be given proper attention. Ehrman, Leaver, and Oxford (2003) emphasized the need for further study in learner differences in learning styles, strategies, and motivation. The related literature review showed there was a gap in research comparing learning styles and multiple intelligences of EFL students. Moreover, it can also be concluded that there is very little if any research investigating the possible link between styles and multiple intelligences. This gap was also emphasized by Peacock (2001). Therefore, this study aimed at finding out the possible relations between preferences of perceptual and social learning styles, preferences of multiple intelligences and foreign language achievement.

CHAPTER 3

METHODOLOGY

3.1 Design of the study

This study was exploratory in nature aiming at finding descriptive assertions about perceptual and social learning style preferences and multiple intelligence preferences of intermediate level freshmen students at Basic English School at METU. Moreover, this study was correlational as it aimed to examine the relationship between learners' preferences of multiple intelligences and learning styles and between these two variables and English language proficiency.

For the study the quantitative data was collected through two inventories, one of which was specifically designed by Reid to identify ESL/EFL students' perceptual and social learning style preferences and the other was designed by Teele to identify students multiple intelligence preferences. Students' GPAs were taken as the indicator of success in foreign language learning.

3.2 Research Question

1) What are the multiple intelligence preferences of the English language learners at Basic English School at METU as identified by TIMI?
2) What are the perceptual and social learning style preferences of the English language learners at Basic English School at METU as identified by PLSPQ?

3) What is the nature and strength of the relationship between multiple intelligence and the perceptual and social learning style preferences?
4) What is the factorial structure of multiple intelligence preferences and perceptual and social learning style preferences?
5) What is the nature and strength of the relationship between foreign language achievement, on the one hand, multiple intelligence and the perceptual and social learning style preferences, on the other?

3.3 Participants

Participants were chosen from the intermediate level students who did not object to participating in the study at School of Basic English at Middle East Technical University. One hundred and twenty three students participated in the study. The Basic English is compulsory for those who are not proficient enough in English to pursue their university education in Middle East Technical University which is an English medium school. The aim of the school is to bring students' English proficiency in reading, writing, speaking, and listening to the level that will enable them to follow their study. In the Basic English Preparatory School, before the semester begins, students take a placement exam. Depending on their English background as assessed by proficiency exams, they are assigned to one of the levels of beginner, elementary, intermediate, and upper-intermediate. In the spring term, levels are grouped as pre-intermediate, intermediate and upper-intermediate.

The participants were all native speakers of Turkish who were learning English as a foreign language. Moreover, the participants' major areas and educational backgrounds were different and that was not taken into account. Their age range was between 18 and 24 with a mean of 18.87.

For the analyses including GPA, only 107 students' responses to the questionnaires were taken into account because out of 123, GPA scores of 107 students were obtained.

3.4 Instruments

In this study, two self-report inventories were used. Self assessment or self-estimation of intelligence preferences, abilities, and styles has been explored by several researchers (Furnham & Buchanan, 2005). Borkenau and Liebler (1993) found a correlation of .32 between self-rated and psychometrically assessed intelligence (IQ). Other researchers such as Paulus, Lysy, and Yik (1998), De Nisi and Shaw (1997), Furnham and Fong (2000), Furnham and Rawles (1999), Zhang (2005) and Reilly and Mulhern (1995) found positive and significant correlations as well.

Zhang (2005) examined cognitive development, modes of thinking, career interests, learning approaches, thinking styles, and personality traits in a study including 5019 participants from Hong Kong, mainland China, and the United Stated and found that:

> self-evaluations of one's abilities not only statistically predicted one's preferred way of doing things, including learning approaches, modes of thinking, and thinking styles, but also predicted the degree of intensity of one's interest in different types of careers, one's cognitive-developmental levels, as well as one's personality traits. (p.85)

Zhang (2005) concluded that future research should include self-rated abilities since they show significant predictive ability. However, Lowman (1987) suggested that because of the limited validity of the instruments, results from those instruments should be cautiously interpreted. In the present study, Teele Inventory for Multiple Intelligences (TIMI) was used to find out participants' multiple

intelligence preferences. TIMI was specifically designed to examine the profiles of multiple intelligence preferences as defined by Gardner (1983).

It is a forced-choice pictorial inventory containing 56 numbered pictures of panda bears representing characteristics of seven intelligences. Participants have twenty eight-opportunities to select one of the two alternatives and eight different times to select each of the seven intelligences. Therefore, for each intelligence, the maximum possible point is eight. TIMI is easy to score. When tallied, the scores present a profile of the students' intelligence preferences. It was developed in 1992 by Sue Teele, and has been broadly used at preschool, elementary, middle school, high school, community college, and higher education institutions. It was noted by Teele (1996) that TIMI was being used in over one thousand different school settings throughout the United States and in seven other countries.

However, it should be noted that TIMI was not designed to assess actual intelligences; instead, it assesses multiple intelligence preferences. Assessing multiple intelligences requires complex tools designed particularly for each intelligence types. Yet, such assessment is not feasible and practical; therefore, in this study one of the commonly utilized self-report preference questionnaires was used. Reliability tests were done by test-retests.

Reliability tests were done by test-retests. Test-retest results showed significant correlations ranging from .45 to .88 at the .01 significance level. Field testing was conducted at an elementary school for the content validity (Teele, 1995). Based on item by item analysis correlation studies were done to compare the results of TIMI to the Metropolitan Achievement Test (MAT 6). The MAT measures the achievement reading, mathematics, language, science, and social studies. Convergent

validity was established at Green tree East School by correlating logical-mathematical and linguistic intelligence to the MAT 6. There were statistically significant positive high correlations between students' logical-mathematical and linguistic intelligence preferences on TIMI and their mathematic and language/reading scores on MAT 6. Moreover, the relationship between the TIMI scores of the middle and high school teachers and their subject areas was investigated. Linguistic intelligence preference was the highest among English teachers in middle and high school and among history teachers in high school. Logical-mathematical intelligence preference was the highest among mathematical teachers in both schools. Spatial and musical intelligence preference was the highest among art teachers. Bodily-kinesthetic intelligence preference was the highest among physical education teachers. Intrapersonal intelligence preference was the highest among English teachers in middle school and art teachers in high school. Interpersonal intelligence preference was the highest among mathematical and physical teachers in middle school and physical teachers and vocabulary education teachers in high school.

Items on the TIMI were examined to check if they were clear and if they showed one-to-one correspondence to the core operations of intended intelligences. First, some items were found to be obscure. The item 25B, where a panda is walking away from a group of panda, can be interpreted in different ways depending on with which panda a student think that he or she is most like. This picture can easily be taken as interpersonal intelligence when a student identifies himself or herself with a panda in the group. In the picture 20B, some students may not see the cloud as a dog figure and may think that this picture represents enjoying being alone in the nature.

Similarly, some students may understand watching television from the item 24B while others may take it as drawing. This will interfere with students' consistency in choosing the pictures. Second, there are some items that may be understood as referring to intrapersonal or interpersonal intelligence preferences. For example, only two of the 8 items related to linguistic intelligence depict the activities done together with other people, while 6 of them refer to individual activities. Similarly, three out of 8 musical intelligence items involve being with others. There is a possibility that students who choose these items may indicate interpersonal intelligence preference. Therefore, TIMI needs further refinement and development.

The Perceptual Learning Style Preference Questionnaire (PLSPQ) (see Appendix) was used to identify learners' perceptual and social learning styles. It has been widely used with university students and it is easy to score. It covers concept of six learning style preferences: visual, auditory, kinesthetic, tactile, group learning and individual learning. In the inventory, there are 30 statements, which participants rate on a five-point likert scale ranging from strongly agree to strongly disagree. The reliability of the inventory have been established on high, upper intermediate and advanced ESL classes through split-half method (Reid, 1987). The construct validity was done based on previously normed learning style inventories, review of a committee from Intensive English Program in English Department, and a pilot test with ESL learners and native speakers. By comparing the pair correlations and split-half method results from ESL learners to the results of native speakers, items were reviewed.

When the statements were checked in PLSPQ by the current researcher, it was observed that some of the items were open to interpretation. Especially some

statements of kinesthetic learning style were vague. For example, sentences with" doing something in class" do not explain what it means. Moreover, those items can be interpreted as preference for group learning style. Furthermore, visual learning style depicts only textual construct. Reid (1990) reported that during the norming process of the questionnaire, non-textual items of visual construct such as reading graphics, photographs and pictures were taken out in order to increase the construct correlation coefficient.

3.5 Data Collection

After getting permission from the administration board of the department of Basic English at Middle East Technical University, voluntary intermediate level students were selected. Participation was voluntary. A pilot study utilizing twenty volunteers was conducted in order to insure the management of the instruments and uncover any possible problems as well as to estimate the required time. After the pilot test, it was found that there were no unclear statements within the instruments and one class hour, in this case, 50 minutes, was enough for the introduction of the instruments, implementation and feedback session.

The study was conducted in 50 minute class time during regular school schedule. Classroom teachers were also present during the data collection. The administration of the instruments adhered to the manual of directions provided by the publishers. Moreover, participants were not allowed to interact with each other during the implementation of the inventories. First, a short orientation was provided for all participants regarding the nature of the study. Learning styles and multiple intelligence theory were briefly introduced and any questions from the students were answered. It was clarified that not any intelligence and learning style types were

superior to one another and all human beings possessed those intelligences and styles. This might have increased the data reliability as it helped students give genuine answers (Ehrman, 1996). Following the introduction, Teele Inventory for Multiple Intelligences (TIMI) answer sheets were distributed and the instructions on the manual were read to the participants. Each picture group was shown on the transparency for ten seconds and students chose one of the choices that they felt *was the most like them* by checking the corresponding option on their answer sheet. Students were reminded to give sincere answers. They were also told not to spend too much time on any items and not to change their answers. Next, displaying the evaluation key on the overhead projector, participants who wanted to learn their dominant intelligence preferences found out the scores for their each intelligence type.

Subsequently, participants received the Perceptual Learning Style Preference Questionnaire (PLSPQ) and after the instructions, they answered each question individually. Again with this inventory, students who preferred to learn the results evaluated their answers by looking at the evaluation key displayed on the overhead projector. Moreover, students' overall performance of the previous term (GPA) scores received from school administration, taken into account as a measurement of language performance, were collected from the classroom teachers. Finally, all data were double-checked by the researcher before being stored on computer for analysis.

3.6 Data analyses

Students' answers to the questionnaires were calculated on the basis of the original systems designed by Teele and Reid. However, although Reid (1987) provided three cut-off scores for major learning style preference (38 and above),

minor learning style preference (27-37), and negligible learning style preference (24 or less) to analyze the data, in this study the scores received from the PLSPQ (see Appendix) were not broken down into three ranges in order to be able to run statistical analyses as multiple regression and ANOVA. The data was quantitative and analyzed on the statistical program SAS (Cody & Smith, 1997). Descriptive statistics and frequency values are presented and reviewed. Since out of 123 students, 107 students' GPA scores were received, for the analyses including GPA, only data from 107 students was used.

Repeated measure one way ANOVA, factor analysis, Pearson correlation coefficient and multiple regression analyses were used for the data analyses in this study. Repeated measure one way ANOVA was computed to find out whether mean differences among style preferences and multiple intelligence preferences were statistically significant. The Pearson correlation and factor analysis were computed to be able to answer the third research question to identify the factorial structure and nature and strength of the relationship between perceptual and social learning style and multiple intelligence preferences.

It was appropriate to use multiple regression analysis to answer the fourth research question. Multiple regression analysis was used for analyzing collective or separate effects of two or more independent variables on a dependent variable (Pedhazur, 1982). There were more than two independent variables and only one dependent variable. First independent variables were the scores on the perceptual and social learning style preferences including visual, kinesthetic, auditory, tactile, individual and group as well as the scores on the multiple intelligence preferences, including linguistic, logical mathematical, spatial, musical, bodily-kinesthetic,

interpersonal and intrapersonal. The dependent variable was language proficiency based on students' GPA records. Multiple regression analysis was chosen over ANOVA analysis because the variables are continuous and categorizing them to run ANOVA often causes errors (Pedhazur, 1982, p. 7)

For the selection of a subset of variables, *stepwise* method was used in multiple regression analysis. Stepwise method finds the best independent variable to be entered in the prediction equation and then the variable with the highest increment to R^2. It continues until no variables can be added without a significant increase in R^2 and no variables can be deleted without a significant decrease in R^2. Moreover, after each addition of variables, it controls if earlier variables still significantly contributes (Pedhazur, 1982).

CHAPTER 4

RESULTS

4.1 Descriptive Statistics

The demographic data regarding the frequency distribution and percentage sample by gender are displayed in Table 1. Forty nine of the respondents were female while 74 were male. The mean for the age of the participants was 18, with a minimum of 18 and maximum of 24.

Table 1: Gender distribution

	Frequency	**Percent**
F	49	39.8
M	74	60.2
Total	123	100.0

The distribution of each variable involved in the analyses was examined. The descriptive statistics regarding the mean, standard deviation, minimum, maximum, skewness, and kurtosis values are displayed in Table 2. The distributions of variables were found to be approximately normal with no outliers or extremes. The logical-mathematical and GPA distributions were platykurtic, which suggests a somewhat flat distribution. However, they were all within the normal ranges.

Table 2: Descriptive Statistics

Variable	N	Mean	Std Dev	Min	Max	Skew	Kurtosis
GPA	107	33.37	4.81	22	41	-0.4	-0.62
MI							
Linguistic	123	3.03	1.50	0	7	0.26	-0.17
Logical-Math	123	4.17	1.96	0	8	-0.05	-0.71
Spatial	123	3.95	1.63	0	8	0.37	-0.26
Musical	123	3.28	2.00	0	8	0.46	-0.46
Bodily-Kin	123	4.69	1.43	1	8	-0.18	0.09
Intraperson	123	3.36	1.76	0	8	0.47	-0.41
Interperson	123	5.50	1.80	1	8	-0.54	-0.50
L. Styles							
Visual	123	35.69	6.64	18	50	-0.15	0.02
Group	123	30.74	8.52	10	48	-0.26	-0.57
Auditory	123	35.98	5.13	22	48	-0.25	0.08
Kinesthetic	123	38.27	6.45	12	50	-0.99	1.86
Individual	123	35.67	8.15	16	50	-0.13	-0.54
Tactile	123	36.86	6.41	20	50	-0.36	0.18

4.2 Multiple intelligence preferences

The first research question addressed in this study was: What are the multiple intelligence preferences of the English language learners at Basic English School at METU as identified by TIMI? The results of the analysis (Figure 3) showed that approximately 34% of the students identified interpersonal intelligence as their most dominant intelligence; 20% of the students preferred logical-mathematical intelligence; 16% of the students preferred bodily-kinesthetic intelligence; 13% of the students identified spatial intelligence; 9% of the students chose musical; 8% of

the students identified intrapersonal, and 3.5% of the students preferred linguistic intelligence as their most dominant intelligence.

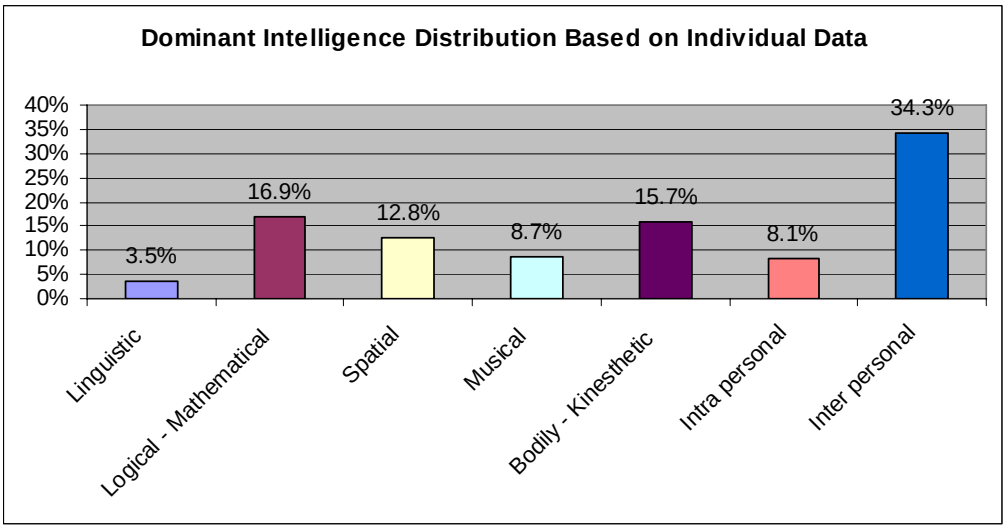

Figure 3: Dominant intelligence distribution based on individual data

To find out the multiple intelligence preferences, the mean scores of 123 students as identified by TIMI were computed and ranked. The interpersonal intelligence was ranked first and followed by, bodily-kinesthetic, logical-mathematical, spatial, intrapersonal, musical and linguistic: Interpersonal (M=5.5), bodily-kinesthetic (M=4.69), logical- mathematical (M=4.17), spatial (M=3.95), intrapersonal (M= 3.36), musical (M= 3.28), and linguistic (M= 3.03). The magnitude of the mean scores is depicted in bar-graph form in the Figure 4.

In order to determine if the mean differences are statistically significant, repeated measures of one way ANOVA was computed. Based on the results of pairwise comparisons, linguistic, musical, and intrapersonal intelligence preferences were not significantly different from each other at the significance level .05.

Similarly, mean differences of spatial and logical intelligence preferences were not statistically significant.

As a result, since interpersonal and bodily-kinesthetic intelligence preferences were significantly different from the others, it was concluded that interpersonal intelligence was preferred most; bodily-kinesthetic intelligence was preferred as the second; spatial and logical-mathematical intelligence as the third; and linguistic, musical, and intrapersonal intelligences were preferred the least.

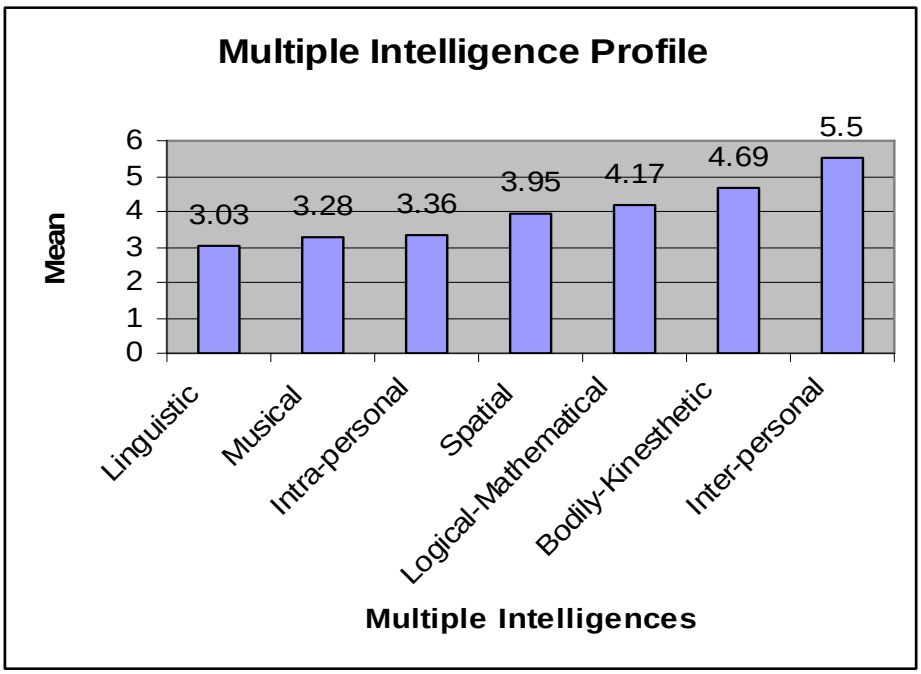

Figure 4: Mean scores for multiple intelligence preferences

The results implied that the students showed the strongest tendency to the activities requiring them to use their interpersonal intelligence. Such activities implied on the TIMI are talking to friends, playing games with the friends, spending time with family member, and sharing problems with friends.

4.3 Perceptual and social learning style preferences

The second research question was: What are the perceptual and social learning style preferences of the English language learners at Basic English School at METU as identified by PLSPQ?

Based on the individual data analysis (Figure 5), it was observed that kinesthetic learning style was identified as the most dominant learning style by approximately 30% of the students; individual learning style was identified as the most dominant by 20% of the students; tactile learning style was identified as the most dominant by 18% of the students; visual learning style was identified as the most dominant by 17% of the students; auditory learning style was identified as the most dominant by 11% of the students, and group learning style was identified as the most dominant by 7% of the students. 78% of the students preferred at least 2 major styles, which are between the cut off scores 38 and 50. Only 4% of the students did not show any major preference. In detail, 17% had one major style; 21% had two; 28% had three; 20% had four; 8% had five major learning styles, and 1.6% (2 students) showed major preference for all the learning styles. Moreover, 61% of the students did not show any negligible preferences with the cut off scores between 0 and 24.

The results showed that EFL students participated in this study had multi-style preferences for perceptual and social learning styles. More specifically, kinesthetic learning style was ranked first with the mean of 38.27 and closely followed by tactile (m= 36.86), auditory (m= 35.98), visual (m= 35.69), individual (m= 35.67), and group (m=30.74). Figure 6 graphically shows the magnitude of the mean scores.

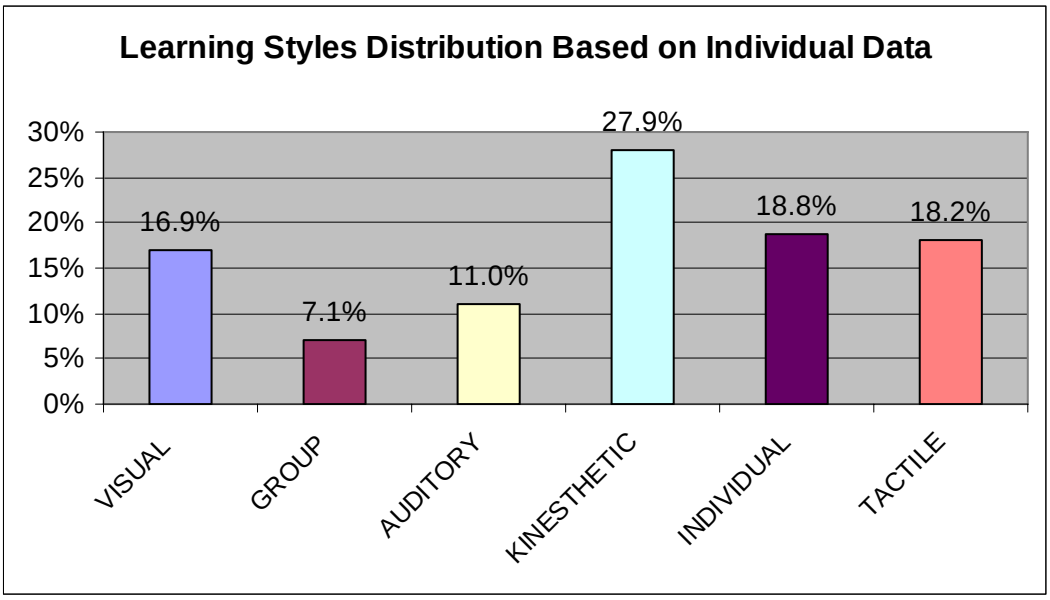

Figure 5: Dominant learning style distribution based on individual data

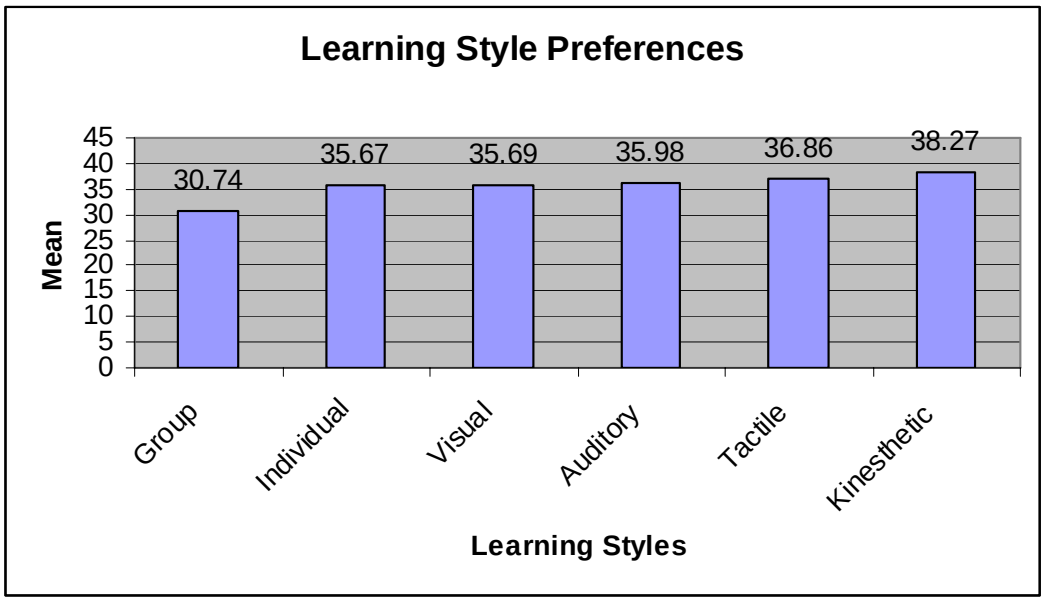

Figure 6: The magnitude of the mean scores

To further support the results, repeated one way ANOVA was computed. According to the pairwise comparison results, mean differences of individual, visual,

auditory, and tactile learning style preferences were not statistically significant at the significance level of .05. The mean differences of kinesthetic and group learning style preferences were statistically different from the rest of the preferences. In conclusion, kinesthetic learning style was the most preferred style, while group learning style was the least preferred. Students showed a tendency to prefer learning new material through activities including bodily involvement, which are presented as doing experiments and role-playing in the PLSPQ. However, although the students preferred group learning as the last style, they did not differentiate among other styles. That is, most of the students (78%) showed a multi-style preference profile. This implied that those students can be very flexible in approaching and learning new information, which provides an advantage for learning.

4.4 Relationship between preferences of multiple intelligences and learning styles

The third research question was: What is the nature and strength of the relationship between multiple intelligence preferences and the perceptual and social learning style preferences, and what is the factorial structure of multiple intelligence preferences and perceptual and social learning style preferences? In order to determine the relationships between learning styles and multiple intelligences, the Pearson correlation and factor analysis were computed. Factor analysis is useful to find out certain properties and structure in the relationships among variables (Pedhazur & Schmelkin, 1991).

Significant correlations were found in the Pearson correlation output. The highest correlation was between inter-personal intelligence and group learning style ($r = .41905$, $p < .0001$). There were statistically significant positive relations between

students' preferences for linguistic intelligence and individual learning style (r = 0.20474, p = .0231); logical-mathematical intelligence and individual learning style (r = 0.27358, p = 0.0022); intra-personal intelligence and individual learning style (r = 0.19102, p = 0.0343); inter-personal intelligence and kinesthetic learning style (r = 0.24145, p= 0.0071). There was a significant negative correlation between inter-personal intelligence and individual learning style (r = -0.35788, p < 0.0001). The next slight negative correlations were between musical intelligence and individual learning style (r = -0.21828, p = 0.0153) and intrapersonal intelligence and group learning style (r=-0.1811, p=0.0450)**.** Table 3 displays the Pearson correlation coefficients.

The oblique promax rotation was used for the factor analysis since this method allows the correlations among the latent factors. The results did not show any significant correlations among the factors. The inter-factor correlations ranged from 0 to 17. According to the rotated factor pattern (Table 4), variables significantly loaded positively on the first factor were group learning style and interpersonal intelligence, and negatively individual learning style and intrapersonal intelligence.

Variable significantly and positively loaded on the second factor was logical-mathematical intelligence, and negatively loaded on was musical intelligence. Kinesthetic, auditory, and tactile learning styles were significantly and positively loaded on the third factor.

On the fourth factor, bodily-kinesthetic intelligence positively loaded while the spatial intelligence negatively loaded. Intrapersonal intelligence positively loaded on the fifth factor whereas the linguistic intelligence negatively loaded. Finally, both individual and visual learning styles positively loaded on the sixth factor.

Table 3: Pearson correlations for learning styles and multiple intelligences

** Correlation is significant at the 0.01 level (2 tailed)

* Correlation is significant at the 0.05 level (2 tailed)

		Visual	Group	Audi	Kinest.	Indivi	Tacti.	Ling	Logic	Spatial	Music	Bodily	Intra	Inter
Visual	**r**	1.000												
Group	**r**	-0.196	1.000											
Audi	**r**	0.015	-0.024	1.000										
Kinesthetic	**r**	-0.042	0.398**	0.364**	1.000									
Individual	**r**	0.411**	-0.509**	0.045	-0.085	1.000								
Tactile	**r**	0.032	0.203*	0.140	0.331**	0.019	1.000							
Ling	**r**	0.099	-0.175	0.114	-0.004	0.2047*	-0.126	1.000						
Logic	**r**	0.008	-0.163	-0.131	-0.120	0.274**	0.027	0.225*	1.000					
Spatial	**r**	0.085	-0.112	0.000	0.041	0.068	0.131	-0.092	-0.1913*	1.000				
Music	**r**	-0.167	0.120	0.098	-0.014	-0.219*	-0.010	-0.318**	-0.473**	-0.058	1.000			
Bodily	**r**	-0.019	0.063	0.013	0.073	-0.147	0.154	-0.196*	-0.152	-0.415**	-0.180*	1.000		
Intraper.	**r**	0.036	-0.1811*	-0.066	-0.116	0.191*	0.085	-0.239**	-0.141	0.083	-0.160	-0.152	1.000	
Interper.	**r**	0.099	0.419**	0.085	0.241**	-0.358**	0.048	-0.256**	-0.3204**	-0.306**	0.024	0.257**	-0.399**	1.000

Table 4: Factor analysis-Standardized regression coefficients

Rotated Factor Pattern (Standardized Regression Coefficients)												
	F 1		**F 2**		**F 3**		**F 4**		**F 5**		**F 6**	
GROUP	78	*	7		21		-8		-2		-21	
INTER	77	*	-10		2		24		-14		22	
INDIV	-58	*	19		10		-3		3		49	*
MATH	-13		80	*	-9		4		-25		-16	
MUSICAL	-1		-81	*	-2		-18		-3		-25	
KIN	32		5		78	*	5		-3		3	
AUD	-30		-33		77	*	14		-17		-1	
TACTILE	19		22		56	*	-29		28		-3	
BODILY	11		5		1		85	*	21		6	
SPATIAL	-2		-19		-4		-80	*	7		24	
INTRA	-52	*	2		4		6		83	*	-6	
LING.	-21		29		10		-10		-72	*	3	
VISUAL	-4		2		-2		-11		-7		90	*
Printed values are multiplied by 100 and rounded to the nearest integer. Values greater than 0.352473 are flagged by an '*'.												

The overall pattern of the factorial analysis results demonstrates an approximate division between intelligence and style. Although there are some positive interactions among styles and intelligences, there are not any positive interactions among intelligences. Intelligences factored into interpersonal versus intrapersonal, logical-mathematical versus musical, bodily-kinesthetic versus spatial, intrapersonal intelligence versus linguistic intelligence. Such factoring can either imply a tendency among individuals towards a complementary distribution, such that when an individual has higher preference for linguistic intelligence, the person tends to have low preference for intrapersonal intelligence, which is a weak argument as the theory does not support this; or this factoring is highly sample-specific. This needs to be further studied. The factors implying interactions between styles and intelligences are clear to interpret. Personal intelligences factored with compatible

learning styles. For example, interpersonal intelligence positively factored with group learning style and intrapersonal intelligence together with individual learning style negatively loaded on this factor. It can be expected that when a person shows preference for interpersonal intelligence, he or she also prefers to learn with a pair or a group. However, further studies are needed to arrive at this conclusion.

Pearson correlation and factorial analyses results imply some interactions among learning style and multiple intelligence preferences. As explained by Ehrman (1996), Riding (2001), McMahon, Rose, and Parks (2004), Silver (1997) and Riding and Agrell (1997), the results suggest that learning styles interact with abilities or intelligences. It needs to be further examined if the styles are intelligence-specific (Gardner, 1993b). Learning style theories and multiple intelligence theories need to further address how these concepts relate to each other. This also influences applications of style and intelligence theories to education. It could be necessary to match learning material or teaching methods to not only to individuals' learning style or multiple intelligence profiles, but to both at the same time.

4.5 Multiple regression analysis

The fifth research question was: What is the nature and strength of the relationship between foreign language achievement, on the one hand, multiple intelligence and perceptual and social learning style preferences, on the other? For the multiple regression analysis, the data were screened and an assessment of each assumption was made. Assumption 1 required that independent variables to be fixed. This assumption was not met because learning style and multiple intelligence preferences are not considered fixed. It is argued that they can change by education, experience and environment (Gardner, 1999; Dunn, 1999). Although the predictors

cannot be assumed to be fixed, multiple regression is robust to violations of this assumption (Pedhazur, 1982). Assumption 2 required the measurement of independent variables without error. Measurement errors often occur in behavioral research because of low to moderate reliability of many measures (Pedhazur, 1982). The data used in the study was obtained from the reliable instruments and the source. Assumption 3 was met as the scatter plots revealed linear relationships among the variables. For the next assumption, homoscedasticity, the residuals were plotted with the predicted values. The residuals were approximately normally distributed (sk = -0.38, ku = -0.39). Therefore, this assumption did not seem to be violated. Assumption 5 was also met as the errors were found to be normally distributed after screening outliers by using studentized residuals and Cook's D. The maximum value of studentized residual was -2.455 and 0.095 for Cook's D, which showed that there was not any strong influence on the regression output. Assumption 6 necessitates that residuals (errors) be independent of each other. The design of the study did not lead any concern in terms of independence of residuals. According to the last assumption, excluding any variables which may have effect on the outcome and the predictors bias the correlation coefficient. However, this is especially critical for correlation for explaining phenomena (Pedhazur, 1982). Since the aim in this study was not to explain the achievement in foreign language learning, this assumption was tenable. Based on the assessment of assumptions, it was reasonable to proceed with a multiple regression analysis to predict foreign language achievement (GPA) from multiple intelligences and learning styles.

The stepwise method revealed that in step 1, the visual learning style was entered. R^2 was 0.0792, which shows the simple correlation coefficient between

GPA and visual learning style. The intercept was 40.71017, the slope of visual was -0.20338 and F value was 9.03 ($F_{(1,105)} = 9.03$, $p = 0.0033$). In the step 2, logical-mathematical intelligence was added. R^2 was 0.140, the intercept was 38.24840, the slope of logical-mathematical was 0.62063 and F value was 7.44 ($F_{(2,104)} = 7.44$, $p = 0.0075$). After step 2, the program stopped as the addition of other variables did not bring statistically significant effect. Therefore, multiple regression model was conducted predicting foreign language achievement from visual learning style and logical-mathematical intelligence preference.

The obtained coefficient of determination value, R^2, was 0.1407, suggesting about 15% of the variance in foreign language achievement (GPA) is accountable by the two predictors. The adjusted R^2, or the corrected R^2 for the number of independent variables, was 0.1241 showing some acceptable shrinkage. The typical prediction error, root mean square error, was 4.50. Cohen's (1992) effect size was found to be 0.16, which can be interpreted as a medium effect according to Cohen's guidelines suggesting 0.02 as small, 0.15 as medium, and 0.35 as large.

Standardized regression coefficients are depicted in Table 5. The regression coefficients of visual and logical-mathematical variables were both significant, ($t_{(104)} = -3.13$, $p= 0.0023$ and $t_{(104)} = 2.73$, $p = 0.0075$, respectively). The obtained prediction equation was:

GPA = 38.25 + 0.62*Logical-Mathematical – 0.20*Visual

As a result holding the visual as constant, students with a 1 point higher logical-mathematical intelligence preference score would be predicted to have a 0.62 point higher GPA score as well as when the logical-mathematical is held constant, students with 1 point higher visual score would have a 0.20 less GPA score.

Table 5: Multiple regression coefficients and its statistical significance
** Correlation is significant at the 0.01 level (2 tailed)

Variable	t Value	Pr > |t|
Intercept	14.86	<.0001
Visual	-3.13	**0.0023****
Log-Math	2.73	**0.0075****

When the squared semi-partial correlations were investigated it was found out that, logical-mathematical intelligence was uniquely accounted for approximately 6% and the visual learning styles was accounted for about 8% of the variability in the predicted GPA.

The Analysis of Variance output from the multiple regression was examined. The amount of variation in GPA attributed to predictors was 0.14. Although the predictors appear to account for a little proportion of the variability in predicting achievement, the F-statistic for the regression was 8.51, which was significant at the 0.05 ($p = 0.0004$). The F value indicated that the independent variables, logical-mathematical intelligence and the visual learning style were statistically significantly related to the dependent variable. However, visual learning style showed a negative relationship. In summary, these variables were predicting the GPA while the other variables were not predicting and therefore those variables were not added to the equation.

4.6 Summary of the Findings

According to the statistical analyses based on the research questions, the following findings were found. The results of descriptive statistics showed that EFL

students participated in this study showed multi-style perceptual learning preferences. In terms of Reid's (1987) categorization of scores, 61% of the students did not show any negligible preferences. The group learning style was preferred the least. Kinesthetic learning style was the major style with the mean of 38.24 and the minor styles were tactile (m= 36.44), auditory (m= 36.04), individual (m= 35.66), visual (m= 35.77), and group (m=30.89). 78% of the students showed a multi-style preference profile. They tended to have several strong preferences.

Descriptive statistics for TIMI showed that interpersonal intelligence was the most dominant intelligence preference (M=5.49) and followed by bodily-kinesthetic (M=4.70), logical- mathematical (M=4.18), spatial (M=3.98), intrapersonal (M= 3.38), musical (M= 3.25), and linguistic (M= 3.02) although the mean difference between spatial and logical-mathematical is not significant as well as among linguistic, musical, and intrapersonal intelligence preferences.

Multiple regression analysis indicated that only logical-mathematical intelligence and visual learning style preference were effective in predicting achievement. Logical-mathematical intelligence statistically significantly and positively predicts foreign language achievement while visual learning style preference statistically significantly but negatively predicts. The R^2 value was 0.1407, showing that only about 15% of the variance in foreign language achievement (GPA) is accountable by the predictors. The regression coefficients for visual learning style and logical-mathematical intelligence were found to be statistically significant ($t_{(104)}$ = -3.13, p= 0.0023 and $t_{(104)}$ = 2.73, p = 0.0075, respectively).

CHAPTER 5

DISCUSSIONS AND CONCLUSIONS

5.1 Summary

The present study was conducted as an exploratory and correlational study. The purpose of the study was to investigate perceptual and social learning styles and multiple intelligence preferences of the foreign language learners in the Basic English School of Middle East Technical University (METU). A secondary purpose was to find out whether there were relationships among learners' multiple intelligence preferences, learning style preferences, and English language proficiency.

To identify students' multiple intelligences preferences, Teele Inventory for Multiple Intelligences (TIMI) and for learning styles, the Perceptual Learning Style Preference Questionnaire (PLSPQ) were administered to 123 students. All students were voluntary and their confidentiality was maintained.

Moreover, students' foreign language success was determined by grade point average (GPA). A pilot study was conducted for practical purposes and to check if the questions were clear. Before administering the questionnaires, students were informed about the aim of the study, perceptual and social learning styles and multiple intelligences theories.

After collecting the data, statistical analyses were done to answer the following research questions:

1. What are the multiple intelligence preferences of the English language learners at Basic English School at METU as identified by TIMI?
2. What are the perceptual and social learning style preferences of the English language learners at Basic English School at METU as identified by PLSPQ?
3. What is the nature and strength of the relationship between multiple intelligence preferences and the perceptual and social learning style preferences?
4. What is the factorial structure of multiple intelligence preferences and perceptual and social learning style preferences?
5. What is the nature and strength of the relationship between foreign language achievement, on the one hand, multiple intelligence and perceptual and social learning style preferences, on the other?

5.2 Discussion of the Findings and Conclusions

5.2.1 Discussion of Descriptive Statistics and Pearson Correlations

Findings revealed that based on the self-examination and estimation of multiple intelligences, EFL learners in this study preferred to take place in the activities along which they can use their interpersonal intelligence which is related to the ability to understand and respond to other people's thoughts, emotions, intentions and feelings. However, as stated before, it should be kept in mind that some items standing for interpersonal intelligence on TIMI are open to interpretation and therefore, need to be modified. The analysis of the findings from PLSPQ for the second research question showed that students showed multi-style preferences for

perceptual and social learning styles. The most preferred style was kinesthetic and very closely followed by tactile. This finding was congruent with the previous studies (Reid, 1987; Reid, 1998; Stebbins, 1995; Rossi-Le, 1995; Park, 2001; Park, 2002). Visual learning style was the minor preference in all of the studies, and group learning style was preferred the least in most of them This finding was also congruent with the findings of Reid (1987; 1998), Stebbins (1995), Rossi-Le (1995), Inham and Price (1993), and Peacock (2001) Park, (1997), and Tabanlıoğlu (2003).

The results implied that adult Turkish EFL students participated in the study preferred learning English through total physical involvement in the learning environment, involving such activities as interviewing, and with their hands, that is, they enjoy learning through writing, drawing, and creating models. Besides, although it is in the minor style range with a considerably high magnitude of mean, their preference for learning English within a group is their least preference.

The results of the present study and the research in the literature showed consistent results which may lead to the conclusion that both ESL and EFL students have similar and multi-learning style preferences. This brings a question to the minds: Is content dependency of learning styles the immediate influence for these results? In other words, as Kolb, Boyatsiz, and Mainemelis (2001) argued that educational experiences, professional career choice, current job role, and task demands are the factors shaping learning styles; the study of English language either because of specific task demands or common learning activities can be the influential factor for learners to have higher preferences towards specific learning styles. Future research that looks into the unique contribution of these factors to shaping learning styles can provide deeper understanding.

Moreover, the result of the current study showing that students tend to have high preference for kinesthetic and tactile learning style and least preference for group learning style is interesting because this is congruent with the findings of Milgram and Price (1993). Although foreign language domain was not included in their studies, in several domains such as science, art, drama, mathematics, literature, music, and sports, gifted students in many countries showed a preference for kinesthetic and tactile learning style and did not show preference for group learning style.

When the student population is considered at the Department of Basic English in Middle East Technical University, it can be argued that they are already outstanding students who are selected based on the university entrance exam. This result might be because that they were high achievers in their major study fields, which was not a variable in the current study. Therefore, this might have an effect on the results of this study. The students may represent Turkish adult EFL learners who are high achievers in their major study domains at the same time. Further studies can be carried out with diverse student populations to investigate the unique effect of achievement in different fields.

Concerning the research question three, Pearson correlation coefficients revealed that several statistically significant moderate relationships exist between perceptual and social learning styles preferences and multiple intelligence preferences. Interpersonal intelligence preference has a moderately positive relationship to the group learning style and a moderate negative relationship to the individual learning style. This indicates students who prefer to take place in activities requiring the use of interpersonal intelligence tend to have preference for learning

within a group or with a pair. Since the core operations of interpersonal intelligence are to understand and respond to others feelings, thoughts, and work together, those students may make use of their ability in a group activity which generally requires working with others on the same task, communicating, and interacting with others.

In addition, students who prefer activities that necessitate interpersonal intelligence, and thus, tend to choose this particular intelligence have a preference for kinesthetic learning style, which "means to experience sensation through the reactions and movement of muscles, tendons and joints" (Jonassen and Grabowski, 1993, p. 77). Those students may enjoy learning English through activities which involve body movements, such as role-plays, drama, field trips, interviews, and projects. However, it should be noted that statements on PLPQ referring to kinesthetic learning style are obscure, and thus, need for further refinement.

Intrapersonal intelligence preference has a positive relation with individual learning style preference and a negative relation with group learning style preference. This indicates that those who prefer the activities in which they are alone and can focus on their inner-self, their aims, feelings, or goals, and thus, show higher preference for intrapersonal intelligence prefer learning English alone instead of with others. This also shows a match between intelligence and style preference. Since, intrapersonal intelligence is related to the ability to understand, one's inner-self feelings and guiding one's life through self understanding, those students tend to be goal-directed, independent, and prefer learning individually.

It should be noted that when the items in the TIMI were checked in order to understand whether there is a one-to-one correspondence between the activities in the pictures and the descriptions of the multiple intelligences as well as if there is any

vagueness, it was found that items represent core operations. However, item 25B is open to interpretation. Thus, this item needs to be modified.

The weak negative relation between musical intelligence preference and individual learning style may reveal that the social aspect of music may be dominant among the participants in this research. Considering that students participated in this study were young adults, they may like group participation in music and probably dancing. Hence, music intelligence preference did not show a relationship with individual learning style which may refer to listening to music alone, composing or writing lyrics.

To further support this argument, items on the questionnaire were examined whether they were biased against individual activities. Three out of 8 items involve being with others. Therefore, students who chose items referring to musical intelligence and being with others at the same time might have indicated interpersonal intelligence preference as well. As a result, modification of items and further analysis of TIMI with different participant population is required.

The weak positive relationship between linguistic intelligence and individual learning style can indicate that students who show higher preference for linguistic intelligence want to learn alone. They may not prefer group or pair work. They may enjoy reading or writing alone, but they may not like giving speech to a group of people or taking place in discussion groups.

Again, it should be noted that the examination of items of linguistic intelligence on the questionnaires were found to be biased for individual activities. Therefore, although some activities referring to the core operations of linguistic intelligence are included in TIMI, linguistic intelligence is fairly represented.

Pictorial items need to be developed in order not to have bias for individual activities.

Another correlation showed that those who chose the activities related to logical mathematical intelligence tend to prefer individual learning style. That is, their preference indicates that their ability to reason deductively or inductively, create hypotheses, find out regularities and cause and effect relations tends to be high and at the same time they like learning language alone. Finally, items of logical-mathematical intelligence preference on TIMI were checked whether there was a bias for individual activities. There was not a bias for individual activity preference. The relationship between logical-mathematical intelligence preference and individual learning style preference was independent of item biases.

5.2.2 Discussion of Factorial Analysis and Multiple Regression Results

Factor analysis showed six factors out of 13 variables, including multiple intelligence preferences and learning style preferences. Variables loaded on factors were approximately grouped as intelligence preferences and learning style preferences. This might show that questionnaires assess different concepts as they were designed to do so.

The first factor, with positive loadings of interpersonal intelligence and group learning style as well as negative loadings of intrapersonal intelligence and individual learning styles, indicated that it comprised personal intelligences with division between people who prefer to study alone and who prefer to study with others. Thus, students who prefer those activities representing personal intelligences tend to chose possibly corresponding learning style. That is, students who show preference for intrapersonal intelligence also prefer to study alone and those who

indicate higher preference for interpersonal intelligence show tendency towards group learning style. This is parallel to the explanations of Renzulli and Dai (2001) and Ehrman (1996). Individuals show a tendency to capitalize on their strengths and abilities in their chose of learning styles.

It is difficult to find a theoretical explanation for why musical intelligence has a negative load on factor two with positive loading of logical-mathematical intelligence. It may be because that in this study, students had preference to use social aspect of musical intelligence. That is, they may be within a group while using their musical intelligence. Moreover, as the Pearson correlation results revealed logical-mathematical intelligence had a positive correlation with individual learning style. Thus, this might negatively affect musical intelligence latent.

The third factor can be named as perceptual learning styles as variables of auditory, tactile, and kinesthetic learning styles significantly and positively loaded on the factor. Since the students' learning styles showed multi-style preference, all these three variables were not discriminated and loaded on the same factor. Items on PLSPQ, pertain to tactile and kinesthetic learning style preference, are not clearly distinct from each other. Statements of tactile construct express making a model, making something for a class project, making drawings, and building something while those of kinesthetic express doing things, doing experiments, participating in rope-plays and related activities. Those activities require overlapping skills and abilities. They do not distinctly correspond to the explanations of these learning styles. Such statements as making something or doing something are obscure. They are open to interpretation and this leads to reliability and validity concerns. Thus, these statements need further refinement.

Factor four can be received as object related intelligences. Gardner (1993b) argues that logical-mathematical, bodily-kinesthetic and spatial intelligences are object related intelligences. Object-relatedness is explained by Gardner (1993b):

> Logical-mathematical intelligence, which grows out of the patterning of objects into numerical arrays; spatial intelligence, which focuses on the individual's ability transform objects in space; and bodily intelligence, which focusing inward, is limited to the exercise of one's own body and, facing outward, entails physical actions on the objects in the world. (p. 235)

This factor may reveal a distinction between bodily-kinesthetic and spatial intelligences in terms of abstract and concrete organization. Although bodily-kinesthetic and spatial intelligences share the ability of object manipulation, they may differ in that bodily-kinesthetic intelligence requires using one's body to handle the objects skillfully. Bodily-kinesthetic intelligences may address the concrete organization while spatial intelligence addresses perceiving objects or visual world accurately and may refer to abstract manipulation.

The fifth factor has the positive loading of linguistic intelligence and negative loading of intrapersonal intelligence. This could show that the use of linguistic intelligence in a group setting is dominated. Students who preferred activities related to intrapersonal intelligence did not prefer the activities related to linguistic intelligence and vice versa. Therefore, this factor comprised of social aspect of linguistic intelligence.

Finally, visual and individual learning style both positively and significantly loaded on factor six. This factor may indicate preference for working alone also generally requires using visual learning style. For example, students may prefer to be alone while reading a book or looking at visual displays. However, it should also be

noted that visual learning style refers to only reading textual materials in PLSPQ as non-textual items of visual construct were not included by Reid (1990) in order to have higher reliability results.

Multiple regression analysis demonstrated that the proportion of variability in the outcome variable (GPA) accounted for by the predictor variables (of the multiple intelligences, only logical-mathematical intelligence and of the perceptual and social learning styles preferences, only visual learning style) was statistically significant enough. It is not very clear why the visual learning style has a negative coefficient. It may be a result of a possible conflict between those students' preferences and teachers' teaching style and learning environment. The participants with high preference for visual learning style may have lower achievement level because they may be at a potential learning disadvantage because of their learning environment (Reid, 1995; Ehrman, 1996; Dunn, 1999). The logical-mathematical intelligence preference illustrated high contribution to the prediction of the achievement. This may indicate that students may use their logical mathematical intelligence to learn language because they may conceive language as symbolic and abstract. Finally, according to Gardner (1983) students may utilize logical-mathematical intelligence especially for semantic and pragmatic domains of language. However, this argument is not supported with any research. Moreover, as Waterhouse (1988) and Segalowitz (1997), it can be true that L2 learning ability may not depend solely on linguistic intelligence. Considering that foreign language achievement is affected by various variables such as aptitude, interests, motivation, educational background, learning strategies, memory, individual differences in cognitive capacities, and so on, it is very critical to include all predictors that have effect on the outcome in order to

better explain the achievement in a regression analysis (Glass & Hopkins, 1984). Nonetheless, the aim of the study was not to explain the foreign language achievement but to explore the effects of multiple intelligences and learning styles on the foreign language achievement.

The participant profile might have affected the regression result. Since, GPA distribution was platykurtic, with less outliers than a normal distribution, that might have lowered the value of the R^2 (Glass & Hopkins, 1984). Therefore, further studies can show if the current results are sample specific or not.

Crozier (1997) emphasized that low correlations between student achievement and learning style questionnaires mean that one cannot predict with much confidence student achievement based on the scores on learning style questionnaire and those correlations do not prove causal relationships, however, such information shows trends among the student population.

5.3 Implications

The current study revealed that there is not a specific learning style preference that advances foreign language achievement. In the current sample, 78% of the students showed multi-style preferences, that is, they are dominant in different perceptual and social learning styles. It is possible to suggest that this might have affected the regression analysis. Moreover, it can be suggested that foreign language success may be related to having multiple style preferences because this means that students with multi-style preferences are more flexible and can use their strengths as well as compensate their weaknesses through use of different learning styles. In different learning environments, students with multi-style preferences are at advantage because they can easily perceive input, act on it and compensate their

weaknesses if they have any. The previous studies also revealed successful learners tend to have multi-style preferences (Reid, 1995; 1998; Park, 2002). Therefore, students can be taught how to learn best through capitalizing on their primary style and improving their minor styles, which are used to reinforce initial learning (Denig, 2004; Reid, 1995).

The present study also identified some relationships between multiple intelligence and learning style preferences; positive relationships between inter-personal intelligence and group learning style; linguistic intelligence and individual learning style; logical-mathematical intelligence and individual learning style; intra-personal intelligence and individual learning style; inter-personal intelligence and kinesthetic learning style; negative relationships between inter-personal intelligence and individual learning style; musical intelligence and individual learning style. This implies that as Renzulli and Dai (2001), Curry, (2000), Ehrman, (1996), Riding, (2001), and Martin (2005) pointed out possible interrelations between intelligences and learning styles, these results provide data-driven evidence. To some extent, students tend to prefer learning styles that are compatible with their intelligence preferences. A specific framework which pays attention to interactions of styles and intelligence preferences can be devised for this sample.

For example, when a teacher asks students to write a letter, students having higher preference for logical-mathematical intelligence and intrapersonal intelligence can be allowed to study alone while those having higher preference for interpersonal intelligence can be allowed to work within a group. Therefore, it is necessary for the teachers to know their students abilities and preferred learning styles for pedagogical applications.

Applications of multiple intelligence and learning style theories in classroom settings have become popular (Gardner, 1993a; Dunn, 1999; Haley, 2004; Eisner, 2004; Kornhaber, 2004; Shearer, 2004). However, when the applications of both multiple intelligences and learning style theories are investigated, it is quite difficult to differentiate them from each other.

Denig (2004) argued that not many teachers are aware of the distinctions between multiple intelligences and learning styles or even some teachers may not be able to define them. Both multiple intelligences and learning styles theories contribute to learning. They are complementary instead of competitive (Dunn, Denig & Lovelace, 2001).

5.4 Recommendation for Further Research

Research on learning styles and multiple intelligences is quite isolated from each other and from personality and cognition studies. The current study provided data driven evidence for interactions among learning style and multiple intelligence preferences. Sternberg (2001) suggested some possible reasons for style research being isolated from each other and from other related fields. Learning styles have been thought as abilities and/or personality traits. Learning style research has not addressed the other style theories. Further research that looks into interactions among them is crucial for a deeper understanding of how these variables interact (Sternberg, 2001).

Wider information base is necessary in the field of individual differences in second language acquisition (Robinson, 2001). Further research should integrate learning styles, cognitive styles, multiple intelligences, and personality traits and investigate the relationships among them because several researchers suggested that

these concepts are interrelated (Curry, 2000; Ehrman, 1996; Riding, 2001). Findings from such research would add to deeper understanding of individual differences. Additionally, theories of individual differences will contribute to understanding of foreign language achievement. It will also lead to more effective ESL/EFL instructional methodology, curriculum and material development. Furthermore, recommendations can be made for the assessment of styles and intelligences. Self-report questionnaires need to be accompanied by classroom observations and interviews with teachers and students in a longitudinal research format to have more valid results (Leutner & Plass, 1998; Wintergerst, DeCapua, & Itzen, 2001; Ehrman, 1996; Skehan, 1991).

This study did not investigate the possible developmental aspect of learning styles. In learning styles literature, it is argued that styles are flexible and context dependent, however, there is not any research utilizing pre and post-testing methodology. Research should be carried out to compare the EFL students learning styles identified when they start learning English to their learning style preferences identified at the end of a semester. The results may reveal whether or not students adapt their learning styles to foreign language learning context.

Probably the biggest gap in the literature is the absence of intelligence-fair tests for investigating multiple intelligences. Further studies might investigate practical, intelligence fair, reliable, and valid assessment instruments and techniques.

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APPENDIX

Perceptual Learning-Style Preference Questionnaire

Name, Surname: _____

Teacher: _____

School: _____

Date: _____

Grade: _____

Age: _____

Directions

People learn in many different ways. For example, some people learn primarily with their eyes (visual learners) or with the ears (auditory learners); some people prefer to learn by experience and/or by "hands-on" tasks (kinesthetic or tactile learners); some people learn better when they work alone while others prefer to learn in groups. This questionnaire has been designed to help you identify the way(s) you learn best--the way(s) you prefer to learn. Read each statement on the following pages. Please respond to the statements AS THEY APPLY TO YOUR STUDY OF ENGLISH. Decide whether you agree or disagree with each statement. For example, if you strong agree, mark:

Please respond to each statement quickly, without too much thought. Try not to change your responses after you choose them. Please answer all the questions. Please use a pen to mark your choices.

SA Strongly agree	A Agree	U Undecided	D Disagree	SD Strongly Disagree
X				

Item	SA	A	U	D	SD
1. When the teacher tells me the instructions I understand better.					
2. I prefer to learn by doing something in class.					
3. I get more work done when I work with others.					
4. I learn more when I study with a group.					
5. In class, I learn best when I work with others.					
6. I learn better by reading what the teacher writes on the chalkboard.					
7. When someone tells me how to do something in class, I learn it better.					
8. When I do things in class, I learn better.					
9. I remember things I have heard in class better than things I have read.					
10. When I read instructions, I remember them better.					

11. I learn more when I can make a model of something.					
12. I understand better when I read instructions.					
13. When I study alone, I remember things better.					
14. I learn more when I make something for a class project.					
15. I enjoy learning in class by doing experiments.					
16. I learn better when I make drawings as I study.					
17. I learn better in class when the teacher gives a lecture.					
18. When I work alone, I learn better.					
19. I understand things better in class when I participate in role-playing.					
20. I learn better in class when I listen to someone.					
21. I enjoy working on an assignment with two or three classmates.					
22. When I build something, I remember what I have learned better.					
23. I prefer to study with others.					
24. I learn better by reading than by listening to someone.					
25. I enjoy making something for a class project.					

26. I learn best in class when I can participate in related activities.					
27. In class, I work better when I work alone.					
28. I prefer working on projects by myself.					
29. I learn more by reading textbooks than by listening to lectures.					
30. I prefer to work by myself					

Self-Scoring Sheet

Instructions

There are 5 questions for each learning category in this questionnaire. The questions are grouped below according to each learning style. Each question you answer has a numerical value.

SA Strongly agree	A Agree	U Undecided	D Disagree	SD Strongly Disagree
5	4	3	2	1

Fill in the blanks below with the numerical value of each answer. For example, if answered Strongly Agree (SA) for question 6 (a visual question), write a number 5 (SA) on the blank next to question 6 below.

Visual
6 = 5

When you have completed all the numerical values for Visual, add the numbers. Multiply the answer by 2, and put the total in the appropriate blank.

Follow the process for each of the learning style categories. When you are finished, look at the scale at the bottom of the page; it will help you determine your major learning style preference(s), your minor learning style preference(s), and those learning style(s) that are negligible.

If you need help, please ask your teacher.

Visual	
Question	Score
6	
10	
12	
24	
29	
Total	
Score = Total x 2	

Tactile	
Question	Score
11	

14	
16	
22	
25	
Total	
Score = Total x 2	

Auditory	
Question	Score
1	
7	
9	
17	
20	
Total	
Score = Total x 2	
Group	
Question	Score
3	
4	

5	
21	
23	
Total	
Score = Total x 2	

Kinesthetic	
Question	Score
2	
8	
15	
19	
26	
Total	
Score = Total x 2	
Individual	
Question	Score
13	
18	
27	

28	
30	
Total	
Score = Total x 2	

Major learning Style Preference	38-50
Minor Learning Style Preference	25-37
Negligible	0-24

Explanation of Learning Style Preferences

Students learn in many different ways. The questionnaire you completed and scored showed which ways you prefer to learn English. In many cases, students' learning style preferences show how well students learn material in different situations.

The explanations of major learning style preferences below describe the characteristics of those learners. The descriptions will give you some information about ways in which you learn best.

Visual Major Learning Style Preference

You learn well from seeing words in books, on the chalkboard, and in workbooks. You remember and understand information and instructions better if you read them. You don't need as much oral explanation as an auditory learner, and you

can often learn alone, with a book. You should take notes of lectures and oral directions if you want to remember the information.

Auditory Major Learning Style Preference

You learn from hearing words spoken and from oral explanations. You may remember information by reading aloud or moving your lips as you read, especially when you are learning new material. You benefit from hearing audio tapes, lectures, and class discussions. You benefit from making tapes to listen to, by teaching other students, and by conversing with your teacher.

Kinesthetic Major Learning Style Preference

You learn best by experience, by being involved physically in classroom experiences. You remember information well when you actively participate in activities, field trips, and role-playing in the classroom. A combination of stimuli--for example, an audiotape combined with an activity--will help you understand new material.

Tactile Major Learning Style Preference

You learn best when you have the opportunity to do "hands-on" experiences with materials. That is, working on experiments in a laboratory, handling and building models, and touching and working with materials provide you with the most successful learning situation. Writing notes or instructions can help you remember information, and physical involvement in class related activities may help you understand new information.

Group Major Learning Style Preference

You learn more easily when you study with at least one other student, and you will be more successful completing work well when you work with others. You

value group interaction and class work with other students, and you remember information better when you work with two or three classmates. The stimulation you receive from group work helps you learn and understand new information.

Individual Major Learning Style Preference

You learn best when you work alone. You think better when you study alone, and you remember information you learn by yourself. You understand new material best when you learn it alone, and you make better progress in learning by yourself.

Minor Learning Styles

In most cases, minor learning styles indicate areas where you can function well as a learner. Usually a very successful learner can learn in several different ways.

Negligible Learning Styles

Often, a negligible score indicates that you may have difficulty learning in that way. One solution may be to direct your learning to your stronger styles. Another solution might be to try to work on some of the skills to strengthen your learning style in the negligible area.

This explanation was adapted from the C.I.T.E. Learning Styles Instrument, Murdoch Teacher Center, Wichita, Kansas 67208. Copyright 1984, by Joy Reid.