EFFECTS OF METHYLPHENIDATE TREATMENT ON COGNITIVE ABILITIES, HYPERACTIVITY AND ANXIETY LEVEL OF CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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ABSTRACT

EFFECTS OF METHYLPHENIDATE TREATMENT ON COGNITIVE ABILITIES, HYPERACTIVITY AND ANXIETY LEVEL OF CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER

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Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neuropsychiatric disorders in childhood among school-aged children. It is characterized by behavior disinhibition, overactivity and/or difficulty in sustaining attention. Psychotherapy and pharmacotherapy are reported ways of treating ADHD. Around 35% of individuals diagnosed with ADHD also met the criteria for anxiety disorders that commonly coexist with ADHD. If not treated up to 70% of children with ADHD continue to meet the diagnostic criteria into adolescence. Psychostimulants (Methylphenidate) are the first line of treatment in Turkey. The first aim of this present study was to introduce Spence Children's Anxiety Scale Parent version (SCAS-P) by conducting Turkish translation, factor structure, and reliability-validity studies of the

scale. Results of the principle component analysis extracted five factors for the Turkish version of SCAS-P. Inter-correlations among the factors (r=0.28 –0.45) were found to be satisfactory indicating for convergent validity. Criterion validity of the scale was found to be significant as well. Analysis indicated that the top 27th percentile of the sample was significantly differenciated from the bottom 27th percentile of the sample ($t(74)=9.63$, $p<.05$). Results revealed Cronbach alpha of .88, and the split half reliability of .79 for the total scale score. Internal consistency of the subscales of the SCAS-P ranged from 0.56 to 0.78. The second aim of this study was to examine the effects of Methylphenidate (MPH) on cognitive abilities, hyperactivity and anxiety level of children with ADHD since MPH is known to be a first line of treatment for Attention Deficit Hyperactivity Disorder (ADHD). Thirty-six elementary school children, from age seven to twelve were gathered from the local Hospital for the Social Security Office Child Psychiatry Clinic in Ankara via using purposive sampling. Seventeen children who met the DSM-IV diagnostic criteria for ADHD were assigned to the drug group, and nineteen children without ADHD were assigned to the comparison group. Bender Gestalt Visual Motor Perception Test, Wechsler Intelligence Scale for Children-Revised subscales, and Vigilance Task developed by the researcher were administered to participant children, for measuring cognitive abilities. Hacettepe ADHD Scale and SCAS-P were administered to parents of the participants for measuring hyperactivity level and child anxiety. Measurements were repeated after a 12-week follow up both for the drug group (N=17) and the comparison group (N=19). In the 12-week period, drug group received MPH treatment, and the comparison group received no interventions

regarding ADHD. 2 (Drug group vs. Comparison group) x 2 (Pretest vs. Posttest) mixed ANOVA with repeated measures on the last factor was conducted for the results of each measurement scale separately. As expected, MPH treatment revealed improvement in cognitive abilities and hyperactivity level of children with ADHD. All participants were found to have high anxiety scores when first referred to the hospital, and were found to have lower scores of anxiety on posttest. The findings were discussed on the basis of literature and limitations of the present study.

Keywords: Attention Deficit Hyperactivity Disorder, Treatment, Methylphenidate, Child Anxiety, Anxiety Assessment

ÖZ

DIKKAT EKSIKLIGI VE HIPERAKTIVITE BOZUKLUGU OLAN ÇOCUKLARDA METILFENIDATIN BILISSEL BECERILER, HIPERAKTIVITE VE KAYGI DÜZEYI ÜZERINDEKI ETKISI

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Dikkat Eksikligi ve Hareketlilik Bozuklugu (DEHB) okul çagindaki çocuklar arasinda en sik görülen nöropsikiyatrik bozukluklardan biridir. Davranislari kontrol edememe, asiri hareketlilik, ve/veya dikkati toplamada güçlükle tanimlanir. DEHB tanisi almis çocuklarin %35'i ayni zamanda siklikla DEHB ile birlikte görülebilen kaygi bozukluklari tani ölçütlerine de uymaktadir. Çocukluk çaginda DEHB tanisi almis çocuklarin %70'i tedavi edilmedigi durumda tani ölçütlerini ergenlik döneminde de karsilamaktadir. Psikoterapi ve farmakoterapi DEHB'nin tedavisinde siklikla kullanilan yöntemlerdir. Psikostimulanlar (Metilfenidat) Türkiye'de en sik kullanilan tedavi

aracidir. Bu çalismanin birinci amaci, Spence Çocuklar için Kaygi Ölçegi Ebeveyn formunu Türkçe'ye uyarlamak için faktör analizi ve geçerlik-güvenirlik çalismalarini yapmaktir. Faktör analizi sonuçlari, SCAS-P için bes faktör göstermektedir. Faktörler arasi korelasyonlar (r=0.28 – 0.45) ölçegin aynilik (birlesiklik) geçerligi bakimindan tatminkardir. Ölçegin ölçüt geçerligi bulgulari da anlamli olarak rapor edilmistir. Örneklemin üst %27'sinin alt %27'sinden anlamli olarak farkli oldugu bulunmustur (t(74)=9.63, p<.05). Yapilan güvenirlik analizi sonuçlari ölçegin toplam puani için Cronbach Alfa degerini .88 ve iki yarim güvenirligini .79 olarak göstermistir. Alt ölçeklerin tutarlilik katsayisi 0.56 ile 0.78 arasinda degismektedir. Çalismanin ikinci amaci metilfenidatin bilissel beceriler, hiperaktivite ve kaygi düzeyi üzerindeki etkisinin arastirilmasidir. Ankara'da Sosyal Sigortalar Kurumu Hastanesi Çocuk Psikiyatrisi Klinigi'ne DEHB sikayetleriyle gelen çocuklar arasindan yaslari yedi ile onbir arasinda degisen okul çaginaki 36 çocuk amaçli örneklem yöntemiyle arastirma için seçilmistir. Bu çocuklardan DSM-IV ölçütlerini karsilayarak DEHB tanisi alan onyedisi ilaç grubuna, DEHB tanisi almayan ondokuzu da karsilastirma grubuna atanmistir. Bender Gestalt Görsel Motor Algi Testi, Wechsler Çocuklar Için Zeka Ölçegi ve arastirmaci tarafindan gelistirilen dikkat testi bilissel becerilerin ölçülmesi amaciyla uygulanmistir. Hacettepe Dikkat Eksikligi ve Hiperaktivite Bozuklugu Ölçegi ve Spence Çocuklar Için Kaygi Ölçegi ebeveyin formu da hiperaktivite ve kaygi düzeyilerinin ölçülmesi amaciyla katilimcilarin annelerine uygulanmistir. Ölçümler, 12 hafta sonunda her iki arastirma grubu için de tekrarlanmistir. Bu 12 hafta içerisinde ilaç grubu metilfenidat tedavisi alirken, karsilastirma grubuna DEHB tedavisine yönelik herhangi bir müdahale

yapilmamistir. Her ölçekten alinan puanlar için ayri ayri 2(Ilaç Grubu X Karsilastirma Grubu) X 2(Ön test X Son test) son faktörde tekrar ölçümlü ANOVA yapilmistir. Sonuçlar beklendigi gibi metilfenidatin bilissel beceriler ve hiperaktivite düzeyleri üzerinde iyilestirici yönde etkisi oldugunu göstermistir. Bütün katilimcilarin ilk test sonuçlarina göre yüksek kaygi düzeyine sahip olduklari ve ilaç grubunda 12 hafta sonra bu düzeyin azaldigi saptanmistir. Bulgular literatür ve çalismanin sinirliliklari isiginda tartisilmistir.

Anahtar Kelimeler: Dikkat Eksikligi ve Hiperaktivite Bozuklugu, Tedavi, Metilfenidat, Çocuklarda Kaygi, Kaygi Degerlendirme

To my family...

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CHAPTER 1

INTRODUCTION

1.1 Introductory Information on ADHD

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neuropsychiatric disorders in childhood among school-aged children. ADHD characterized by inattention, impulsivity, and hyperactivity occurs in about 1 to 10% of childhood population with a higher incidence in boys than girls by a ratio of approximately three to one (Barkley, 1998). As a developmental disorder, it can be diagnosed in childhood and continued into adulthood. Prevalence studies in Turkey reveal a rate of 1.16 to 2.78% for ADHD (Erol, 1988; Öktem, 1993; Toros & Tataroglu, 2002).

The fourth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; APA, 1994) has defined three subtypes of this disorder: ADHD predominantly inattentive type, ADHD predominantly hyperactive impulsive type, and ADHD combined type. According to DSM-IV there must be clear evidence of clinically significant impairment in social, academic or occupational functioning and the symptoms should last for at least six months, and symptoms should be present before seven years of age (APA, 1994).

The features of inattentive, hyperactive, and impulsive behavior in children are recognized as a disorder when the combinations of these behaviors are severe,

developmentally inappropriate, and impair functions of the child at home and school (British Psychological Society, 1996). The core symptoms of ADHD differ enormously from one individual to another. Therefore, it is important to assess the child over a period of time and under different environments.

Barkley (1996) provided a review of ADHD emphasizing the major symptoms of inattention and hyperactive-impulsive behavior termed as disinhibition. Hyperactivity is characterized by excessive motor activity inappropriate to child's age and to what is demanded by the situation. Children with ADHD tend to be noisy, fidget, squirm, and talk incessantly. They also have difficulty remaining seated with high level of activity (Taylor, 1994). Impulsivity is an observable pattern of behavior that is reckless, unthinking, impetuous, and disinhibited so that children with ADHD are frequently in trouble for careless behavior or for not obeying social rules. Therefore, they are more likely to have accidents (Öktem, 1996). In social settings, they are impatient, interruptive, and fail to wait their turn (Hill and Cameron, 1999). Accordingly, the complex of disinhibition reflects the relative immaturity of the child compared to normal peers in controlling motor movements and in resisting temptation or delaying gratification. These features are often poorly tolerated within social and academic contexts; hence, children with ADHD face problems regarding relationships with peers and academic achievement (Leonard, 2003). Up to 70% of children with ADHD continue to meet the diagnostic criteria into adolescence, and more than 50% meet the diagnostic criteria in young adulthood.

Inattention is characterized by the inability to sustain attention to a task, or respond to a task, or to abide by rules and follow instructions. Such children are more disorganized, distracted and forgetful and they tend not to persist in correctly performing boring activities and are slower or less likely, to return to an activity once interrupted. The inability to regulate arousal level is an important feature of ADHD. Voeller (2001) reported that hypoarousal is in the core of this type of impairment. Kinsbourn (1983) who first introduced the concept of hypoarousal suggested that individuals with poor attention control caused by low arousal levels tend to use hyperactive behavior to tie up their nervous systems. This behavioral pattern was found to be consistent with those caused by deficits in medial prefrontal, anterior cingulated areas and related subcortical structures.

There is evidence that patients with ADHD also manifest a range of cognitive disabilities. These include problems with verbal fluency and confrontational communication, internalization of self-directed speech, adhering to restrictive instructions, self-regulation of emotional arousal, motor coordination and sequencing, planning and anticipation, effort allocation, application of organizational strategies in tasks, working memory and mental computation (Barkley, 1996). These children have low performance on tasks that require sustained attention (Merrel & Tymms, 2001). It is usually the case that children with ADHD perform best when stimuli are presented rapidly and they do worse when they need to alter their rate of response and respond slowly (Sergeant, 1988).

1.1.1 Historical Perspective

Children with features of ADHD had been described as early as 1798. Alexander Crichton's definitions of attentional problems represented an early description of ADHD (Palmer & Finger, 2001). The label for the condition has changed several times over the last 100 years.

From 1900 to 1960, research (Still, 1902; Bradley, 1937; Clements, 1966) has focused on organic deficits and brain dysfunction. In 1902, Still described a group of children who showed a range of abnormal dysfunctions of inattention, restlessness and fidgeting and argued that a biological origin could be the reason for these behaviors (British Psychological Society, 1996). Bradley (1937) discovered that amphetamine could reduce the level of hyperactivity and behavioral problems of these children. This led to the first use of Ritalin in 1957. Usage of a specific drug for treatment purposes supported the distinct characteristics and the biological bases of the condition. In 1960s, the term Minimal Brain Dysfunction (MBD) was introduced to identify ADHD (Clements, 1966).

Between the years 1960 to 1970, research on the disorder came down to the development of a symptom oriented classification system. In the late 1960's, the lack of specificity of the term MBD led to a diagnostic reappraisal (Douglas and Peters, 1978). In 1968, the second edition of DSM introduced the term "hyper kinetic reaction of childhood". This classification focused on observable behavior while ignoring the possible biological basis. This shift in emphasis from etiology to

behavioral expression as the diagnostic orientation marked the first stage in the emergence of the concept ADHD as symptoms becoming the disorder (Red, 1995).

Douglas (1972) argued that hyperactive children usually do badly on standardized tests of attention; therefore attention, not hyperactivity was the most important characteristic that distinguished children with ADHD from other disruptive children. In 1980, the DSM-III (APA, 1980) established the category of attention deficit disorder (ADD) and following that in 1987 DSM-III-R differentiated ADD with hyperactivity from ADD without hyperactivity. In 1994, the DSM-IV introduced the category ADHD and highlighted the clinical feature of impulsivity (APA, 1994).

Research conducted from 1990 to early 2000 brought the arguments from the term attention deficit to dysfunction in self-regulation. Barkley (1998) argued that ADHD was far more than just a disorder of attention and response inhibition. He developed a model of self-regulation, incorporating executive functions to explain the nature of deficits experienced by individuals with ADHD. All these changes have provided clinicians a good foundation on understanding the condition and developing appropriate assessment and treatment procedures.

1.1.2 Etiology of ADHD

Although the specific etiology of ADHD is unknown, most professionals agree that it is a neurological condition that affects different psychological processes as attention control, behavioral inhibition and executive functions. Transactional models have stressed the interactive nature of contributors in the development of

ADHD, including biological, genetic, neurobiological, and psychosocial elements. Recent research on the etiology of the disorder has focused on the biological basis of the disorder. Possible risk factors for ADHD include maternal smoking during pregnancy, season of birth, minor physical anomalies, left-handedness, a history of abuse or neglect, lead poisoning, drug exposure, low birth weight, and mental retardation (Gary & Kagan, 2000).

With regard to the biological environment, the idea that food additives cause ADHD has been studied and rejected (Conners, 1980) as has the theory that excessive sugar intake leads to ADHD (Wolraich, Wilson, & White, 1995). Some toxins have been implicated in the etiology of ADHD. Lead contamination leads to distractibility, hyperactivity, restlessness, and lower intellectual functioning (Needleman, 1982).

The literature (Milberger, Biederman, Faraone, Guite, & Tsuang, 1997) examining the association of ADHD with pregnancy and delivery complications (PDC) supports the idea that PDCs predispose children to ADHD. The PDCs implicated in ADHD frequently lead to hypoxia and tend to involve chronic exposures to the fetus, such as toxemia, rather than acute, traumatic events (Faraone & Biederman, 1998). Maternal smoking during pregnancy predicts behavioral and cognitive impairments and ADHD in children (Milberger, Biederman, Faraone, Chen, & Jones, 1996).

To sum up, it could be stated that the cause of ADHD is unknown but there are several factors contributing to the development of ADHD. These factors could be

listed as psychosocial, genetic, biological, and neurobiological. Different basis of ADHD will be discussed in the next three sections.

1.1.2.1 Psychosocial Basis of ADHD

Although psychosocial factors are not considered primary in the etiology of ADHD, they do play a role. Goodman and Stevenson's (1989) study of twins found an association of ADHD behaviors with seven adverse family variables, including parental depression, marital discord, coldness to the child, and criticism of the child. The link with family adversity has been supported by other studies as well. Campbell (1997) studied parental rating of their three-year-olds when the children were referred for help. When the children were age six, those who have received the more negative ratings of ADHD behaviors, had families that had experienced more stress and were lower in social status. An unfavorable mother child relationship also predicted the stability of the problems. Studies of hyperactive school aged children with ADHD indicate that their parents are less consistent, more impatient, and more authoritarian (Campbell, 1995).

Researchers have also implicated the psychosocial environment in the etiology of ADHD. Rutter's (1975) research revealed six risk factors within the family environment that correlated highly with childhood disturbances: (a) severe marital discord; (b) low social class; (c) large family size; (d) paternal criminality; (e) maternal mental disorder; and (f) foster placement. It was found that the combination of adversity factors, rather than the presence of any single one impaired development.

Biederman, Milberger, & Faraone (1995) found a positive association between Rutter's index of adversity and ADHD, measures of ADHD-associated psychopathology, impaired cognition, and psychosocial dysfunction. Biederman, Milberger, & Faraone, (1995) showed that chronic conflict, decreased family cohesion, and exposure to parental psychopathology, particularly maternal psychopathology, were more common in ADHD families compared with control families. The differences between ADHD and control children could not be accounted for by either socio economic status or parental history of major psychopathology.

School environment is reported to have effects on child's attentiveness and reflectivity as well. How a classroom is organized and how activities are structured can influence academic achievement. Lectures given in classrooms that are not structurally organized and without monitoring and feedback, affect the child's relationship as well as academic success. As with parents' teacher perception and tolerance of student behavior may influence daily social interactions (Whalen, 1989).

For some children ADHD results from a biological predisposition for the relevant behaviors that then interact with psychosocial variables. Psychosocial variables, not being accepted as primary cause of ADHD, provide the critical context within which the disorder develops. Therefore, it seems likely that they shape nature and the severity of the disorder (Barkley, 1996; Taylor, 1994).

1.1.2.2 Genetic and Biological Basis of ADHD

Genetic effects have been found to account for about half the variance in measures of hyperactivity and inattentiveness (Goodman and Stevenson, 1989). However, a review of the literature by Hinshaw (1994) suggests that there may be an increased incidence of family members displaying psychopathology, which would support a genetic basis; the mechanisms between genetic factors and the actual neurological pathology are not clear. Lahoste, Swanson, & Wigal, (1996) found that 49% of the ADHD group had the 7-repeat Dopamine D4 gene on a chromosome compared to only 20 percent of the controls. The 7-repeat Dopamine D4 gene has been associated with novelty seeking, impulsivity, exploratory behavior and excitability (Bradshaw, 2001).

Single photon emission tomography (SPECT) studies in children with ADHD found reduced cerebral blood flow and low activity in the striatal and orbital prefrontal areas (Lou, 1996), which are responsible for behavioral inhibition and executive functions. In some magnetic resonance imaging studies, the right frontal lobe width was decreased compared with the frontal lobes of normal children (Zametkin, Karoum, Linnoila, Rapoport Brown, & Chuang, 1990). Studies of position emission tomography scans have shown that these children had decreased metabolic activity in the primary sensory and sensory motor regions (Riccio, Hynd, Cohen, & Gonzales, 1993). Study has found that the sizes of right frontal anterior lobes are decreased by 6-8% in children with ADHD, relative to controls (Filipek, Semrud-Clekerman, Steingard Renshaw, Kennedy, & Biederman 1997).

The caudate nucleus, which is involved in regulating motor control, particularly on the right side, showed decreased metabolism in children with ADHD (Filipek, Semrud-Clekerman, Steingard, Renshaw, Kennedy, & Biederman, 1997). Filipek et al. found that children with ADHD had an altered asymmetry of the caudate nucleus; the left side was shown to be bigger than the right, unlike the usual case where the right side was shown to be bigger than the left. Recently decreased cerebellar vermis has been found in children with ADHD (Mostofsky, Reiss, Lockhart, & Denckla, 1998).

Abnormal encephalogram brain activity patterns have been found in the frontal lobes of children with ADHD. Slow wave activity in the frontal regions and decreased beta activity in the temporal regions during task performance have been reported. Evoked response studies have suggested that children with ADHD have a reduction in amplitude to both auditory and visual stimuli (Satterfield, Schell, & Ncholas, T 1994). These studies suggest that children with ADHD have lower levels of brain activity that is related to their poor level of attention control and behavioral inhibition.

1.1.2.3 Neurobiological Basis of ADHD

Stimulants that are a first line treatment for ADHD acting on norepinephrine (NE) and dopamine (DA) systems has led to a hypothesis of catecholamine dysfunction in ADHD. In the last 30 years, theories of neurobiology of ADHD have been based on this hypothesis, but its status still remains unclear. Recent refinements

of this theory have emphasized the primary roles of dopamine and norepinephrine (Solanto, 1998). Castellanos (1994) extended the unitary dopamine theory of ADHD, based on a proposal that different abnormalities may exist in two dopamine regions: underactivity in a cortical region (anterior cingulate) which results in cognitive deficits, and overactivity in a subcortical region (caudate nucleus) which results in motor excess, as well as response to reinforcement (Solanto, 1998). Noradrenergic theory of ADHD was modified by Arnsten, Steere, & Hunt (1996) in a similar way, based on a proposal that different abnormalities may exist in two noradrenergic regions; underactivity in a cortical region (dorsolateral prefrontal), which results in primary memory deficits, and overactivity in a subcortical region (locus corelleus), which results in overarousal. Noradrenergic neurons are important in mediation of the orienting response, selective attention, and possibly vigilance (Pliszka, 2004).

Animal studies related to the role of central NE measuring the activity of the locus coeruleus on a task performance showed that good task performance was associated with low base line activity of the locus coupled with acute phasic bursts of locus coeruleus activity in the presence of target (Usher, 1999). A high number of false alarms were found to be associated with low baseline activity; sedation and inattention were found to be associated with low responsiveness of the of the locus coeruleus. Usher's findings were in line with the results of Waterhouse et. al's (1999) study that, both very high or low levels of NE in the locus coeruleus reduce neuronal activity and is associated with diminished information processing capacity or diminished selective attention. However, a moderate level of NE enhances

performance by increasing responses to relevant stimuli and suppressing responses to irrelevant stimuli (Berridge, 2001).

DA system regulates motor output, as well as the response to reinforcement. Selective stimulation and lesion studies reveal that DA neurons in the nigrostriatal and mesolimbic pathways are essential for the selection, initiation, sequencing and maintenance of motor function (Tucker & Williamson, 1984). According to Grace's (cited in Pliszka, 2004) tonic/phasic model of DA regulation, two pools of central DA exist: a tonic pool that continually accumulates in the synaptic space and stimulates auto receptors and a phasic pool that is acutely released in response to a neuronal impulse. The phasic release is essential in information transfer and the tonic pool reduces the size of the phasic release by stimulating auto receptors. It is hypothesized that the tonic pool is reduced in ADHD, and this leads to an excessive phasic release disorganizing the executive function and may over stimulate reward centers in the nucleus accumbence, which leads to excessive sensation-seeking behavior. Stimulants increase the size of the tonic pool by blocking the reuptake of DA, thus increasing auto receptor stimulation. This process down regulates the phasic release, reduces its disorganizing effect and returns DA release to an optimum state. This model offers an explanation for the correlation of high DA metabolite levels with more symptoms of ADHD. The connection between the symptoms of ADHD and DA metabolite levels links pharmacological treatment of ADHD that is based on DA release.

The effects of MPH on DA release have been examined in healthy volunteers (Volkow, Wang, Fowler, Telang, Mynard, & Logan, 2004). Subjects were first administered MPH in a resting state and again while performing mathematics problems for a monetary reward. During the monetary task it was found that MPH increased DA release in the striatum, which showed not only that MPH increases DA, and that it does so during tasks that require attention.

The exact dysfunction in DA and NE systems has still been unknown; however, it might be likely that a simple deficiency in one of these systems accounts for ADHD symptomatology. The action at the NE reuptake site might affect DA in an indirect way. Release of an optimum level of NE and DA could be said to be relative to the disorder rather than an absolute level of these catecholamines (Pliska, 2004).

There is less convincing evidence regarding the involvement of 5-HT in ADHD; SSRIs have little benefit in treating the disorder. In the DA transporter knockout mouse studies Gainetdinov, Wetsel, Jones, Levin, Jaber, & Caron (1999) found that SSRIs reduce hyperactivity. Another study carried out by Barrickman, Noyes, Kuperman, Schumacher, & Verda, (1999) showed that a single fluoxetine trial improved symptoms relative to baseline in the ADHD patients. However, in controlled trials, the serotonin agonist fenfluramine was found to be no different than placebo in the treatment of ADHD (Donnelly, Rapoport, Potter, Oliver, Keysor, & Murphy, 1989). In a report by Findling (1986) it was stated that 11 patients with comorbid major depressive disorder and ADHD treated with SSRI alone did not

experience any reduction in ADHD symptoms. Also, the changes in central or peripheral serotonergic indices were not found to be associated with response to treatment in ADHD subjects, and MPH was not reported to block the reuptake of serotonin (Zametkin, Karoum, Linnoila, Rapoport, Brown, & Chuang, 1985b). Thus, there appears to be no direct role of serotonin system in the pathophysiology of ADHD.

Recently, there is evidence reported that the nicotinic cholinergic receptors are defective. According to Leonard (2003), nicotinic receptors can act as heteroceptors on dopaminergic terminals in the frontal cortex, which serves to emphasize the significance of the dopaminergic system in the pathology of ADHD. Nicotine influences the central acetylcholine system, which modulates arousal and alertness, these data, points out the role of the cholinergic systems in ADHD. Wilens, Biederman, Spencer, Bostic, Prince, & Monuteaux (1999) found that, in adults, the indirect cholinergic agonist ABT-418 was superior to placebo in reducing ADHD symptoms, although the effect was less robust than that of stimulants. It has been shown that nicotine increases ventral striatal DA (Brody, Olmstead, London, Fahari, Meyer, & Grossman, 2004). Pliska (2004) suggested that cholinergic agonists, if they are effective in the treatment of ADHD, might work through catecholamine systems.

1.1.3 Comorbidity of ADHD with Psychiatric or Developmental Disorders

Many studies have found that over 50% of individuals diagnosed with ADHD also meet the diagnostic criteria for one or more additional psychiatric disorder (Brown, 2000). Conduct and oppositional defiant disorder, specific learning disorders, anxiety, and mood affective disorders commonly coexist with ADHD (Nelson & Israel, 2000), with prevalence rates of 46%, 20-80%, 35%, 22-44% respectively. Pervasive developmental disorder, mental retardation, and tic disorder are other comorbid conditions that can also coexist with ADHD (Pliszka, 2003). A growing body of literature indicates that most pervasive and severe outcomes of ADHD occur in children who have comorbid conduct or mood disorders in childhood (Pliszka, 2003). The implication of high rates of comorbidity is that simply recognizing features of ADHD is not enough and that a full appraisal of the child is necessary. ADHD is frequently comorbid with a variety of psychiatric disorders.

ADHD and ADHD with comorbid conduct disorder (CD) appear to be distinct subtypes. Children with ADHD/CD are at higher risk of antisocial personality and substance abuse as adults. Several epidemiological studies reported that the comorbidity rate of conduct and oppositional defiant disorder for children with ADHD range between 40% and 70% (Szatmari, Offord, & Boyle, 1989). It is also indicated that ADHD is a risk factor for the development of conduct disorder (Newcorn and Halperin, 2000).

The overlap between ADHD and specific learning disorders is consistently reported in the literature. About one half of the children diagnosed with primary

ADHD are reported to have a specific learning disorder. Specific learning disorder together with ADHD is reported to affect reading, spelling, and language and arithmetic skill (Goldstein, 2000).

The degree of prevalence of major depressive disorder (MDD) and bipolar disorder among children with ADHD is controversial. Prevalence rates of affective disorders in the ADHD population range from 3% to as much as 75%. Depressive symptoms generally have an onset after the ADHD symptoms and the co-existence of ADHD with MDD does not appear to prolong the depressive episode or number of depressive episodes (Pliszka, 2003).

1.1.3.1 Comorbidity of ADHD with Anxiety

Although the comorbidity of anxiety disorder with ADHD is not as common as ODD/CD comorbid with ADHD, it has been reported in the literature (Perrin and Last, 1996). Rates of comorbidity are reported to be ranging from 6% in a community sample, 2%-21% in studies of children referred to anxiety clinics, to as much as 50% in studies of children referred to behavior disorder clinics (Costin, Vance, Barnett, O'Shea, & Luk, 2002).

The reported effects of comorbid anxiety on diagnostic subgroups were not found to be consistent. Comorbid anxiety was said to have an ameliorating effect on impulsivity in ADHD. Children with ADHD tend to exhibit more severe symptomatology such as irritability, mood liability and emotional outbursts. Higher levels of aggression were associated with higher levels of reported anxiety in these

children. Several studies have reported that psychostimulant treatment may not be as effective as in children with ADHD and anxiety disorders than it is in treating ADHD without comorbid anxiety (Buitelaar, Van Der Gaag, Swaab-Barneveld, & Kuiper, 1995). In a meta analytic study (cited in Pliszka, 2003), it was found that anxiety did not predict a poorer response to stimulant treatment.

1.1.3.2 Anxiety Assessment in Children

Anxiety disorders represent one of the most common disorders of childhood psychopathology. Studies with community samples report that 8 to 12% of children suffer from a form of anxiety that is sufficient to interfere in daily functioning. Anxiety disorders in children may present in a variety of forms such as separation anxiety, generalized anxiety, social phobia, specific phobia, obsessive-compulsive disorder, panic disorder and agoraphobia. There is strong evidence suggesting that if not treated, childhood anxiety disorders may persist into adolescence and adulthood (Keller et. al, 1992)

In the past decade, researchers and clinicians have reached consensus on the various types of childhood anxiety disorders (American Academy of Child and Adolescent Psychiatry, 1997). According to DSM-IV, the following anxiety disorders in children and adolescents are discernable: (1) separation anxiety disorder is characterized by excessive anxiety concerning separation from the home or from significant attachment figures, to a degree that is beyond the child's developmental level; (2) generalized anxiety disorder, formerly termed overanxious disorder (APA,

1987), refers to excessive anxiety and worry, accompanied by symptoms of motor tension and vigilance; (3) social phobia is concerned with marked and persistent fear of social or performance situations in which embarrassment may occur; (4) panic disorder is characterized by the presence of panic attacks (i.e., a discrete period of intense fear) accompanied by persistent concern about their recurrence or their consequences; (5) obsessive-compulsive disorder is characterized by the occurrence of obsessions, i.e., intrusive ideas, thoughts, images, or impulses that cause marked anxiety or distress, and compulsions, i.e., repetitive behaviors or mental acts which serve to neutralize anxiety; (6) specific phobia is characterized by marked and persistent anxiety provoked by exposure to a specific feared object or situation, often leading to avoidance behavior; and (7) acute stress disorder and posttraumatic stress disorder are both characterized by the re-experiencing of an extremely traumatic event accompanied by symptoms of increased arousal and by avoidance of stimuli associated with the trauma. Assessment of anxiety seems to be an important issue at this point.

Early intervention of children with anxiety disorders is dependent upon the availability of valid and sound assessment instruments. In both research and clinical practice, self-report questionnaires for measuring childhood anxiety symptoms are frequently used for anxiety assessment. This type of measure is easy to administer, requires a minimum of time, and captures information about anxiety symptoms from the child's point of view (Strauss, 1993). The three most widely used instruments for this purpose have been the Revised Children's Manifest Anxiety Scale (RCMAS;

Reynolds & Richmond, 1978), the State–Trait Anxiety Inventory for Children (STAIC; Spielberger, 1973), and the Fear Survey Schedule for Children – Revised (FSSC-R; Ollendick, 1983). All these instruments are simplified versions of adult questionnaires and were developed prior to the establishment of the current diagnostic criteria of DSM-IV. Although there is of good deal of overlap between adult and child measures, there are developmental issues that need to be considered.

Over the past few years, a number of new questionnaires have been developed in an attempt to measure the various aspects of childhood anxiety. In this context, three scales should be mentioned, namely the Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Conners, 1997), the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997), and the Spence Children's Anxiety Scale (SCAS; Spence, 1998). Among these instruments the SCAS shows a broader scope and a closer connection with the DSM-IV structure (Spence 1998).

SCAS is 38-item scale prepared in two different forms as the child version (SCAS) and the parent version (SCAS-P). Items of both versions are scored on a four-point scale from zero to three. Both SCAS and SCAS-P have six subscales measuring for panic attack and agoraphobia, separation anxiety, physical injury fears, social phobia, obsessive-compulsive and generalized anxiety/overanxious disorder.

Since SCAS is a recently developed scale, adaptation studies are being conducted in several countries. Australia, Germany, and Japan are of these countries. The reliability and validity of the SCAS was evaluated in a sample of 556 German

primary school children (Essau, Muris,& Ederer, 2002). SCAS (alpha=0.92) was demonstrated to have high internal consistency and the validity of the SCAS was supported by a number of findings. The frequency of anxiety symptoms and their association with gender and age in Japanese and German children were compared using the SCAS (Essau, Sakano, Ishikawa, & Sasagawa, 2004). A total of 1837 children (862 from Germany and 975 from Japan) between the age of 8 and 12 years were investigated. Results revealed that German children reported significantly higher symptoms of separation anxiety, social phobia, obsessive-compulsive disorder, and generalized anxiety disorder than Japanese children. Conversely, Japanese children reported significantly higher scores on symptoms related to physical injury fear. In both countries, girls scored higher than boys on all the scales of the SCAS. Symptoms of separation anxiety and panic decreased with age, whereas social phobia increased with age. The findings underscore the impact of culture on children's anxiety.

Among all these instruments, STAIC is widely used for the assessment of child anxiety in Turkey. The adaptation, validity, and reliability studies of STAIC for Turkish population were conducted by Özusta (1993). It is a simplified self-report questionnaire prepared for adults, and measures state-trait anxiety. Although scale has a Cronbach alpha of .82 for state anxiety and, .81 for trait anxiety, STAIC was advised for the use of clinical observation rather than diagnosing anxiety.

As different from STAIC, SCAS is a questionnaire that is inspired by the anxiety disorders listed in the DSM–IV (APA, 1994) and assesses symptoms of

generalized anxiety disorder, separation anxiety disorder, social phobia, panic disorder and agoraphobia, obsessive–compulsive disorder, and specific phobia represented by a subscale named “physical injury fears”. Since SCAS-P covers a broad range of the anxiety disorders, it was adopted to Turkish in this present study to evaluate anxiety level of children with ADHD as a parent report.

1.1.4 Treatment of ADHD

1.1.4.1 General Overview of Treatment

A variety of treatments have been applied to attention deficit hyperactivity disorder. These treatments include cognitive and behavioral therapies, family interventions, school-focused interventions, social skills training, and pharmachotreatment. Pharmacological agents that have been used for ADHD are central nervous system stimulants, antidepressants, and antipsychotics.

Providing information to children who have ADHD seems to be an important part of the intervention process. Children can develop an understanding of how attention, memory and learning processes work and learn effective ways to enhance their learning and academic performance through cognitive behavioral interventions (Levine, 1990; 1993a, 1993b). Social skills training, which focuses on remediating the deficits in social skills, is another way for individual interventions. However, is reported as of limited success by DuPaul and Stoner (1994), since these children already have the necessary skills and know the rules of social interaction, but do not perform appropriately because of their impulsivity.

One of the psychosocial interventions considered most important is providing education for the child's family, the child and teachers about the illness, treatment and expected treatment outcomes. Parent management training involves teaching the parents consistent and appropriate disciplinary strategies, which employ immediate rewards for achieving targeted behaviors. Such techniques reduce the child's disruptive behaviors, decrease family stress and increase the parents' self-confidence, and their parenting abilities (Sava, 2000)

School-focused interventions aim enhancing academic performance, improving classroom behavior and improving peer relationships. Simple modifications such as seating the child in the front of the classroom to minimize distractions can be beneficial. A structured classroom setting with clearly defined rules and expectations, consistent and immediate reinforcement, and regular feedback creates an encouraging learning atmosphere (Sava, 2000).

The combined use of pharmacotherapy and psychological interventions has been reported as promising for the treatment of ADHD and comorbid conduct and oppositional defiant disorder. Individual psychotherapy, cognitive behavioral therapies for behavioral regulation, and family interventions support the effectiveness of medication. Informing patients and parents on possible effects of medication helps reducing the anxiety regarding treatment and increase the effectiveness of pharmacological treatment. Stimulants are often effective treatments for aggressive or antisocial behavior in patients with ADHD, but mood stabilizers or atypical

antipsychotics might be used to treat explosive aggressive outbursts (Nelson & Israel, 1999).

Treatment outcome research indicate that up to 70% of children with ADHD continue to meet the diagnostic criteria into adolescence, and more than 50% meet the diagnostic criteria in young adulthood. Hyperactivity and impulsivity in childhood tend to diminish by adolescence, but other symptoms persist. However, in reviewing the data on outcome for ADHD, it is important to consider some aspects of the overall picture. First, difficulties experienced change over the course of development. Second, the percentage of youth who continue to have problems varies a good deal from study to study. This variation could be an accurate reflection of real differences in samples. Third, despite the long list of difficulties that can exist into later years, general trend is for continuity of the problems to weaken over time. Certainly not all children with ADHD experience maladaptations in later years (Nelson & Israel, 1999).

The prognosis is influenced by the severity of symptoms, comorbidity, intelligence quotient, family situation, parental pathology, family adversity, socioeconomic status, and treatment received. Research on this area provides a strong argument for the early recognition and treatment of ADHD in childhood. However, it turns out that no factor strongly predicts further outcome. In addition different factors seem more related to outcome in some areas of functioning than in other areas (Campbel, 1995; Fergusson, Lynskey & Horwood 1997; Lambert, 1988). For instance, educational outcome appears especially associated with earlier deficits in

attention, intelligence, and academic skills, as well as in family social class and child rearing practices. In contrast, adolescent and adult antisocial behavior is linked to several early factors including family disturbance and the occurrence of previous aggression and conduct problems.

1.1.4.2 Pharmacological Treatment

Although stimulant medication is quite effective for most children with ADHD 10% to 30 % of children may not respond to treatment with stimulants (Julien, 1998). A variety of medications have been used in conjunction with or instead of psychostimulants. Antipsychotics are known to be beneficial on symptoms like hyperactivity, impulsivity, and difficulty sustaining attention. However, these medications are known to be less effective than psychostimulants. Some clinicians reframe from using antipsychotics due to their risks of controversial effects on cognitions and learning, irreversible tardive dyskinesia, and sedative effects.

The tricyclic antidepressants such as imipramine and Tofranil have been successfully used as second order treatments, although the occurrence of cardiac toxicity is a risk. SSRIs such as fluoxetine or Prozac and the non-tricyclic antidepressant buproprion have also been reported to be helpful for children who do not respond to stimulant medication. The antidepressants are also frequently prescribed when mood symptoms, anxiety, or overfocusing are of concern (Cherkes-Julkowski, Sharp, & Stolzenberg, 1997). Clonidine, an anti hypertansive, and the anti seizure medication carbamazepine have also been used in combination with or as

alternatives to stimulant medication (Julien 1998), especially when aggression or irritability is present (Cherkes-Julkowski, Sharp, & Stolzenberg, 1997).

1.1.4.2.1 Methylphenidate

Currently, central nervous system stimulants are the drugs of choice for treating children with attention deficit hyperactivity disorder (ADHD). Dextroamphetamine sulfate was the first psychostimulant that was used for this purpose. In 1955, MPH received approval from the US Food and Drug Administration for the treatment of ADHD in children; the next such drug to receive approval was pemoline in 1975. MPH is a first line pharmacological treatment for ADHD. Double blind placebo controlled research has proven better results with the use of MPH, the most commonly used stimulant, compared to dextroamphetamine, and pemoline. Seventy five percent of medicated children show increased attention, decreased impulsivity and activity level (Whalen & Henker, 1998). Effects of MPH reducing co-occurring, aggressive, noncompliant oppositional behaviors are reported (Hinshaw, 1994). Indirect catecholamine agonist methylphenidate (Trade name; Ritalin) was first used in 1957. At the time, usage of a specific drug for treatment purposes supported studies conducted on the effects of MPH (cited in Chu, 2003).

1.1.4.2.2 Pharmacology of MPH

Methylphenidate is a short-acting stimulant with a pharmacokinetic half-life of 2 to 3 hours. The time to peak blood drug concentrations following the oral

administration of MPH is between 1 and 3 hours. This requires at least twice daily administration to efficacy throughout a typical school day, requiring administration at school, which can result in decreased compliance. MPH is absorbed well from the gastrointestinal tract and easily passes to the brain. After oral administration, 50 and 90% of MPH dose is excreted in urine by 8 and 48 hours, respectively. There is considerable interindividual variability in MPH absorption rate in hyperactive children (Patrick & Markowitz, 1997).

The molecular structure of MPH contains a small amount of phenethylamine, which superimposes on its supposed neural substrates dopamine and norepinephrine, providing for the essential receptor interactions. The behavioral manifestations of ADHD have been theorized to involve an interactive imbalance between dopaminergic, noradrenergic and serotonergic neurotransmitter systems (Pliszka, Mccracken, & Maas, 1996). The mechanism, by which MPH produces psychostimulant effect appears to depend notably upon the facilitation of catecholaminergic neurotransmission.

MPH increases the amount of DA in the synaptic cleft by blocking the presynaptic DA transporter. However, orally administered MPH slowly enters the brain and reaches maximal concentrations after 60 to 90 minutes. It releases slowly in order to prevent further release of DA when it reaches the brain, and is attached to the dopamine transporter. (Solanto, 1998).

Recognizing that MPH binds with high affinity to the naptic clearance of impulse-released dopamine, leading to longer postsynaptic neurochemical mediation

(Schweri, Skolnick, Rafferty, Rice, Janowski, & Paul, 1985; Gatley, Pan, Chen, Chaturvedy, & Ding, 1996). MPH does not stimulate catecholaminergic receptors directly but it rather facilitates the action of DA and NE (Solanto, 1998).

MPH blocks DA reuptake by binding to the DA transporter or it releases DA. Effects of MPH on noradrenergic system have been less well studied. Indirect evidence admits the possibility of relative noradrenergic overactivity in ADHD and MPH has been said to produce a significant reduction in firing of NE neurons in the locus corelleus. MPH inhibits sensory activity through sensory afferents and corrects the abnormality in locus corelleus by enhancing release of NE in the periphery. Synaptosomal studies indicate that MPH inhibits dopamine uptake more than it inhibits norepinephrine uptake and much more so than it does serotonin uptake (Gatley, Pan, Chen, Chaturvedy, & Ding, 1996).

Side effects of MPH are reported as being relatively lower than other types of medication used for ADHD. Most commonly observed side effects of MPH are headaches, stomachaches, nausea, and sleeplessness. Some children demonstrate a mild agitation and a slight hyperactivity after cessation of the drug (cited in Hinshaw 1994).

1.1.4.2.3 Psychopharmacological Effects of MPH

Psychostimulants are know for decreasing inappropriate physical activity, vocalization, and disruptive behavior; improving compliance with adults' requests; increase attention span and short-term memory; and lessening friction between the

child and his or her peers and siblings (Willens, 1992). In a double-blind, placebo-controlled, crossover study of treatment with stimulant drugs in 36 boys with ADHD aged 7 to 11 years, Zeiner, Bryhn, & Bjercke (1999) found that 30 patients (83%) showed significant improvement in hyperactivity at home or school and 22 patients (60%) had levels of hyperactive behavior within normal limits.

MPH was shown to improve cognition, vigilance, reaction time, short-term memory and learning of verbal and nonverbal material. MPH enhances cognitive flexibility, yet enhancement of the response inhibition is less effective at high than at lower doses. These controversies on dissociation of dose effects on cognitive function and behavior may be caused by the lack of precise measures of cognitive function. The therapeutic benefit of MPH on cognitive performance in pediatric cases of ADHD was addressed. Reports note highly variable treatment responses using MPH for cognitive/academic function. MPH also produces a decrease in preference for novelty and has positive effects on focused attention, and learning (Gary & Kagan, 2000).

MPH was also shown to help with problems of impulsivity (Brown & Sleator, 1979; Rapport, Stoner, DuPaul, Birmingham, & Tucker, 1985) and activity level (Porrino et al., 1983) as well as attention (Charles, Schain, Zelnicker, & Guthrie, 1979), and that the children with ADHD respond well to MPH treatment in terms of behavioral symptoms (Biederman, 2003). Additionally classroom behavior of children with ADHD after eight weeks of stimulant treatment was evaluated and found to be the same with healthy children as measured hyperactivity (Abikoff &

Gittelman 1985). Significant improvement in behavior and conduct in children with ADHD treated with methylphenidate for up to five weeks was detected in another study by Klein et al. (1997), who used teacher and parent assessments of child behavior.

Livingston (1996) reported that MPH treatment was favorable for amelioration in memory functioning in children with ADHD. Literature on MPH's effects on continuous test performance and vigilance tasks is also favorable (Losier, B. J., Mcgrath, P. J., & Klein, R. M. 1996; Coons, H.W., Peloquin, L.J., Klorman, R., Blauer, L.O., Ryan, R.M., Perlmutter, R.A., Salzman, L.F. 1981; Batson, Simon, Herman, &Finch, 2002). Twenty children with ADHD and 20 age-matched controls were assessed with a continuous performance task requiring subjects to identify repeating alphabetic characters. The results showed that the ADHD group at baseline was more impulsive and inattentive than controls and had shorter response latencies. Low dose MPH was associated with reduced impulsivity (fewer false alarms), whereas the higher dose level was associated with reduced impulsivity and less inattention (more hits). There were no adverse effects of the higher dose for any of the children (Losier, B. J., Mcgrath, P. J., & Klein, R. M. 1996). Despite the positive impact of short term methylphenidate therapy on the behavioral and social symptoms of patients with ADHD demonstrated by this and other studies, the long term positive effect of methylphenidate on children with ADHD has yet to be firmly established.

Motor activity levels of children with ADHD were measured using a portable lactometer after administration of oral methylphenidate 0.45 to 1.25 mg/kg twice

daily. Activity was found to be reduced by MPH. Rapport et al. (1997) showed that methylphenidate reduced impulsivity with increasing dosages. This impulsivity has been measured via latency times and error rates on the Matching Familiar Figures Test and via parent and teacher ratings of self-control. Likewise, Tannock et al. (1995) noted that improvement in inhibitory control was dose-related at 2 doses of methylphenidate (0.3 and 1 mg/kg/day). The classroom behavior of 28 children with ADHD treated for 8 weeks (mean dosage 41.5 mg/day) was evaluated and found to be indistinguishable from that of healthy children as measured by gross and fine motor movement, hyperactivity, noncompliance and interference. Significant improvement in behavior and conduct in children with ADHD treated with MPH was detected (Abikoff et al., 1985).

Twenty children with ADHD and 20 age-matched controls were assessed with a continuous performance task requiring subjects to identify repeating alphabetic characters. Evoked response potentials and behavioral measures were recorded and analyzed for trials where a correct response was made. The ADHD group was assessed at baseline and on placebo, low and high dose levels of MPH. The results showed that the ADHD group at baseline was more impulsive and inattentive than controls and had shorter response latencies. Low dose MPH was associated with reduced impulsivity (fewer incorrect responses), whereas the higher dose level was associated with reduced impulsivity and less inattention (more correct responses). There were no adverse effects of the higher dose for any of the children. These results suggest differential dosage effects and dissociation between dose levels and aspects

of processing. Despite the positive impact of short term methylphenidate therapy on the behavioral and social symptoms of patients with ADHD demonstrated by this and other studies, the long term positive effect of methylphenidate on children with ADHD has yet to be firmly established. It was shown that methylphenidate treatment of children with ADHD positively affects mother-child interactions, sibling interactions and overall family interactions, in addition to improving peer relationships (Rey, 2000). Another study has shown that children with ADHD treated at doses of 5 to 50 mg/day are less intense, more involved in tasks, more effective at communicating and generally more socially responsive. Similarly, children on MPH showed fewer negative social behaviors (Kimko, 1999).

The standard form of MPH is prescribed 2 to 4 times daily (Stein, 1996). Although the sustained-release form of MPH has behavior effects lasting approximately for 8 hours and helps the child through the school day, an after-school dose of regular-acting MPH is often required for the child to accomplish homework and to make behavior more manageable at home (Birmaher et al., 1989).

1.1.5 ADHD Literature in Turkey

ADHD research in Turkey is quite comprehensive. Topics of assessment and diagnostic procedures, etiology, cognitive and executive functioning of children and adolescents with ADHD, parental history of psychological problems, family and teacher education, comorbidity, treatment and prognosis of ADHD have been subject to research.

Özcan, Egri, Kutlu, Yakinci, Karabiber, & Genç (1998) conducted a study to determine the prevalence of ADHD among school age children living in Malatya city center. Students that were pointed as having inattention, hyperactivity, and/or impulsivity were examined clinically. Prevalence of ADHD for this population was reported to be 9.5% with a boy to girl ratio of 2.75. In another follow up study by Öner & Aysev (2000) rate of ADHD in school-aged children who had behavioral symptoms at preschool was explored. Fifteen percent of children in the sample had a diagnosis of ADHD within three years. It was found that internalizing problems during the preschool period predicted ADHD. In general prevalence studies in Turkey reveal a rate of 1.16 to 2.78% for ADHD (Erol, 1988; Öktem, 1993).

Studies that were descriptive of characteristic of children with ADHD were conducted. Pekcanlar, Turgay, & Miral (2000) examined the frequency and distribution of DSM-IV symptoms in children with ADHD. The most common symptom was found to be distractibility by 98 %. It was also reported that 95% of mothers reported inattention symptoms such as “has difficulty sustaining attention in tasks or activities”. Accordingly, Turkish children were compared to Canadian children in terms of DSM-IV criteria (Erman, Öncü, Türkbay, Erman, Söhmen, Turgay, & Yorbik, 2000). No prominent differences were reported between Turkish and Canadian children however, Turkish children were found to be more hyperactive and impulsive than Canadian children.

Comorbidity of ADHD with specific learning disorders and disruptive behavior disorders were reported. Fifty four percent of children who had ADHD were

reported to have comorbid disruptive behavior disorders in Turkey (Senol, 1997). In a follow up study, the psychiatric status of children who had ADHD in childhood was examined during adolescence by Aysev & Öner (2001). Results of the study revealed that ADHD group received several psychiatric diagnoses in adolescence according to SCID-I.

Psychosocial and/or medical interventions were commonly reported ways of treatment. As for medical interventions, Ritalin is the most widely used brand of MPH in Turkey as well and it has been subject to several researches. Studies in Turkey concentrate on the biological effects of MPH. Öner, Aysev, Küçük, and Ibis (2000), compared cerebral blood flow of children with ADHD before and after MPH treatment. SPECT Images of eleven children while performing a reading task requiring sustained attention were taken before and after MPH use. The first and second images were compared for each child. Results indicated a statistically significant decrease in regional blood flow in right parietal region and an increase in the left temporal region after treatment. Results implicated that right anterior parietal region could have a possible importance in effects of MPH on attention.

In another study, Pekdemir, Toros, Çamsari, Çiçek, Yurtdas, Parmaksiz, & Katircibasi (2003) investigated the effects of MPH on cardiovascular functions in the treatment of ADHD. 38 patients with ADHD and 29 non-ADHD were investigated by electrocardiography and the data of ADHD group were compared with non ADHD group. Results of the study showed no significant difference between the groups for baseline measurement. However, after 12 weeks MPH treatment increased the

ventricular repolarization parameters in ADHD groups indicating a need for early diagnosis of possible side effects in patients on MPH treatment.

The role of combined treatment was subject to research in another study. Sevim (2002) investigated changes in symptoms of ADHD by neuropsychological instruments after a combined treatment of school, parental, and medical interventions. Results of this study indicated better performance on BGVTPT and WISC-R full test and subtest scores. These changes were reported to occur after a combined treatment for ADHD. Use of a combined treatment causes the contribution of each treatment factor on ADHD to remain unclear.

As a conclusion it could be stated that ADHD research in Turkey focuses on the psychosocial aspects of ADHD rather than ADHD treatment. Studies on medical treatment of ADHD show the biological effects of medication and lack demonstrations on cognitive and behavioral effects of it. Additionally, although the world literature of ADHD have been conducting research on the use of MPH in ADHD comorbid anxiety, Turkish literature lacks work on ADHD comorbid anxiety and the effects of psychostimulant treatment in such situations.

1.2 Aims of the Present Study

In the light of the literature that was presented, the first aim of the present study was to introduce a new instrument for children's anxiety assessment. Reliability and validity studies were conducted for the parent report of Spence Children's Anxiety Scale (SCAS-P). The second aim of the present study was to see the effects

of 12-week MPH use on different functional aspects of ADHD symptomatology and anxiety level. Visual motor perception, activity level, anxiety level, vigilance task performance, short-term memory, and attention components were assessed in children with ADHD and a comparison group of children without ADHD.

Regarding the effects of MPH treatment research questions are listed:

1) Does MPH help improve visual motor perception of children diagnosed with ADHD?

2) Does MPH help improve hyperactivity level of children diagnosed with ADHD?

3) Does MPH help improve the full-scale anxiety scores of children diagnosed with ADHD?

4) Does MPH help improve vigilance task performance of children diagnosed with ADHD?

5) Does MPH help improve the WISC-R subscale measures of children with ADHD?

1.3 Significance of the Present Study

This present study was conducted for its unique contributions to Turkish literature on anxiety assessment and effects of ADHD medication on anxiety as well as cognitive and behavioral effects of MPH. First one of the major significances of this study is providing a reliable and valid instrument for measuring anxiety in children. The instruments used for measuring child anxiety are simplified forms of

adult measurement scales. However, Spence Childrens' Anxiety Scale Parent Report (Spence, 1999) is an instrument that was developed specifically for measuring child anxiety. It provides information on six different types of anxiety disorders in addition to an overall anxiety score. Since anxiety is a culturally bond concept, SCAS-P is of help comparing different aspects of anxiety within different cultures. The use of SCAS-P in this research introduces a new diagnostic and therapeutic instrument for child assessment.

Secondly this present study was conducted with patients who received a solid pharmachotreatment. There are studies conducted on the ameliorating effects of combined treatment, which is identified as the combined use of medical, parental, and teacher interventions. These interventions clearly have a combined effect on children's anxiety and activity level. This present study provides information on the solid effects of pharmachotreatment on anxiety and activity level.

Finally MPH is known for its effects on a broad scale of areas regarding ADHD. These include attention, activity level, memory, comorbidity, social adaptation, and spatial and cognitive abilities. This present study provides an opportunity to see the changes in these areas in the co- occurrence of anxiety.

CHAPTER 2

METHOD

2.1 Study I: Reliability and Validity Study for the SCAS-P

2.1.1 Participants

Participants were volunteer mothers of 142 boys and 138 girls, 280 Turkish children. They were reached through different local elementary schools. Children's age for the validity and reliability studies of SCAS-P (Spence, 1999) ranged between seven and twelve (M=8.71, SD=1.39) whereas mothers' age ranged from 26 to 51. Mothers of children were contacted from different elementary schools in order to reach parents from low to high SES. Thus a heterogeneous sample was provided.

2.1.2 Materials

Spence Children's Anxiety Scale Parent version (SCAS-P) was established by Spence (1999). It is a parent-completed measure driven from the SCAS items designed to assess children's symptoms of anxiety along the structure of the DSM-IV. SCAS-P consists of 38 anxiety items and one open ended non-scored item. Maximum score available is reported as 114 and the cut-off score was advised as 28 points. It provides an overall measure of anxiety as well as providing diagnostic information on panic attack and agoraphobia (items 12, 19, 25, 27, 28, 30, 32, 33, 34), separation anxiety (items 5, 8, 11, 14, 15, 38), physical injury fears (items 2, 16,

21, 23, 29), social phobia (items 6, 7, 9, 10, 26, 31), obsessive compulsive (items 13, 17, 24, 35, 36, 37) and generalized anxiety disorder / overanxious disorder (items 1, 3, 4, 18, 20, 22, 69) on a four-point scale that was developed by Spence (1998). Each item is scored from zero to three according to how often the stated conditions on each item happen to the child (i.e. 0=never, 1=seldom, 2=often, 3=always). The sub-scale scores are computed by adding the individual item scores on the set of items, and total score is computed by adding up the subscale scores.

The SCAS-P was reported to show good psychometric properties and that it was reported to be highly useful for both research and clinical purposes, especially when combined with the child version (Spence 2003). Original scale reliability studies yielded a .89 alpha for the SCAS-P total score. Reliability coefficients for subscales were revealed as 0.74 for separation anxiety, 0.74 for social phobia, 0.67 for generalized anxiety, 0.61 for panic attack and agoraphobia, 0.74 for obsessive–compulsive disorder, and 0.58 for physical injury fears.

Convergent validity of the scale was obtained by comparisons with other parent report scales (i.e. Child Behavior Checklist-CBCL). Strong correlations were reported between SCAS-P and CBCL indicating for convergent validity. In terms of convergence, inter-correlations between parent and child self-report on the separate SCAS subscales were reported to range from 0.23 to 0.60. Parent–child agreement was reported to be highest for the subscales that consisted of items with observable behavior such as separation anxiety (Spence, 2003). SCAS-P was applied to mothers of children with anxiety and mothers of children without anxiety, and total scale

scores for both groups were compared. Scale was also reported to successfully differentiate children with anxiety from normal children, indicating a discriminant validity.

2.1.3 Procedure

SCAS-P (Spence, 1999) was first translated into Turkish from the original 38-item scale. In order to translate SCAS-P into Turkish and determine the psychometric properties in a Turkish population, the permission was taken from Sue Spence who had developed the scale. The translation of the scale into Turkish was made by using a one-way translation method (Savasir, 1994).

After the translation of the scale to Turkish was completed, 280 mothers were administered the scale at schools where their children attended. Mothers were given the anxiety scale and were asked to state how often the conditions stated on the items of the scale happened to their children. Duration of administration was not limited. Time to complete the form changed between 15 to 25 minutes depending on mothers' reading skills.

2.2 Study II: Effects of MPH Treatment on Cognitive Abilities, Hyperactivity Level, and Anxiety

2.2.1 Participants

Fifty-three elementary school children between ages seven and eleven were evaluated for availability to participate in this present study. These children that were

referred to the hospital for possible Attention Deficit Hyperactivity Disorder (ADHD) examination were first screened for normal intelligence (see Section 3.2.2) through Wechsler Intelligence Scale for Children Revised (WISC-R). Thirty-six of these children with an age mean of 9.06 (SD= 1.33) were found to meet the criteria for normal intelligence. The mean of WISC-R full-scale score for these 36 children was found to be 96.08. Seventeen children who were diagnosed with mental retardation according to intelligence testing results were excluded from the research. This exclusion left the number of participants as 36 for this research. Diagnosis and assignment of participants to the study groups was solely based on the DSM-IV diagnostic criteria, which was administered by the child psychiatrist.

All 36 participants came from low socio economic status families. Family income for all participant families was between minimum wage and eight hundred million Turkish Liras per month. Family income was controlled in order to make sure medical intervention was the only kind of treatment children with ADHD and their families received. Caregiver age and education was also enquired in order to eliminate demographic differences between the drug group and the comparison group.

2.2.1.1 Drug Group

Drug group consisted of seventeen children who fully met the diagnostic criteria for ADHD according to DSM-IV (see Appendix A). Criteria were administered by the child psychiatrist after IQ screening. Children who manifested

six or more of the symptoms of either inattention or hyperactivity / impulsivity for at least six months were also asked whether the symptoms were present before age seven and whether some impairment from the symptoms were present in at least two settings (i.e. home, school). Seventeen children who complied with these queries within the stated circumstances were diagnosed with ADHD by the child psychiatrist and were assigned to the drug group. Children in the drug group were not categorized according to different subtypes of ADHD. Twelve boys and five girls who were diagnosed with ADHD were prescribed appropriate doses (0.25mg to 5mg) of MPH (Ritalin) by the child psychiatrist.

Participant age varied from seven to eleven and the mean was found as 8.82 years with a standard deviation of 1.42. WISC-R full-scale scores for the drug group ranged between 80 and 135 (M=95.76; SD=14.28). The mean age of mothers of participants in the drug group was 32.82 (range: 27-43 years; SD=4.44). There were nine elementary school graduates, one middle school graduate, six high school graduates and one university graduate among participant mothers.

Children in the drug group did not receive any sort of therapeutic interventions but medication. Parents whose children participated in the drug group did not receive any kind of familial intervention regarding ADHD between pretest and posttest procedures.

2.2.1.2 Comparison Group

Comparison group consisted of nineteen children who referred to the clinic for ADHD examination but had not met the full diagnostic criteria of ADHD that was administered by the child psychiatrist. According to the items of the DSM-IV criteria all children in the comparison group scored for not listening when spoken to, not following through on instructions and failing finishing schoolwork, losing things necessary for tasks or activities, leaving seat in the classroom when expected to be seated, being on the go, talking excessively, having difficulty awaiting turn, and interrupting or intruding on others. However, they did not meet the requirement for at least six symptoms of inattention or hyperactivity/impulsivity. This group was named as comparison group for having referred to the hospital with ADHD symptomatology and for not being normal controls.

Fifteen boys and four girls in this group were from seven to eleven years of age with a mean of 9.26 years (SD=1.19). WISC-R full-scale scores for the comparison group ranged between 82 and 126 (M=96.36; SD=11.26). Participants' mothers' age ranged between 25 and 51 (M=35.89; SD=5.99). There were six elementary school graduates, two middle school graduates, and eleven high school graduates among participant mothers.

Comparison group participants did not receive any kind of medication or therapeutic help. Parents of the children in this group were not provided any kind of familial interventions during the control period.

2.3 Materials

2.3.1 Diagnostic Statistical Manual of Mental Disorders Fourth Edition (DSM-IV)

ADHD is characterized by impulsivity, over activity and or being inattentive to an extent, which is not warranted for the developmental age of children and is a significant difficulty to their social and educational success. Diagnostic criteria for ADHD classify the symptoms of the disorder into two groups as inattention and hyperactivity / impulsivity (APA, 1994). DSM-IV criteria were used for diagnostic purposes by the child psychiatrist. DSM-IV criteria are presented in Appendix B.

2.3.2 Wechsler Intelligence Scale for Children-Revised (WISC-R)

Wechsler Intelligence Scale for Children Revised (WISC-R) was developed by Wechsler in 1949, for assessing children from six to twelve years of age and it was revised in 1974. The scale consists of two different sections as verbal and performance. Each one of these sections contains six subtests, which makes a total of 12 subtests.

Verbal section consists of general information, similarities, arithmetic, vocabulary, comprehension, and digit span subtests respectively where as performance section consists of picture completion, picture arrangement, block design, object assembly, digital symbol, and labyrinths subtests respectively. Digit span and labyrinths subtests are withheld from the total intelligence coefficient and are used when other subtests are inappropriate. However in this study, all participants

were administered digit span subtest as a measure for memory. WISC-R was used in this research for IQ screening and for measuring performance capacity of children with ADHD. Behavioral measures for WISC-R verbal and performance subtests are summarized in Table 2.1 and 2.2.

Table 2.1. Behavioral measures for WISC-R verbal subtests

WISC-R Verbal Tests	Behavioral Measures
General Information	Acquired general cultural knowledge, expressive language skills
Similarities	Conceptual and logical relation skills
Arithmetic	Basic arithmetic skills, verbal memory use, attention, ability to eliminate alternatives
Vocabulary	Vocabulary, verbal development, verbal fluency
Comprehension	Practical knowledge, social judgment, abstract thinking, ability to organize knowledge
Digit Span	Short term memory capacity and attention

(Anastasi, 1990)

Table 2.2. Behavioral measures for WISC-R performance subtests

WISC-R Performance Tests	Behavioral Measures
Picture Completion	Capacity to perceive peripheral stimuli, level of interest for details, visual alertness
Picture Arrangement	Grasp of cause and effect relationship, ability to synthesize, predicting social processes, planning strength, sense of humor
Block Design	Performance speed, visual perception, motor coordination skills, non verbal judgment, analytical and spatial thinking, perceptual organization capacity

(Table 2.2 continued)

Object Assembly	Ability to see the whole from the piece, capacity of organizational perception, perception speed, ability to use trial error skills, spatial capacity
Digital Symbol	Ability to learn a new task, visual perception, motor coordination skills
Labyrinths	Visual motor coordination, fine motor coordination, speed

(Anastasi, 1990)

Turkish standardization studies of WISC-R were conducted by Savasir and Sahin (1982). Normative studies sample consisted of 1639 participants between 6 and 15 years of age, from eleven different cities of Turkey. Participants were selected from schools located at different socio economic status areas, and were from families of different education levels.

Total scores from each subscale are converted to standard scores according to standard score tables prepared for every four-month age interval. Correlation coefficients between subtests were found to vary between .51 and .86 for the Turkish sample. Split half reliability values for verbal section and performance section were .97 and .93 respectively (Savasir and Sahin, 1995).

2.3.3 Hacettepe Attention Deficit Hyperactivity Disorder Scale

Hacettepe Attention Deficit Hyperactivity Disorder Scale (Öktem, 1993) is a 29 item self report measurement used for ADHD diagnosis. Maximum score available was reported as 58 points. Cut-off point is conventionally advised as 19. It was developed through revising different measurement scales that are used in this

area in Hacettepe Child Psychiatry Department (Öktem and Sonuvar, 1993). Reliability of the scale was revised by Öktem and Baykal (1995). Scale was administered to parents as a measure of parent report on child behavior. Hacettepe ADHD Scale was presented in Appendix C.

2.3.4 Bender Gestalt Visual And Motor Perception Test

Bender Gestalt Visual and Motor Perception (BGVMPT) test was first developed by Bender in 1938 in order to measure visual and motor perception. It was first used for examining brain damage and affective problems (Hain, 1964) and later its usage was broadened to a larger area including measuring memory, time and place perception, and organization skills as well as visual and motor development.

BGVMPT consists of nine cards with a geometrical figure on each card. Each card is presented to the participant one by one and in a certain order, and the participant is asked to copy the figure on a sheet of paper. Possible errors for this test could be grouped into four as distortion, rotation, integration, and perseveration (Koppitz, 1964).

Most common way of scoring BGVMPT in the literature is shown as the Koppitz method. According to the Koppitz method every error for each single drawing is scored as one point. Maximum score for this test is stated as 30 (Koppitz, 1964).

Norm studies of BGVMPT for Turkish population were conducted by Yalin (1980) and Somer (1988). Test-retest reliability for first, second, and third graders

were found to be .80, .73, and .81 respectively. Inter rater reliability was stated as .93 by Somer (1988) and .97 by Yalin (1980). In this study BGVMPT was used to measure the perception of visual stimuli, visual motor coordination, and expression of the visual stimuli through motor functioning.

2.3.5 Spence Children's Anxiety Scale Parent Report (SCAS-P)

SCAS-P consists of 38 anxiety items and one open ended non-scored item. Maximum score available is reported as 114 and the cut-off score was advised as 28 points. It provides an overall measure of anxiety on a four-point scale that was developed by Spence (1998). Original scale reliability studies yielded a .89 alpha. Scale reliability of the Turkish version was reported as .88. SCAS-P was administered to participants' parents as a measure of child anxiety. Parents were asked to report how often each of the items happened to their child.

2.3.6 Vigilance (Attention-Memory) Task

The vigilance attention memory task is a target cancellation task that was developed by the researcher in order to measure attention. It consists of three cancellation tasks administered to each participant in order of increasing difficulty. Each cancellation task consists of different figures arranged in a 6 line, 8 column matrix with one target on the first two lines, two target figures on the third and fourth lines, three targets on the fifth line, and four targets in the sixth line.

First cancellation task consisted of thirteen different figures including a light bulb, a flower, a pencil, a television, an ice cream cone, a car, an apple, a single key, a flower in a pot, a clock, a birthday cake, a telephone and a pair of scissors with the light bulb being the target stimulus. All figures were spread through a 6X8 matrix together with the target stimulus as formulated above.

Second cancellation task consisted of three different looks of an apple, upward stem, leftward stem, and rightward stem with leftward stem apple being the target stimulus. These apples were spread on the matrix in a way that any one of them would not precede its own.

Third cancellation task included eight different geometric figures with hexagon being the target stimulus. All figures were spread through a 6X8 matrix together with the target stimulus as formulated above again in a way that any one of them would not precede its own. All tasks are presented in Appendix D. Norm studies for the vigilance tasks were performed on 20 children of the same age group as the participants of the present study. These children who were selected by accidental sampling were administered the task for any possible ceiling effect.

After the task being checked for age norms, participants of the current study were administered each cancellation task on a separate sheet of paper with the target stimulus indicated on top, and they were asked to scan through each line starting from first to last and mark each target stimulus they identify with a marker. They were informed about the fact that duration of each task would be timed and they were also

told not to correct any errors, or not to go back for any missed targets. Evaluation of every task was based on timing, omission errors, and commission errors.

2.3.7 Demographic Information Form

Demographic information regarding child's date of birth and child's grade was gathered the day participants first came to the hospital. This demographic information also included questions regarding mothers' age, mothers' education, family income, changes in children's academic life, and possible side effects of the drug. Demographic information form is presented in Appendix E.

2.4 Procedure

Participants for the current study were gathered from the local Hospital for the Social Security Office Child Psychiatry Clinic in Ankara. One of the important significances of this hospital for this research was the availability of children with ADHD. Additionally the aim of this present study was to make measurements based on MPH use. In line with this aim ADHD treatment is based on psychostimulant medication, especially MPH. Children with ADHD that refer to this hospital are prescribed medication only but are not provided psychosocial interventions. Purposive sampling was used for gathering children with ADHD that had normal intelligence. Researcher did not intervene the decisions of the child psychiatrist and the hospital procedures except for assigning the referrals to study groups.

A group of children that were referred to the hospital for a possible ADHD examination were first administered Wechsler Intelligence Scale for Children on the referral day for a differential diagnosis of mental retardation as a requirement of hospital procedures. This screening for mental retardation took 60 to 90 minutes for each child. Nineteen children out of fifty-three referrals were found to be suffering from mental retardation. Remaining thirty-six children were examined for ADHD symptoms by the child psychiatrist according to DSM-IV criteria. Child psychiatrist read the items of the DSM-IV criteria of ADHD to the mother of the participants and recorded whether the symptoms stated on each item were present.

Following the diagnostic procedure families who brought their children to the local hospital were first informed about the research. After being told on the scales their child and their selves were going to be administered, they were informed about pre and posttests and the duration between these applications. Parents and children who agreed to participate in the study were appointed an available date and time for pretest applications before drug onset.

Children's pretest administrations were conducted in the psychiatrist's office at the Child Psychiatry Clinic while parents were filling out Hacettepe ADHD scale, and SCAS Parent Report Form outside the administration room on the seats by the corridor. Inside the administration room, the child and the researcher sat at a table squarely facing each other. First the child was informed on the reason of being in the research setting and the applications that were going to be carried out within the next 30 to 45 minutes. Child administration started after forming a relationship with the

child through daily conversations on likes and dislikes. All of the children were administered all the instruments prepared for the research in the very same order, one after the other without giving any breaks.

First, Bender Gestalt Visual and Motor Perception test was administered. For this test children were provided a plain sheet of paper, a pencil and an eraser and were asked to draw the shapes on each card they were shown onto their sheet of paper. Secondly, vigilance tasks were administered for measuring attention and duration of task completion on a cancellation task. Children were provided three different tasks with a different target stimulus in each task, a light bulb, an apple and a hexagon in order of increasing difficulty respectively. Child administration lasted from 30 minutes up to 45 minutes for each child.

After the completion of pretest child and parent administrations, children were prescribed MPH (trade name: Ritalin) by the child psychiatrist at appropriate dozes (from 0.25 mg to 5 mg) different for each child regarding their body weight. MPH was instructed to be used orally twice a day (in the morning and at noon) on school days. Parents were reminded for starting to give the drug according to the exact time and dose as prescribed by the child psychiatrist and use it continually within the next three months. Parents were also appointed for posttest applications that were to be conducted three months after the pretest applications at this point. Posttest appointments were set within three ours after drug administration.

Posttest administrations included the very same instruments in the very same order only with differences in the application of WISC-R. Only the performance

subscales and digit span subscale of WISC-R were administered during posttest. Administrations of Bender Gestalt Visual and Motor Test, vigilance task, Hacettepe ADHD Scale and SCAS were carried out in the exact same way they were carried out during pretest. Parents were debriefed about the research and were informed on the changes in their children's test results within two days following posttest.

2.5 Data Analysis

Data analysis and all related statistical procedures for this study were carried out by SPSS for Windows (Statistical Package for Social Sciences for Windows Release 9.0). Demographic information was analyzed through descriptive statistics. Factor analysis was performed by using Principle Component Analysis and Cronbach's Alpha coefficients were used for SCAS-P scale reliability analysis. 2 (Drug group vs. Comparison group) x 2 (Pretest vs. Posttest) mixed ANOVA with repeated measures on the last factor was conducted for each independent variable separately. Minimum significance level for ANOVA analysis was stated as .05 and reported in the Results section together with the ANOVA outcome.

CHAPTER 3

RESULTS

3.1 Study I: Factor Structure and Scale Validity of SCAS-P

3.1.1 Principle Component Analysis

Prior to Principle Component Analysis (PCA) for the factor structure of SCAS-P, in the first step, the Kaiser-Meyer-Olkin measure was calculated for factorability. Analysis revealed the KMO value as .84 indicating that sample was appropriate for factor analysis. In the second step an initial PCA analysis was conducted on the 38 items of the SCAS-P. Analysis revealed 10 factors accounting for 56.92% of the total variance. Eigenvalues revealed for the 10 factors were 7.38, 2.94, 1.96, 1,76, 1.57, 1.36, 1.29, 1.20, 1.41, and 1.03 respectively. The scree plot was tested for the number of factors. Scree plot test revealed a five-factor solution this sample. Finally parallel analysis was conducted to extract the correct number of factors. As a requirement of parallel analysis, a random data matrix was generated from the real raw data. Eigenvalues of the factors that were extracted from the random data were compared to the eigenvalues of the factors that were extracted from the real raw data. Accordingly, a factor was kept if its eigenvalue on the real raw data matrix was greater that its eigenvalue on the random data matrix. Parallel analysis revealed a five-factor solution as well as scree plot test. In line with the results of the factorability tests, PCA was performed by using varimax rotation and forcing for five factors.

According to the PCA analysis, the first factor explained 19.41% of the total variance (41.08%). First factor consisted of eight items that were related to separation anxiety and physical injury fears. The second factor explained 7.72% of the total variance. Nine items that were related to panic attack and agoraphobia symptoms made up the second factor. Third factor that consisted of nine items of social phobia was found to explain the 5.16% of the total variance. Fourth and fifth factors explained 4.65% and 4.12% of the total variance respectively. Factor I (items 2, 14, 05, 08, 04, 16, 23, 29) was named after separation anxiety and physical injury fears; Factor II (items 32, 18, 12, 30, 33, 28, 03, 36, 17) was named after panic attack; Factor III (items 10, 26, 09, 01, 06, 22, 11, 31, 07) was named as social phobia, Factor IV (items 37, 35, 13, 15, 20, 24) as obsessive compulsive; and Factor V (items 27, 25, 34, 19, 38, 21) was named as agoraphobia. Eigenvalues and explained variance for each factor, item loadings and communalities for each item are presented in Table 3.1.

Table 3.1 Item loadings, eigenvalues, explained variance, and communalities (h^2)

	FI	FII	FIII	FIV	FV	h^2
Item 02	**.713**	.166	.009	.000	-.009	.554
Item 14	**.705**	.132	.007	-.006	.006	.529
Item 05	**.664**	.005	.220	-.007	.005	.499
Item 08	**.646**	-.002	.260	.113	.000	.498
Item 04	**.582**	.270	.177	-.145	.002	.464
Item 16	**.483**	-.002	.002	.161	-.006	.260
Item 23	**.462**	.007	.007	.221	.228	.323
Item 29	**.459**	-.006	.008	.000	.008	.228
Item 32	.002	**.712**	.001	.188	.209	.587
Item 18	.007	**.671**	.009	.259	.003	.530
Item 12	.138	**.630**	.009	.007	-.002	.430

(Table 3.1 continued)

Item 30	-.008	**.590**	.136	.122	.008	.394
Item 33	.178	**.481**	.225	.150	.223	.385
Item 28	.008	**.463**	.198	.000	.447	.459
Item 03	-.005	**.441**	.299	-.180	.000	.319
Item 36	.005	**.440**	.276	.407	.009	.445
Item 17	.199	**.412**	.363	.010	.207	.394
Item 10	.206	.007	**.595**	.106	.000	.412
Item 26	.006	.004	**.580**	.246	.187	.437
Item 09	.258	.177	**.575**	.004	-.009	.438
Item 01	.006	.291	**.564**	.000	-.001	.406
Item 06	.170	.178	**.532**	-.151	.235	.422
Item 22	-.158	.140	**.531**	.197	.305	.458
Item 11	.289	.003	**.521**	.299	-.004	.447
Item 31	.003	.106	**.377**	-.157	.314	.277
Item 07	.246	.148	**.314**	.003	-.005	.185
Item 37	.000	.254	.005	**.697**	.007	.557
Item 35	-.002	.240	.002	**.683**	-.005	.527
Item 13	.150	.010	.132	**.544**	.006	.430
Item 15	.245	.392	.009	**.432**	.145	.430
Item 20	.285	-.001	.315	**.409**	.154	.372
Item 24	.185	.257	.284	**.300**	.190	.307
Item 27	.009	.008	.007	-.003	**.649**	.441
Item 25	-.008	.008	.000	.000	**.582**	.351
Item 34	.428	.140	-.003	.009	**.507**	.469
Item 19	-.004	.134	.171	.008	**.490**	.295
Item 38	.465	-.005	.009	.136	**.472**	.468
Item 21	.348	-.004	-.008	.006	**363**	.263
Eigen values	7.37	2.93	1.96	1.76	1.56	-
% Of variance	19.41	7.72	5.16	4.65	4.12	-

Note: FI- Separation Anxiety and Physical Injury Fears, FII- Panic Attack, FIII- Social Phobia, FIV- Obsessive Compulsive, FV- Agoraphobia.

3.1.1.2 Criterion and Convergent Validity of SCAS-P

Total SCAS scores of top 27th and bottom 27th percentiles of 280 participants were compared through t-test for scale criterion validity. Analysis showed that SCAS total score significantly differentiated the top 27th percentile of the sample from the bottom 27th percentile (t (74)=9.63, p<. 01). Following that, five subscales were controlled for criterion validity. Subscales of separation anxiety and physical injury fears (t (74)=11.08, p<. 01), panic attack (t (74)=8.08, p<. 01), social phobia (t (74)=9.35, p<. 01), obsessive compulsive (t (74)=8.79, p<. 01), and agoraphobia (t (74)=10.29, p<. 01) all differentiated the top 27th percentile of the sample from the bottom 27th percentile significantly. Mean, median, standard deviation, minimum, and maximum values for each subscale and the total score are presented in Table 3.2.

Table 3.2 Descriptive statistics of SCAS-P

	Mean	Median	SD	Min	Max
Separation anxiety and physical injury fears	8.84	8	5.47	0	24
Panic attack	3.69	3	3.60	0	17
Social phobia	8.14	8	4.65	0	24
Obsessive-compulsive	3.81	3	3.02	0	14
Agoraphobia	2.71	2	2.61	0	11
Total	27.20	25	14.02	1	72

Inter-correlations among the subscales of the Turkish version of SCAS-P were moderate. As reported in Table 3.1.5, the third factor was shown to have the highest correlation with the scale total score. Second and the third factors were found to have the highest correlation among the subscales of the Turkish version of the SCAS-P.

Table 3.3 Inter-correlations between the subscales of the Turkish version of SCAS

	FI	FII	FIII	FIV	FV	Total
FI	1.00					
FII	.28*	1.00				
FIII	.43*	.53*	1.00			
FIV	.30*	.51*	.43*	1.00		
FV	.45*	.32*	.32*	.30*	1.00	
Total	.76*	.71*	.79*	.67*	.62*	1.00

*** Correlation is significant at the 0.01 level**

3.1.2 Scale Reliability

Scale reliability was measured through several reliability analyses. First Cronbach Alpha Coefficient was computed for internal consistency. Analysis revealed an alpha value of .88 for the scale total score. Item total correlations are listed in Table 3.4. Items that had item total correlations above .20 were kept within the scale. Item 25 had an item total correlation below .20 however, squared multiple correlation for that item was found to be reasonable and item was kept. Secondly, analysis of split half reliability was conducted. Results revealed a split half coefficient of .79 indicating satisfactory internal consistency.

Table 3.4 Item total correlations for SCAS

Item Number	Item Total Correlation	Squared Multiple Correlation	Alfa if item deleted
01	.41	.34	.87
02	.46	.48	.87
03	.23	.29	.87
04	.46	.38	.87
05	.47	.48	.87

06	.44	.38	.87
07	.33	.23	.87
08	.48	.46	.87
09	.45	.42	.87
10	.44	.36	.87
11	.46	.36	.87
12	.39	.35	.87
13	.33	.32	.87
14	.46	.47	.87
15	.25	.30	.87
16	.29	.35	.87
17	.52	.39	.87
18	.41	.42	.87
19	.25	.22	.87
20	.43	.34	.87
21	.24	.22	.87
22	.34	.40	.87
23	.43	.33	.87
24	.46	.39	.87
25	.15	.28	.87
26	.42	.40	.87
27	.28	.34	.87
28	.43	.46	.87
29	.29	.31	.87
30	.29	.35	.87
31	.28	.23	.87
32	.40	.49	.87
33	.48	.39	.87
34	.43	.36	.87
35	.24	.44	.87
36	.44	.42	.87
37	.31	.46	.87
38	.43	.42	.87

Reliability analyses were also performed for each factor. As can be seen in Table 3.5 reliability of obsessive compulsive and agoraphobia factors seem to be lower. However, other factors have acceptable alpha coefficients.

Table 3.5 Cronbach's alpha values for SCAS-P subscales

	Cronbach's Alpha
Separation anxiety and physical injury fears	.78
Panic attack	.76
Social phobia	.73
Obsessive-compulsive	.58
Agoraphobia	.56
Total	.88

3.2 Study II: Effects of MPH Treatment on Cognitive Abilities, Hyperactivity Level, and Anxiety

This study aims to test the effects of MPH usage on visual motor perception, attention, memory, hyperactivity, and anxiety over time. A series of ANOVA analysis were conducted in order to compare drug group with the comparison group over a three-month period on visual motor perception, hyperactivity level, anxiety level, vigilance task performance, and WISC-R subscale measures of children. Possible main effect of drug use on visual motor perception, hyperactivity, anxiety, vigilance task performance, and WISC-R subscale measures was examined. The interaction between drug use and pre-post tests was analyzed.

Prior to ANOVA analysis, data were controlled for incorrect data entry, missing variables, and fit between their distributions. In order to see the differences between drug group and comparison group before and after drug treatment 2 (Drug group vs. Comparison group) x 2 (Pretest vs. Posttest) mixed ANOVA with repeated measures on the last factor was conducted for each independent variable separately.

3.2.1. Visual Motor Perception

BGVMPT was used to assess visual motor performance. According to the results of the ANOVA, the group main effect on BGVMP test performance (F (1,34)=26.55, p<. 05) was significant as indicated in Table 3.6. It was shown that drug group (M=1.61, SD=0. 65) showed larger deviations form the norms on BGVMPT measures than did comparison group (M=0.57, SD=0. 55). There was also a significant main effect of pre-post test on BGVMP Test Scores (F (1.34)=91.99, p<. 05). Group means for pretest and posttest measures were summarized in Table 3.7. Descriptive values for the posttest measures (M=. 36, SD=. 59) indicate that all children scored lower on BGVMPT than they did on pretest (M=1.83, SD=1.37), which indicated a smaller deviation from age norms for all children after three-months of drug treatment.

A significant interaction effect of group and pre-post test was found on BGVMP Test (F (1.34)=46.97, p<. 05). Tukey-Kramer test was performed for the interaction effect. The difference between pretest measures of the drug group and the comparison group was shown to be significant (q=15, p<. 05). Drug group's deviation from the age norms was significantly higher (M=2.88, SD=1.05), than the comparison group (M=0.78, SD=0.71) on the pretest. The difference between pretest and posttest measures of the drug group was also shown to be significant (q=16.86, p<. 05). Drug group's deviation from the age norms was significantly smaller on the

posttest (M=0.35, SD=0.60), than it was on the pretest (M=2.88, SD=1.05). There were no other significant group differences found.

Table 3.6. Summary of ANOVA results for BGVMPT

SOURCE	SS	Df	MS	F	?²
GROUP	19.36	1	19.36	26.55*	.43
ERROR	24.79	34	0.72		
PRE-POST TEST	39.53	1	39.53	91.99*	.73
GROUP x PRE-POST TEST	19.94	1	19.94	46.97*	.58
ERROR	14.43	34	0.42		

*p<0.05

Table 3.7. Group means and standard deviations for BGVMP Test

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	2.88	0.35	1.61
	SD	1.05	0.60	0.65
	n	17	17	17
COMPARISON GROUP	M	0.78	0.36	0.57
	SD	0.71	0.59	0.55
	n	19	19	19
TOTAL	M	1.83	0.36	1.06
	SD	1.37	0.59	0.79
	n	36	36	36

ANOVA analysis was conducted for the errors of distortion, integration, rotation, and perseveration. Analysis revealed significant results on distortion and integration errors. Analysis of variance conducted for group differences on distortion errors were summarized in Table 3.8. The main effect of pre-post test number of distortion errors was shown to be significant (F (1.34)=12.36, p<. 05). All children made higher number of distortion errors on pretest (M=1.61, SD=0.19) than they did

on posttest (M=0.88, SD=0.15). The group main effect on the number of distortion errors (F (1.34)=1.40, p>. 05) was not found to be significant.

There was a significant interaction effect on the number of distortion errors (F (1.34)=7.57, p<. 05). Tukey-Kramer test was performed in order to see the group differences. The difference between pretest and posttest measures of the drug group was shown to be significant (q=6.14, p<. 05). There was a significant decrease in the distortion errors made by the drug group between pretest (M=2.05, SD=1.34) and posttest (M=0.76, SD=1.09) measures as demonstrated in Table 3.9. The difference between the drug group and the comparison group on pretest measures of the number of distortion errors was shown to be significant as well (q=4.68, p<. 05). On pretest, BGVMPT revealed higher number of distortion errors for the drug group (M=2.05, SD=1.34) than comparison group (M=1.16, SD=. 95). Other group differences were not found to be significant according to Tukey-Kramer comparisons.

Table 3.8. Summary of ANOVA results for BGVMPT distortion errors

SOURCE	SS	Df	MS	F	?²
GROUP	1.99	1	1.99	1.40	.04
ERROR	48.50	34	1.43		
PRE-POST TEST	9.46	1	9.46	12.36*	.27
GROUP x PRE-POST TEST	5.80	1	5.80	7.57*	.18
ERROR	26.03	34	0.77		

*p<0.05

Table 3.9. Group means and standard deviations for BGVMPT distortion errors

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	2.05	0.76	1.41
	SD	1.34	1.09	0.21
	n	17	17	17
COMPARISON GROUP	M	1.16	1.00	1.08
	SD	0.95	0.74	0.19
	n	19	19	19
TOTAL	M	1.61	0.88	1.25
	SD	0.19	0.15	0.14
	n	36	36	36

Analysis of variance conducted for group differences on integration errors were summarized in Table 3.10. The main effect of pre-post test number of integration errors was shown to be significant (F (1.34)=29.86, p<. 05). All children made higher number of integration errors on pretest (M=1.72, SD=0.18) than they did on posttest (M=0.20, SD=0.09). The group main effect on the number of integration errors (F (1.34)=8.74, p<. 05) was also found to be significant. Drug group (M=1.41, SD=. 21) recorded higher number of integration errors than did comparison group (M=1.08, SD=. 19).

There was a significant interaction effect on the number of integration errors (F (1.34)=9.64, p<. 05). Tukey-Kramer test was performed in order to see the group differences. The difference between pretest and posttest measures of the drug group was shown to be significant (q=8.50, p<. 05). There was a significant decrease in the integration errors made by the drug group between pretest (M=1.76, SD=1.34) and posttest (M=0.23, SD=. 56) measures as demonstrated in Table 3.11. The difference

between the drug group and the comparison group on pretest measures of the number of integration errors was shown to be significant as well (q=7.37, p<. 05). On pretest, BGVMPT revealed higher number of integration errors for the drug group (M=1.76, SD=1.34) than comparison group (M=. 58, SD=. 69). Other group differences were not found to be significant according to Tukey-Kramer comparisons.

Table 3.10. Summary of ANOVA results for BGVMPT integration errors

SOURCE	SS	Df	MS	F	?²
GROUP	7.16	1	7.16	8.74*	.21
ERROR	27.84	34	27.84		
PRE-POST TEST	17.07	1	17.07	29.86*	.47
GROUP x PRE-POST TEST	5.57	1	5.57	9.64*	.22
ERROR	19.43	34	0.57		

*p<0.05

Table 3.11. Group means and standard deviations for BGVMT integration errors

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	1.76	0.23	1.00
	SD	1.34	0.56	0.16
	n	17	17	17
COMPARISON GROUP	M	0.58	0.15	0.36
	SD	0.69	0.50	0.15
	n	19	19	19
TOTAL	M	1.72	0.20	0.68
	SD	0.18	0.09	0.11
	n	36	36	36

3.2.2 Hyperactivity Level

Hyperactivity level of participants was measured by using Hacettepe ADHD Scale. Results of the 2x2 mixed ANOVA yielded a significant group main effect on ADHD measurement scale scores (F (1,34)=10.07, p<. 05) as documented in Table 3.12. Drug group (M=28.38, SD=7.71) recorded higher scores of hyperactivity than did comparison group (M=20.44, SD=7.28). There was also a significant main effect of pre-post test on ADHD scale scores (F (1.34)=28.38, p<. 05). As demonstrated in Table 3.13, descriptive values indicate that all children scored lower on Hacettepe ADHD scale on posttest (M=21.31, SD=7.91) than they did on pretest (M=21.51, SD=10.84).

A significant interaction effect of group and pre-post test was found on ADHD Scale scores (F (1.34)=22.46, p<. 05). Tukey-Kramer Test was performed for the interaction effect. The difference between pretest and posttest measures of the drug group was shown to be significant (q=9.84, p<. 05). Drug group demonstrated less symptoms of ADHD on the posttest (M=22.52, SD=8.32), than they did on the pretest (M=34.23, SD=9.35). The difference between pretest measures of the drug group and the comparison group was shown to be significant (q=11.59, p<. 05). Drug group (M=34.23, SD=9.35) had more symptoms of ADHD than comparison group (M=20.78, SD=7.80) on pretest. Other group differences were not significant according to Tukey-Kramer comparisons.

Table 3.12. Summary of ANOVA results for ADHD measurement scale

SOURCE	SS	Df	MS	F	?²
GROUP	1129.85	1	1129.85	10.74*	.22
ERROR	3813.42	34	112.16		
PRE-POST TEST	688.68	1	688.68	28.38*	.45
GROUP x PRE-POST TEST	544.96	1	544.96	22.46*	.39
ERROR	824.817	34	24.25		

*p<0.05

Table 3.13. Group means and standard deviations for Hacettepe ADHD Scale

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	34.23	22.52	28.38
	SD	9.35	8.32	7.71
	N	17	17	17
COMPARISON GROUP	M	20.78	20.10	20.44
	SD	7.80	7.57	7.28
	N	19	19	19
TOTAL	M	27.51	21.31	24.19
	SD	10.84	7.91	8.40
	N	36	36	36

3.2.3 Anxiety Level

Anxiety level of children was measured by the Turkish version of SCAS-P. Analysis of variance was conducted for group differences on child anxiety. Results of the ANOVA were summarized in Table 3.14. The main effect of pre-post test on child anxiety scores was shown to be significant (F (1.34)=30.59, p<. 05). All children scored higher on child anxiety on pretest (M=30.55, SD=12.76) than they did on posttest (M=24.18, SD=14.68). The group main effect on SCAS-P scores (F

(1.34)=1.16, p>. 05) was not found to be significant. There were no differences found between groups on subscale scores of SCAS-P, unlike total score.

There was a significant interaction effect on SCAS-P scores (F (1.34)=23.47, p<. 05). Tukey-Kramer test was performed in order to see the group differences. The difference between pretest and posttest measures of the drug group was shown to be significant (q=10.12, p<. 05). There was a significant decrease in child anxiety scores of the drug group between pretest (M=31.00, SD=12.11) and posttest (M=19.05, SD=1.92) measures as demonstrated in Table 3.15. The difference between the drug group and the comparison group on posttest measures of child anxiety was shown to be significant as well (q=8.92, p<. 05). On the posttest, SCAS scores revealed lower anxiety for the drug group (M=19.05, SD=1.92) than comparison group (M=29.31, SD=14.78). Other group differences were not found to be significant according to Tukey-Kramer comparisons.

Table 3.14. Summary of ANOVA results for SCAS-P

SOURCE	SS	Df	MS	F	?²
GROUP	393.21	1	393.21	1.16	.03
ERROR	11490.78	34	337.96		
PRE-POST TEST	727.06	1	727.06	30.59*	.47
GROUP x PRE-POST TEST	557.89	1	557.89	23.47*	.41
ERROR	808.05	34	23.76		

*p<0.01

Table 3.15. Group means and standard deviations for SCAS-P

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	31.00	19.05	25.02
	SD	12.11	1.92	11.94
	n	17	17	17
COMPARISON GROUP	M	30.15	29.31	29.71
	SD	13.63	14.78	13.86
	n	19	19	19
TOTAL	M	30.55	24.18	27.50
	SD	12.76	14.68	13.02
	n	36	36	36

Analyses were performed for each subscales of SCAS-P separately however, results did not reveal any significance.

3.2.4 Vigilance Task Performance

Vigilance task developed by the researcher was administered to participants in order to measure task completion time and percentage of correct responses given.

3.2.4.1 Vigilance A

Analysis of variance conducted for group differences on vigilance tasks revealed a significant main effect of pre-post test on task completion time (seconds) for light bulb task (F (1.34)=23.47, $p<.05$). ANOVA results are summarized on Table 3.16. As shown in Table 3.17 it took fewer seconds for all participants to complete the task on posttest (M= 33.05, SD=0.59), than it did on pretest (M= 39.88, SD= 14.24). Group main effect and interaction effect on the duration of task completion were not shown to be significant.

Table 3.16. Summary of ANOVA results for Vigilance A task completion time

SOURCE	SS	Df	MS	F	?²
GROUP	202.29	1	202.29	0.67	.02
ERROR	11168.08	34	299.06		
PRE-POST TEST	838.91	1	838.91	19.19*	.36
GROUP x PRE-POST TEST	3.25	1	3.25	0.074	.00
ERROR	1485.90	34	43.703		

*p<0.05

Table 3.17. Group means and standard deviations for Vigilance A task completion time

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	41.35	34.94	38.14
	SD	16.71	14.60	15.09
	n	17	17	17
COMPARISON GROUP	M	38.42	31.15	34.78
	SD	11.91	8.21	8.94
	n	19	19	19
TOTAL	M	39.88	33.05	36.37
	SD	14.24	0.59	12.17
	n	36	36	36

ANOVA results for the percentage of correct responses for vigilance task A are summarized on Table 3.18. Effects of pre-post test on the number of correctly marked targets were found to be significant (F (1.34)=10.32, p<. 05). As documented in Table 3.19, drug group and comparison group performance both improved between pretest (M= 94.88, SD= 9.37) and posttest (M= 99.79, SD= 1.28) measurements. Interaction effect and group main effect on correctly marked targets were not significant.

Table 3.18. Summary of ANOVA results for the percentage of correct responses for Vigilance A

SOURCE	SS	Df	MS	F	?²
GROUP	2.14	1	2.14	0.04	.00
ERROR	1703.15	34	50.09		
PRE-POST TEST	433.98	1	433.98	10.32*	.23
GROUP x PRE-POST TEST	0.006	1	0,006	0.002	.00
ERROR	1929.09	34	42.03		

*p<0.05

Table 3.19. Group means and standard deviations for percentage of correct responses for Vigilance A

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	95.02	100.00	97.51
	SD	9.78	0.00	4.89
	n	17	17	17
COMPARISON GROUP	M	94.73	99.59	97.16
	SD	9.26	1.76	5.10
	n	19	19	19
TOTAL	M	94.88	99.79	97.32
	SD	9.37	1.28	4.93
	n	36	36	36

3.2.4.2 Vigilance B

Results of the ANOVA performed for group differences on vigilance tasks revealed a significant main effect of pre-post test on task completion time (seconds) for apple task (F (1.34)=9.37, p<. 05). ANOVA results are summarized on Table 3.20. As shown in Table 3.21 both groups completed the apple task in less seconds on post-test (M= 44.61, SD= 7.86) than they did on pre-test (M= 50.03, SD= 16.44). Main effect of interaction and group main effect was not significant.

Table 3.20. Summary of ANOVA results for Vigilance B task completion time

SOURCE	SS	Df	MS	F	?²
GROUP	20.29	1	20.29	0.04	.00
ERROR	15850.08	34	466.17		
PRE-POST TEST	527.64	1	527.64	9.37*	.22
GROUP x PRE-POST TEST	21.98	1	21.98	0.39	.01
ERROR	1913.17	34	56.27		

*p<0.05

Table 3.21. Group means and standard deviations for Vigilance B completion time

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	51.11	44.58	47.85
	SD	18.82	15.35	16.85
	n	17	17	17
COMPARISON GROUP	M	48.94	44.63	46.78
	SD	14.44	15.92	13.70
	n	19	19	19
TOTAL	M	50.03	44.61	47.29
	SD	16.44	7.86	15.05
	n	36	36	36

ANOVA results of percentage of correct responses given for Vigilance B are summarized in Table 3.22. Effects of pre-post test on the number of targets correctly marked were found to be significant (F (1.34)=10.18, p<. 05). All participants showed better performance on posttest (M= 96.97, SD= 12.59) than pretest (M= 92.78, SD= 15.43). Both drug group and comparison group performance improved between pretest and posttest measurements as demonstrated in Table 3.23. However, the interaction effect and group main effect were not significant.

Table 3.22. Summary of ANOVA results for percentage of correct responses for Vigilance B

SOURCE	SS	Df	MS	F	?²
GROUP	1.46	1	1.46	0.008	.00
ERROR	6625.75	34	194.87		
PRE-POST TEST	315.25	1	315.25	10.18*	.23
GROUP x PRE-POST TEST	39.12	1	39.12	1.26	.04
ERROR	1025.26	34	30.94		

*p<0.05

Table 3.23. Group means and standard deviations for percentage of correct responses for Vigilance B

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	93.66	96.38	95.02
	SD	9.11	8.21	7.90
	N	17	17	17
COMPARISON GROUP	M	91.90	97.57	94.73
	SD	15.27	7.71	11.33
	N	19	19	19
TOTAL	M	92.78	96.97	94.87
	SD	15.43	12.59	9.73
	N	36	36	36

3.2.4.3 Vigilance C

ANOVA results of task completion time (seconds) for Vigilance C are summarized in Table 3.24. Main effect of pre-post test on the number of targets correctly marked was found to be significant (F (1.34)=39.83, p<. 05). Performance of all children improved between pretest and posttest measurements as demonstrated in Table 3.25 (Posttest: M= 61.30, SD= 18.90; pretest: M= 72.90, SD= 20.01). The interaction effect and group main effect were not shown to be significant.

Table 3.24. Summary of ANOVA results for Vigilance C task completion time

SOURCE	SS	Df	MS	F	?²
GROUP	496.78	1	496.78	0.705	.02
ERROR	23966.59	34	704.90		
PRE-POST TEST	2412.92	1	2412.92	39.83*	.54
GROUP x PRE-POST TEST	0.92	1	0.92	0.15	.00
ERROR	2059.44	34	60.57		

*p<0.05

Table 3.25. Group means and standard deviations for Vigilance C task completion time

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	75.64	63.82	69.73
	SD	21.88	19.65	20.41
	N	17	17	17
COMPARISON GROUP	M	70.15	58.78	64.47
	SD	18.39	18.40	17.18
	N	19	19	19
TOTAL	M	72.90	61.30	66.95
	SD	20.01	18.90	18.69
	N	36	36	36

ANOVA results of percentage of correct responses for Vigilance C are summarized in Table 3.26. Effects of pre-post test on the number of targets correctly marked were found to be significant (F (1.34)=12.62, p<. 05). All children's task performance improved between pretest (M= 88.54, SD= 17.29) and posttest (M= 96.77, SD= 7.21) measurements. Descriptive values for Vigilance Task C correct responses are documented in Table 3.27. The interaction effect and group main effect were not significant.

Table 3.26. Summary of ANOVA results for percentage of correct responses for Vigilance C

SOURCE	SS	Df	MS	F	?²
GROUP	22.00	1	22.00	0.08	.00
ERROR	8935.09	34	262.79		
PRE-POST TEST	1214.88	1	1214.88	12.62*	.27
GROUP x PRE-POST TEST	64.32	1	64.32	0.66	.02
ERROR	8935.09	34	262.79		

*p<0.05

Table 3.27. Group means and standard deviations for percentage of correct responses for Vigilance C

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	90.04	96.38	93.21
	SD	13.53	7.25	9.27
	n	17	17	17
COMPARISON GROUP	M	87.04	97.16	92.10
	SD	20.36	7.34	13.10
	n	19	19	19
TOTAL	M	88.54	96.77	92.62
	SD	17.29	7.21	11.31
	n	36	36	36

3.2.5 WISC-R Subtest Scores

3.2.5.1 Digit Span

Results of the ANOVA for digit span subtest were documented in Table 3.28. The main effect of pre-post test on digit span performance (F (1.34)=19.12, p<. 05) was shown to be significant. Descriptive analysis revealed higher scores of WISC-R digit span subtest after a three-month period than baseline as shown in Table 3.29. All children scored higher on posttest measures (M=9.29, SD=2.39) than they did on pretest (M=8.53, SD=2.50). Group main effect was not shown to be significant,

however, there was a significant interaction effect on digit span test scores (F (1.34)=11.96, p<. 05).

Tukey-Kramer test was performed for interaction effect. The difference between drug group and comparison group performances was shown to be significant on pretest measures (q=4.17, p<. 05). Drug group (M=8.17, SD=2.45) scored lower than comparison group (M=8.89, SD=2.55) on pretest measures of WISC-R Digit Span subtest. The difference between pretest and posttest performance of drug group was significant (q=7.94, p<. 05). Drug goup performance on digit span subtest was found to be improved on posttest (M=9.52, SD=2.21) compared to pretest measures (M=8.17, SD=2.45). Other group differences were not found to be significant.

Table 3.28. Summary of ANOVA results for WISC-R Digit Span

SOURCE	SS	Df	MS	F	?²
GROUP	0.26	1	0.26	0.02	.00
ERROR	395.23	34	11.62		
PRE-POST TEST	10.24	1	10.24	19.12*	.36
GROUP x PRE-POST TEST	6.40	1	6.40	11.96*	.26
ERROR	18.20	34	0.53		

*p<0.05

Table 3.29. Group means and standard deviations for Digit Span

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	8.17	9.52	8.85
	SD	2.45	2.21	2.24
	N	17	17	17
COMPARISON GROUP	M	8.89	9.05	8.97
	SD	2.55	2.59	2.55
	N	19	19	19
TOTAL	M	8.53	9.29	8.91
	SD	2.50	2.39	2.37
	N	36	36	36

3.2.5.2 Digital Symbol

ANOVA results for digital symbol subtest are summarized in Table 3.30. A significant main effect of pre-post test on digital symbol subtest scores was shown (F (1.34)=13.31, p<. 05). As documented in Table 3.31, posttest performance (M=10.87, SD=1.93) was higher than pretest (M=9.79, SD=2.71) for all children. Group main effect was not significant.

The interaction effect on digital symbol subtest scores was significant (F (1.34)=8.61, p<. 05). Tukey-Kramer test was conducted for group differences. The difference between pretest and posttest scores of the drug group was shown to be significant (q=6.46, p<. 05). Drug group performed significantly higher on posttest (M=11.52, SD=1.77) compared to pretest (M=9.58, SD=3.06). The difference between drug group and comparison group posttest scores was significant (q=6.46, p<. 05). Drug group (M=11.52, SD=1.77) performed better than comparison group (M=10.21, SD=1.90) on posttest following a three-month interval. Tukey-Kramer test did not reveal significant differences among other groups.

Table 3.30. Summary of ANOVA results for WISC-R Digital Symbol

SOURCE	SS	Df	MS	F	?²
GROUP	3.69	1	3.69	0.39	.01
ERROR	318.46	34	9.36		
PRE-POST TEST	20.77	1	20.77	13.31*	.28
GROUP x PRE-POST TEST	13.43	1	13.43	8.61*	.20
ERROR	53.05	34	1.56		

*p<0.05

Table 3.31. Group means and standard deviations for Digital Symbol

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	9.58	11.52	10.55
	SD	3.06	1.77	3.29
	N	17	17	17
COMPARISON GROUP	M	10.00	10.21	10.10
	SD	2.42	1.90	2.04
	N	19	19	19
TOTAL	M	9.79	10.87	10.31
	SD	2.71	1.93	2.14
	N	36	36	36

3.2.5.3 Picture Completion

ANOVA results for picture completion subtest are summarized in Table 3.32. The group main effect on picture completion subtest performance was shown to be significant (F (1,34)=4.67, p<. 05). Comparison group performance (M=11.52, SD=2.07) was better than the drug group performance (M=10.85, SD=2.56). Main effect of pre-post test on picture completion subtest performance was found to be significant (F (1.34)=22.34, p<. 05). All children scored higher on posttest (M= 11.29, SD= 2.31) measures than they did on pretest (M= 10.08, SD=2.77) as demonstrated in Table 3.33. The interaction effect was not found to be significant.

Table 3.32. Summary of ANOVA results for WISC-R Picture Completion

SOURCE	SS	Df	MS	F	?²
GROUP	50.24	1	50.24	4.67*	.12
ERROR	365.23	34	10.74		
PRE-POST TEST	26.49	1	26.49	22.34*	.39
GROUP x PRE-POST TEST	2.49	1	2.49	2.10	.06
ERROR	40.32	34	1.18		

*p<0.05

Table 3.33. Group means and standard deviations for Picture Completion

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	9.05	10.64	10.85
	SD	3.07	2.43	2.56
	N	17	17	17
COMPARISON GROUP	M	11.10	11.94	11.52
	SD	2.13	2.17	2.07
	N	19	19	19
TOTAL	M	10.08	11.29	10.73
	SD	2.77	2.31	2.43
	N	36	36	36

3.2.5.4 Picture Arrangement

Results of the ANOVA for picture arrangement subtest were documented in Table 3.34. Group main effect was not found to be significant (F (1.34)=0.26, p>. 05). Similarly, the main effect of pre-post test on picture arrangement subtest performance was not shown to be significant (F (1.34)=2.02, p>. 05). However, descriptive analysis revealed higher scores of WISC-R picture arrangement subtest after the three-month period (M=9.21, SD=2.45) compared to pretest measures (M=8.95, SD=2.58) as documented in Table 3.35. There was no significant interaction effect on WISC-R picture arrangement subtest scores.

Table 3.34. Summary of ANOVA results for WISC-R Picture Arrangement

SOURCE	SS	Df	MS	F	?²
GROUP	3.25	1	3.25	0.26	.00
ERROR	420.90	34	12.37		
PRE-POST TEST	1.28	1	1.28	2.02	.06
GROUP x PRE-POST TEST	0.78	1	0.78	1.29	.04
ERROR	20.59	34	0.60		

Table 3.35. Group means and standard deviations for Picture Arrangement

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	9.05	9.52	9.29
	SD	2.81	2.71	2.67
	N	17	17	17
COMPARISON GROUP	M	8.84	8.89	8.86
	SD	2.43	2.23	2.30
	N	19	19	19
TOTAL	M	8.95	9.21	9.06
	SD	2.58	2.45	2.46
	N	36	36	36

3.2.5.5 Block Design

Results of the ANOVA for block design subtest were documented in Table 3.36. The main effect of pre-post test on block design performance (F (1.34)=3.65, p>. 05) was not significant, but difference between pretest and posttest measures were shown to be marginally significant. (p<0.06) As documented in Table 3.37 drug group (M=9.82, SD=2.61) performed better than comparison group (M=9.23, SD=2.38) on WISC-R block design subtest. Group main effect was not significant (F (1.34)=0.49, p>. 05). The interaction effect of group and pre-post tests was not significant as well (F (1.34)=0.11, p>. 05).

Table 3.36. Summary of ANOVA results for WISC-R Block Design

SOURCE	SS	Df	MS	F	?²
GROUP	6.17	1	6.17	0.49	.01
ERROR	424.31	34	12.48		
PRE-POST TEST	1.11	1	1.11	3.65	.01
GROUP x PRE-POST TEST	0,003	1	0,003	0.11	.00
ERROR	10.37	34	0.30		

Table 3.37. Group Means and standard deviations for WISC-R Block Design

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	9.70	9.94	9.82
	SD	2.68	2.63	2.61
	N	17	17	17
COMPARISON GROUP	M	9.10	9.36	9.23
	SD	2.44	2.36	2.38
	N	19	19	19
TOTAL	M	9.40	9.65	9.51
	SD	2.54	2.47	2.47
	N	36	36	36

3.2.5.6 Object Assembly

ANOVA results for object assembly subtest are summarized in Table 3.38. Group main effect (F (1,34)=1.42, $p>.05$) and pre-post test main effect (F (1,34)=0.95, $p>.05$) on picture completion subtest performance were not shown to be significant.

The interaction effect of drug use and pre-post test was found to be significant (F (1.34)=4.79, $p>.05$). Tukey Kramer test was performed in order to see the group differences. The mean difference between the drug and comparison groups' posttest performances was shown to be significant (q=6.68, $p<.05$). Drug group (M= 10.88, SD=2.49) scored significantly higher than comparison group (M= 9.21, SD=2.69) on the posttest measures of WISC-R Object Assembly subtest as documented in Table 3.39. There was no significant difference found among other groups.

Table 3.38. Summary of ANOVA results for WISC-R Object Assembly

SOURCE	SS	Df	MS	F	?²
GROUP	21.79	1	21.79	1.42	.04
ERROR	521.31	34	15.33		
PRE-POST TEST	1.16	1	1.16	0.95	.03
GROUP x PRE-POST TEST	5.82	1	5.82	4.79*	.12
ERROR	41.29	34	1.21		

*p<0.05

Table 3.39. Group Means and standard deviations for WISC-R Object Assembly

		Pre-Test	Post-Test	TOTAL
DRUG GROUP	M	10.05	10.88	10.47
	SD	2.68	2.49	2.46
	N	17	17	17
COMPARISON GROUP	M	9.52	9.21	9.36
	SD	3.47	2.69	3.01
	N	19	19	19
TOTAL	M	9.79	10.04	9.88
	SD	3.09	2.70	2.78
	N	36	36	36

3.2.6 Result Summary

Results of this present study revealed that drug group participants recorded major changes between pretest and posttest measures of BGVMPT, Hacettepe ADHD Scale, and SCAS-P rather than they recorded on measures of WISC-R subscales and vigilance task as summarized in Table 3.40. The effect of MPH on activity level, visual perception, motor coordination, anxiety level, and WISC-R digit span subscale were found to be significant on drug group performance. A significant difference between the drug group and the comparison group on posttest measures of activity level, visual motor performance and anxiety was reported.

There was no main effect of drug reported on vigilance task and WISC-R subtest performances. Pre-posttest and interaction effects were found to be statistically significant on digit span, digital symbol, and object assembly subtests even though the mean vise changes in these subtest scores seem little on Table 3.40. Posttest differences between the drug group and the comparison group on digital symbol and object assembly subtest were shown to be significant.

Table 3.40. Overall mean values

		BGVMPT*	BG-dist.*	BG-int.*	ADHD*	SCAS-P*	Dspan*	Dsymb*	PC	PA	BD	OA*
DG	Pretest	2.88	2.05	1.76	34.23	31.00	8.17	9.58	9.05	9.05	9.70	10.05
	Posttest	0.35	0.76	0.23	22.52	19.05	9.52	11.52	10.64	9.52	9.94	10.88
	Total	1.61**	1.41**	1.00**	28.38**	25.02**	8.85**	10.55**	10.85	9.29	9.82	10.47
CG	Pretest	0.78	1.16	0.58	20.78	30.15	8.89	10.00	11.10	8.84	9.10	9.52
	Posttest	0.36	1.00	0.15	20.10	29.31	9.05	10.21	11.94	8.89	9.36	9.21
	Total	0.57	1.08	0.36	20.44	29.27	8.97	10.10	11.52	8.86	9.23	9.36
Pretest Total		1.83	1.61	1.72	27.51	30.55	8.53	9.79	10.08	8.95	9.40	9.79
Posttest Total		0.36	0.88	0.20	21.31	24.18	9.29	10.87	11.29	9.21	9.65	10.04

*Significant main effect of interaction

**Significant group main effect

DG-Drug group CG-Comparison Group BG-dist-distortion errors BG-int-integration errors
Dspan-Digit Span Dsymb-Digital Symbol PC-Picture completion PA-Picture arrangement
BD-Block Design OA-Object Assembly

CHAPTER 4

DISCUSSION

4.1 Study I: Factor Structure, Validity and Reliability of SCAS-P

The first purpose of this study was to examine the factor structure, validity and reliability of SCAS-P among Turkish Children. Factor structure of SCAS-P was first examined by Spence (2003) on Australian children. A six factor solution was revealed, including panic attack and agoraphobia, separation anxiety, physical injury fears, social phobia, obsessive-compulsive and general anxiety/overanxious disorder factors. Factor structure, reliability and validity studies were conducted in Germany and Japan as well. Results of these studies revealed that, in both countries, generalized anxiety and obsessive-compulsive disorder could not be extracted as a single factor (Essau, Sakano, Ishikawa & Sasagawa, 2002). In Germany, obsessive-compulsive disorder, generalized anxiety, and social phobia all loaded onto a single factor. In Japan, panic disorder was divided into two factors, and loaded on generalized anxiety and obsessive-compulsive disorder. According to the results of the factor analysis it was shown that the factors of the Turkish SCAS-P did not correspond to the original SCAS-P factors as well.

In the Turkish SCAS-P, items of social phobia separation anxiety and physical injury fears seemed to be well understood by the participant mothers even though separation anxiety and physical injury fears loaded onto the same factor. Item 38 and item 21 that appeared on the fifth factor on the Turkish version had cross-loaded on the

first factor as well. Only the items of social phobia loaded onto a single factor. Panic attack and agoraphobia loaded on two different factors as well as obsessive compulsive. Finally items of generalized anxiety disorder / overanxious disorder loaded on four different factors on the Turkish SCAS. Items of obsessive compulsive, panic attack and agoraphobia, and general anxiety seemed not be clear for the mothers and spread onto more than one single factor. The difference in Australian, German, Japanese, and Turkish samples could be explained by cultural differences. Novelty of a situation could be another reason for the differences in factor structure. After filling out the forms majority of mothers who participated in this present study reported that the items of obsessive compulsive and agoraphobia did not make sense to them and that they did not hear about these kinds of problems before.

Following these results some limitations should be discussed related to the adaptation of SCAS-P to Turkish. SCAS-P was reported to have strong psychometric properties for adolescents as well (Spence, 1999). Only seven to eleven year olds were included in this present study, so it is not clear whether these findings can be generalized to other populations (e.g., adolescents). Second, the subjects were not recruited from a clinical sample and no diagnostic interview was used. Hence, the clinical and diagnostic utility of the Turkish version of the SCAS-P has not yet been established.

Third, only two aspects of scale validity were examined. Further studies need to examine other psychometric properties of the SCAS-P such as predictive and discriminant validity. It is reported that the best method of assessing psychopathology in children is via multiple informants (Essau & Barrett, 2001), studies have found parents

and teachers are less satisfactory as informants of internalizing problems compared to externalizing problems (Klein, 1991; Loeber, Green, & Lahey, 1990). Regarding the low agreement among informants, the use of child self-report should be considered together with SCAS-P for punctual and comparative purposes. These limitations should be taken into account when interpreting the findings of this present study.

As a conclusion, this study implicates that SCAS-P shows generally good psychometric properties and that it seems highly useful for both research and clinical purposes. More accurate results of assessment could be available especially when the use of parent report is combined with the child version.

4.2 Study II: Effects of MPH on Cognitive Abilities, Hyperactivity Level, and Anxiety

The second study investigated the effects of MPH treatment on visual motor perception, hyperactivity, anxiety, vigilance task performance, and WISC-R subscale measures of children with ADHD. When all the results of the analysis were evaluated together, it was seen that drug group participants recorded major changes between pretest and posttest measures of BGVMPT, Hacettepe ADHD Scale, and SCAS-P rather than they recorded on measures of vigilance tasks and WISC-R subscales. Results from each measurement scale will be discussed in this order.

BGVMPT was known to be a measure of visual motor perception, memory, and time and space perception and was reported for providing a measure for a vision of before and after treatment differences in ADHD symptomatology (Palmer, 1983).

Findings from this study indicated that the effect of MPH on BGVMPT was meaningful. Children with ADHD were shown to make less number of errors on the posttest, following 12-week drug treatment. Children with ADHD tend to make more errors on the BGVMPT at younger ages and the number of errors decreases as they grow older. Despite 12-week interval being an optimal duration for retest, for some children it might have contributed to the improvement on BGVMPT results on posttest.

The errors made by children on BGVMPT were examined in four categories as, distortion, rotation, integration, and perseveration. It was found that the most common errors made by the drug group were distortion and integration due to attentional deficits and impulsivity. Erman (1997) reported that children with ADHD and Specific Learning Disorder made significantly higher errors of distortion and integration. Sevim (2002) in her study applied both pharmachotreatment and psychosocial interventions as a combined treatment for children with ADHD. She reported that children with ADHD recorded significantly higher errors of distortion than other type of errors and that the number of distortion errors decreased after combined ADHD treatment. Similarly findings of this present study showed a decline on the number of distortion and integration errors at after a 12-week MPH treatment. MPH use was shown to be beneficial for reducing the number of errors in BGVMPT performance.

In the present study MPH was found to be useful in ameliorating the hyperactivity level of children as measured by the Hacettepe ADHD scale. After 12-weeks of MPH use, drug group demonstrated a meaningful decrement on Hacettepe ADHD scale scores. However, the change in the scale scores of the comparison group

was a lot smaller. This could be accepted as the beneficial effect of MPH on child behavior. On the other hand scores of both groups having reduced brings along the need to consider the effects of 12-week time, placebo effect of hospital referral, and mothers perceptions of children's condition.

One of the research questions of this present study was whether MPH was effective on anxiety scores of the children on SCAS-P. The common belief on MPH's effects on anxiety is that ADHD medication is not favorable for reducing anxiety (Barkley, 1976; Buitelaar, 1995; Pliszka, 1989; Tannock, 1995), and yet it might increase the level of anxiety. Unlike the main tendency in the literature, findings of the present study report benefits of MPH treatment on anxiety. Related to the findings of the present study Diamond et al. (1999) found that anxious and non-anxious children with ADHD had equally robust responses to MPH treatment. Pliszka (1989) found 30% of children with ADHD comorbid anxiety clearly benefited from MPH treatment.

The mean values on SCAS-P scores of pretest and posttest measures of both the drug group and the comparison group had approximately the same level of anxiety with means of M=31.00, and M=30.15 respectively. These means were above the cutoff point, yet their difference from the mean was within one standard deviation from the mean. Hence it would be appropriate to refer to these groups as having anxiety within normal levels. However, after 12- MPH treatment the drug group recorded a major decrease in anxiety scores according to SCAS-P where as the comparison group's anxiety level slightly decreased within the 12-week period. Regardless of the time interval between pretest and posttest measurements and/or having ADHD all children

scored lower on SCAS at posttest. This could be explained by a possible placebo effect of having referred to a hospital even though not receiving any interventions regarding child anxiety.

Another explanation might be parents' perceptions of their child's anxiety (Spence, 1998). Vance and friends (2002) reported dissonance between parent and child reports of child anxiety where, a significant change in anxiety of children with ADHD might not be perceived by the parents. In this study SCAS was administered as a parent report. Parents might have perceived the changes in child behavior due to MPH use as changes on anxiety, hence might have reported their children as being less anxious after the 12-week treatment. Child reports of anxiety should be taken into account together with parent reports for healthier anxiety assessment. Additionally, there might have been undetected problems other than ADHD in the comparison group that revealed the same level of anxiety scores as children with ADHD at pretest measures.

Effects of MPH treatment on vigilance task performance were evaluated as well in this present study. A three-level vigilance task was developed for this research. Literature on MPH's effects on continuous test performance and vigilance tasks is favorable (Luiser et al., 1996; Coons et al., 1981; Batson, Simon, Herman, Finch, 2002). However, MPH use was not found to be beneficial on vigilance task performance in this present study. After the 12-week period, both study groups were shown to have improved on vigilance task performance. The task developed being too simple for the age group of participants; hence a possible occurrence of learning effect might be reasons for these results.

Finally pretest and posttest measures of WISC-R subscale scores of the study groups will be discussed. WISC-R is known for providing measures of ADHD symptomatology through its subtests. WISC-R subtests measuring visual perception, visual organization, short-term memory and attention may help follow up the improvement of a child with ADHD following ADHD treatment (Kiris, 2002). Digit span, digital symbol, picture completion, picture arrangement, block design, and object assembly subtest of WISC-R were administered to participants for follow up purposes in this current study.

Results of the present study were evaluated regarding the WISC-R subscale score pattern of children with ADHD, as well as benefits of MPH treatment on WISC-R subscale scores. Children with ADHD were expected to have lower digit span, and performance subtest scores than children without ADHD. Pretest measures of children in the drug group were found to be lower than children in the comparison group on digit span subtest. This difference could be evaluated as children with ADHD having inattention and short-term memory problems. Results yielded meaningful differences between pretest and posttest scores of the drug group on digit span subtest, which could be explained by the beneficial effect of MPH use on short-term memory. Children with ADHD were expected to have lower performance subtest scores than children in the comparison group. Even though there were mean vise differences between the study groups on pretest, these differences were not found to be meaningful in terms of cognitive abilities. Regarding the performance subscale scores, effect of MPH was found to be beneficial only on digital symbol and picture completion subtests. Results

could be interpreted, as MPH would improve visual perception, motor coordination, and attention of children with ADHD. Similarly, drug group performance on object assembly subtest was shown to be better than comparison group after the 12-week interval, a change that could partially be explained by the use of medication. Familiarity of the children with the clinic settings after 12-weeks and less performance anxiety on posttest measures might be other factors that contributed the improvement on scores.

4.3 Limitations and Implications of the Present Study

Following the discussions on the results, it would be appropriate to discuss the limitations and implications of this present study. Estimates of the prevalence of ADHD vary because of factors such as how ADHD is defined, lack of precision in determining ADHD features, and the subjective differences in ratings between parents, teachers, and professionals (Cohen, Riccio, & Gonzalez, 1994). Clearly, diagnostic accuracy is an important goal so that stimulant medications, and other interventions may be applied appropriately. Children in the drug group fully met the DSM-IV criteria for ADHD whereas children in the comparison group were reported only for not listening when spoken to, not following through on instructions and failing finishing schoolwork, losing things necessary for tasks or activities, leaving seat in the classroom when expected to be seated, being on the go, talking excessively, having difficulty awaiting turn, and interrupting or intruding on others. Use of inter-rater reliability in diagnostic procedures might provide with more precise differences between study groups.

In addition to this, for being selected from the child psychiatry referrals comparison group of the present study might have had other possible diagnosis other than ADHD. Comparison group also might have gotten higher anxiety scores regarding those possible diagnoses. One limitation of the present study is lack of a control group of children who referred to the hospital for physiological conditions (i.e. diabetes) or a control group of normal children.

There is widespread agreement in the literature that intervention for children with ADHD should be multi modal, multidisciplinary, and of long duration (Goldstein, 1990). Although ADHD is apparently a biologically based disorder, changes in the environmental situations can improve the functioning of children with ADHD. One drawback of the present study is that no individual or family interventions were provided to the participants and their families. Families were not informed about MPH but were given instructions on how to use it. In addition to that, although parents reported medicating their children as instructed, a reliable record of medication use was absent.

It is stated that children with different types of ADHD respond to MPH treatment in different ways (Gary & Kagan, 2000). This present study did not make a differentiation among different subtypes of ADHD meaning different participants might have had different component of ADHD criteria. Thus, the results regarding the effects of MPH over these subtypes remained unclear in the analysis.

The use of stimulant drugs in ADHD has been found to promote attentiveness and interpersonal interactions with teachers, parents, and peers. Similarly, psychostimulants have been shown to induce significant improvements on laboratory

measures of attention, learning, short-term memory, vigilance, and impulsivity (Elia, Ambrosini, & Rapport, 1999; Spencer et al., 1996). Unfortunately, it has not been shown that academic performance improves to the same level (Rapport, Denney, DuPaul, & Gardner, 1994; Swanson, McBurnett, Christian, & Wigal, 1995). However in the present study, all drug group participants were reported for having better academic achievement by their parents. Since teacher reports of child behavior and academic achievement were not available for the analysis, it is not clear whether the drug group children improved academically or the findings were a result of parents' expectations of drug treatment. Another drawback of the present study might be that the school environment of these children was not taken into consideration. Teachers of the participants were not trained for class and lecture organization while teaching children with ADHD as well as children's situation regarding ADHD.

Regarding these limitations, some implications of this present study are presented. As reported, literature on ADHD studies conducted in Turkey concentrate on psychosocial aspects of ADHD and lack work on ADHD medication. This present study provides a holistic vision of the effects of MPH on various different aspects of ADHD and a chance of comparison among these effects.

Participants of the present study were referred to the hospital for ADHD examination by their teachers as reported by mothers of the children. According to the items of DSM-IV criteria met by the comparison group, it could be stated that attributions of teacher on children with ADHD might be subject to further research.

Parent and teacher interventions seem to be needed in terms of informing parents and teachers on ADHD and ways of treating ADHD.

Despite the stated limitations of the present study results revealed an improvement in cognitive functions, activity level, and anxiety of children with ADHD due to drug use. Regarding these findings further research should be able to manage a control group of normal children, a more precise diagnostic control for clearer results on anxiety and vigilance tasks of optimal difficulty for appropriate age groups. Research conducted with a more heterogeneus sample would provide opportunity to compare children with different subtypes of ADHD and to understand the changes in anxiety due to MPH use.

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APPENDIX A
SPENCE Çocuklar Için Kaygi Ölçegi
(Anne-Baba Raporu)

Sample Items:

Asagida çocugunuzu tanimlayan (anlatan) bazi ifadeler yer almaktadir. Her bir ifade için çocugunuzu en iyi tanimlayan cevabi isaretleyiniz. Lütfen tüm ifadelere cevap veriniz.

	Her zaman	Bazen	Sik sik	Hiç bir zaman
1. Bazi seylere endiselenir.				
2. Karanliktan korkar.				
3. Bir sorunu oldugunda midesinden garip sesler geldiginden sikayet eder.				
4. Korku duydugunu söyler.				
5. Evde yalniz kalmaktan korkar.				

APPENDIX B

DSM-IV Diagnostic Criteria for ADHD

"A. Either 1 or 2

1. Six (or more) of the following symptoms of inattention have persisted for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Inattention

(a) Often fails to give close attention to details or makes careless mistakes in school, work or other activities

(b) Often has difficulty sustaining attention in tasks or play activities

(c) Often does not seem to listen when spoken to directly

(d) Often does not follow through on instructions and fails to finish schoolwork, chores or duties in the workplace (not due to oppositional behavior or failure to understand instructions)

(e) Often has difficulty organizing tasks or activities

(f) Often avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)

(g) Often loses things necessary for tasks or activities (e.g. school assignments, pencils, books, tools or toys)

(h) Is often easily distracted by extraneous stimuli

(i) Is often forgetful in daily activities

2. Six (or more) of the following symptoms of hyperactivity/impulsivity persisting for at least 6 months to a degree that is maladaptive and inconsistent with developmental level:

Hyperactivity

(a) Often fidgets with hands or feet and squirms in seat

(b) Leaves seat in classroom or in other situations in which remaining seated is expected

(c) Often runs about or climbs excessively in situations where it is inappropriate (in adolescents or adults may be limited to feelings of restlessness)

(d) Often has difficulty with playing or engaging in leisure activities quietly

(e) Is often ‘on the go’ or often acts as if ‘driven by a motor’

(f) Often talks excessively

Impulsivity

(g) Often blurts out answers to questions before the questions have been completed

(h) Often has difficulty awaiting turn

(i) Often interrupts or intrudes on others (e.g. butts into conversations or games)

B. Some symptoms of inattention or hyperactivity-impulsivity that caused impairment were present before 7 years of age

C. Some impairment from the symptoms is present in 2 or more settings [e.g. at school (or work) and at home]

D. There must be clear evidence of clinically significant impairment in social, academic or occupational functioning

E. The symptoms do not occur exclusively during the course of a pervasive developmental disorder, schizophrenia, or other psychotic disorder, and are not better

accounted for by another mental disorder (e.g. mood disorder, anxiety disorder, dissociate disorder, and personality disorder)”

APPENDIX C
DIKKAT NOKSANLIGI DAVRANIS DEGERLENDIRME SKALASI

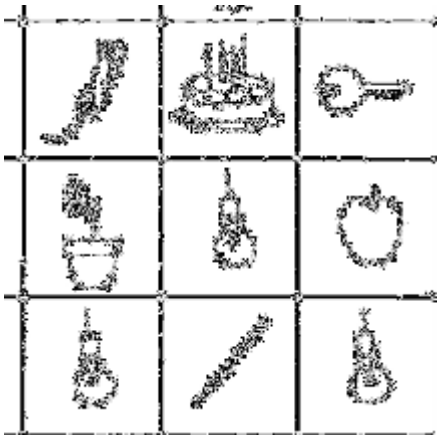
Sample Items:

	YOK	BIRAZ	ÇOK
1. Tepkisel davranislari vardir. (örnegin nedensiz yere arkadasina vurma, itme, çelme takma gibi)	( )	( )	( )
2. Durdugu yerde duramaz, sürekli kipir kipirdir.	( )	( )	( )
3. Huzursuzdur, sürekli ayaktadir.	( )	( )	( )
4. Çok hareketlidir, tehlikeli davranislarda bulunur, "Düz duvara tirmanir".	( )	( )	( )
5. Basladigi isi bitiremez.	( )	( )	( )

APPENDIX D

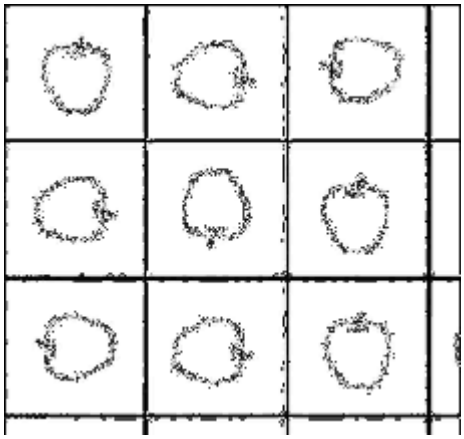
VIGILANCE A

Sample Section:



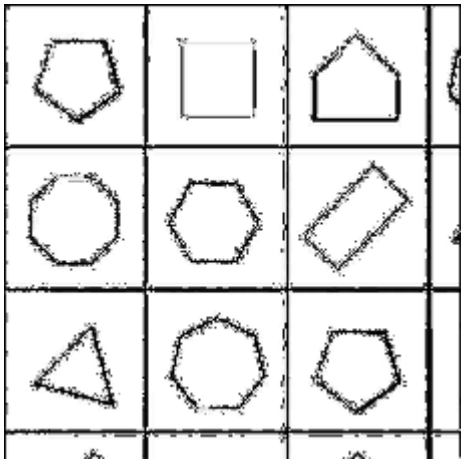
VIGILANCE B

Sample Section:



VIGILANCE C

Sample Section:



APPENDIX E

DEMOGRAFIC INFORMATION FORM

Mother’s date of birth:

Mother’s education:

Family income:

Child’s date of birth:

Child’s gender:

Child’s grade level:

Academic status:

Previous hospitalizations and drug use:

Side effects of MPH:

Changes in the academic status after drug use: