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DEPENDENCE**

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ABSTRACT

ATTENTIONAL BIAS IN EXERCISE DEPENDENCE

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Exercise dependence is a condition that a physical activity becomes an excessive and compulsive behavior accompanying with having cognitive, behavioral and physical symptoms. Exercise dependence is measured by Exercise Dependence Scale (EDS) by using DSM criteria's for substance dependence. In literature, there are many studies found attentional bias in many dependencies such as alcohol, cigarette, marihuana, gambling etc. However, there is no paper studying attentional bias in exercise dependence. This study aims to fill this gap in literature. Study was conducted with 43 male participants (participants who have high social physique anxiety measured by Social Physique Anxiety Scale (SPAS) were excluded from the study) grouped in three based on EDS as risk for exercise dependence, nondependent-symptomatic and nondependent-asymptomatic. Addiction Stroop task is used to measure attentional bias. Participants' reaction times and errors were recorded. Results suggested that there is no significant reaction time and error difference on fitness related words compared to neutral words among risk for

dependence group. However, a general tendency to react slower to fitness-related words was found among all men. The general tendency might be explained by the fact that men were exposed to ideal muscular male body image from different sources all the time, which might resulted in having sensitivity towards related stimuli among all men. No significant group difference was found. One of the reason for this is identifying primary exercise dependence is a problem because of lack of universally agreement methods to asses and diagnose it and existence comorbid disorders accompanied with exercise dependence. Additionally, significant and negative correlation found between EDS and SPAS which is consistent with the literature.

Keywords: Exercise dependence, attentional bias, addiction stroop

ÖZ

EGZERSİZ BAĞIMLILIĞINDA DİKKAT YANLILIĞI

Özbek, Begüm

Yüksek Lisans, Bilişsel Nöropsikoloji

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Egzersiz bağımlılığı, fiziksel aktivitenin aşırı ve dürtüsel yapıldığı, bilişsel, davranışsal ve fiziksel semptomları olan bir durumdur. Egzersiz bağımlılığı, DSM'in madde bağımlılığı kriterlerini kullanarak hazırlanmış Egzersiz Bağımlılığı Ölçeği (EBÖ) ile ölçülmektedir. Literatürde dikkat yanlılığı; alkol, sigara, marihuana, kumar gibi değişik bağımlılıklarda bulunmuştur, fakat egzersiz bağımlılığında dikkat yanlılığını çalışan bir araştırma bulunmamaktadır. Bu araştırmanın amacı literatürdeki bu boşluğu doldurmaktır. Kırk üç erkek katılımcı [Sosyal Fizik Kaygı Envanteri (SFKE) ile ölçülen ve sosyal fizik kaygısı yüksek olan katılımcılar çalışmadan çıkarılmıştır], EBÖ ile 3 gruba ayrılmıştır; egzersiz bağımlılığı riski taşıyanlar, bağımlı olmayan semptomatikler ve bağımlı olmayan asemptomatikler. Dikkat yanlılığını ölçmek için bağımlı-stroop görevi kullanılmıştır. Katılımcıların reaksiyon süreleri ve hataları kaydedilmiştir. Elde edilen sonuçlara göre, egzersiz bağımlılığı riski gösteren katılımcıların fitness ile alakalı kelimelerdeki reaksiyon sürelerinde ve hatalarında diğer gruplara kıyasla önemli bir fark bulunamamıştır.

Fakat sonuçlar, erkeklerin genel olarak fitness ile alakalı kelimelere dikkat yanlılığı gösterdiğini ortaya koymuştur. Bu genel yanlılık, erkeklerin sürekli olarak farklı kanallar aracılığıyla “ideal kaslı erkek bedeni” imajına maruz kalması olarak açıklanabilir. Çalışmada gruplar arası önemli bir fark bulunmamıştır, bunun nedenlerinden birinin egzersiz bağımlılığını ölçmenin zorluğu olduğu düşünülmektedir. Egzersiz bağımlılığını ölçmek için evrensel olarak kabul edilmiş bir değerlendirme ve tanı koyma kriteri bulunmamaktadır ve egzersiz bağımlılığı ile komorbidite gösteren rahatsızlıklar bu durumu daha da zorlaştırmaktadır. Bunlara ek olarak, literatür ile uyumlu olarak, SFKE ile EBÖ arasında anlamlı ve negatif bir ilişki bulunmuştur.

Anahtar Sözcükler: Egzersiz bağımlılığı, dikkat yanlılığı, bağımlı-stroop

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CHAPTER 1

INTRODUCTION

Physical activity is very healthy for individuals who are doing it regularly and an important relationship exists between physical activity and health (Warburton, Nicol & Bredin, 2006). Studies showed that physical activity decreases the risk of various chronic diseases, cancers or bone and joint diseases (Warburton, Nicol & Bredin, 2006). Beside the physical benefits, exercise has some psychological benefits too. Regular exercisers reported that, they feel self-confident, successful and have a sense of control by doing exercise regularly (Yates, Leehey & Shisslak, 1983). However, this healthy behavior might become a harmful habit for individuals across time (Coverley Veale, 1987).

Exercise dependence is a condition that a physical activity becomes an excessive and compulsive behavior accompanying with having cognitive, behavioral and physical symptoms (Hausenblas & Downs, 2002a) and becomes the preferential activity in individuals' life (Coverley Veale, 1987). Exercise dependents may encounter psychological dysfunction, physical injury and problems in social relationships (Hamer & Karageorghis, 2007).

In 2011, Sussman, Lisha & Griffiths published a meta-analysis about the prevalence of various dependencies. They searched for substance dependencies (alcohol, cigarette and drugs) as well as behavioral dependencies. They estimated the prevalence of exercise dependence as 3% - 5% in USA population, which is similar to other behavioral dependencies such as sex addiction (3%), love addiction (3%), gambling addiction (2%), eating addiction (2%), internet addiction (2%), work addiction (10%) and shopping addiction (6%). Villella et. al. (2011) conducted another prevalence study about behavioral addictions among high school students in Italy, they found 8.5% prevalence of exercise addiction.

One of the earliest research was conducted by Baekeland in 1970. Baekeland was investigating how exercise deprivation effects sleep. During the data collection, they had difficulties in finding regular exercisers (exercise 5-6 days in a week) who will stop exercising for a month. Even though they were willing to pay more than usual, they didn't accept. Fourteen college students who accept to participate in the study exercise regularly 3-4 days in a week. First, their sleep was analyzed while they are still exercising for two days, and then they started to stop exercising up to one month. Results showed that exercise deprivation affected their sleep pattern and this caused anxiety, sexual tension and increased the need to be with other people.

Some case studies published about regular exercisers whom showing problematic exercise habits. Yates, Leehey and Shisslak (1983) interviewed 60 runners and published 3 case studies about male regular exercisers aged between 31 to 50. Yates et al. used the term "obligatory runners". They all are regular runners but they also cycle and swim for miles, climb, play handball etc. in daily routine.

Cases reported that, because of doing excessive amount of exercise, they avoid social interactions, they become asexual, when they feel sad they doubled their exercise and if they cannot exercise because of any reason they feel anxious. They all are very obsessive with their eating habits and weight control. In two cases, they reported that even though they have a serious tendinitis (which is an inflammation of a tendon), they still continue to run. Lyons and Cromey (1989) also published a case study which shows similar properties with cases published by Yates et al. (1983). The case is about a male teacher, who is applying a very strict diet and run every day. Running became the prior activity of his life that he does in every spare time he has. Problems started to emerged about his job and marriage because of spending very little time at home and he also lost his sexual interest.

The important difference of exercise dependence from other dependencies is the fact that exercise is a very healthy activity for individuals, which posits it far away from being a “bad habit”. It was difficult for individuals to become aware of their exercise behavior becoming a problem in their lives and for their health. However, exercise dependency has also similar features of other addictions; salience, withdrawal, conflict, tolerance, relapse etc. (Weinstein & Weinstein, 2014). Diagnostic and Statistical Manual for Mental Disorders (DSM) criterias for dependence can be applied for exercise dependence as well (Hausenblas & Downs, 2000).

Tolerance; because of doing the same amount of exercise regularly, the effect starts to disappear, so they need to increase the amount of exercise to reach the desired goal.

Withdrawal; they showed withdrawal symptoms (e.g. anxiety, depression) when they don't exercise and they do it regularly to avoid the possible withdrawal effect. And they feel relieved when they do it.

Intention effect; they are doing more and longer than they were planned to do.

Lack of control; they cannot control the urge to do exercise.

Time; they spend too much time for exercise.

Reductions in other activities; they started to leave their social or personal activities to exercise.

Continuance; they do not stop exercising whether they are having psychological or physical problem.

Exercise dependence may exist as a primary problem or secondary problem accompanying with another pathology especially eating disorders (Hamer & Karageorghis, 2007; Cook et. al., 2013). Both primary and secondary exercise dependence meet the exercise dependence criterias, however they had different intentions and motivations behind it (Cook et. al., 2013). Primary exercise dependence gains recognition as a clinical disorder by its own symptoms (Bamber, Cockerill & Carroll, 2000). In primary exercise dependence, participants exercise to reach the pleasure of the exercise behavior itself, however in secondary exercise dependence external motivations motivate individual to exercise such as controlling the body shape (Hamer & Karageorghis, 2007). Patients, who have eating disorders, may exercise instead of diet and vomiting (Veale, 1995).

In literature, there are some experimental studies investigating exercise dependence in different various of exercise areas. For example, in 1993, Furst and

Germone reported that, longer physical activity (more than 6 years) resulted in higher addiction scores in the exercisers group. Another study was conducted by Pierce, Daleng and McGowan (1993). They found high exercise dependence score among dancers.

Studies showing the negative symptoms of exercise dependence also took part in the literature. In 2006, Kop & Deuster conducted a study with participants who do aerobic exercise regularly. The study was conducted with 40 participants. Half of the participants continue to exercise and half of the participants withdraw for two weeks. Withdrawal group showed fatigue and somatic depressive symptoms after one week and showed cognitive-affective depressive symptoms after 2 weeks. They also showed negative mood which is correlated with the decrease of fitness level.

1.1. Understanding Exercise Dependence

In order to understand the exercise dependence more, some psychobiological hypotheses revealed to understand the underlying mechanisms of exercise dependence (Hamer & Karageorghis, 2007).

1.1.1. Affect Regulation Hypothesis

Exercise can influence emotions and mood. In certain cases, exercisers regularly perform physical activity because of its' affect regulation function. Exercise dependents see exercise as a way to decrease or avoid negative affect and this cause dependency if individuals failed to reduce negative affect with other methods but exercise (Hamer & Vlachopoulos, 2002). Studies showed that, exercise addicts were restless and stressed before the exercise, they experience positive affect

after exercise, they were more depressed, anxious and angry after missing the exercise and they tend to ignore physical discomfort compared to non-addicts (Anshel, 1991). More evidence for affect regulation hypothesis is coming from the exercise deprivation studies. Exercise deprivation cause increase in total mood disturbance, anxiety, tension, depression, confusion (Mondin et. al., 1996), somatic symptoms, insomnia (Morris et. al., 1990) and fatigue (Berlin, Kop & Deuster, 2006). Beside the negative affect regulation function, physical activity also ensures positive affect. Depression, stress (Esch & Stefano, 2010), anxiety and anger were reduced after exercise (Rosa et. al., 2004). In 1968, Tomkins defined two type of runners; negative runners (who run to reduce negative feelings) and positive runners (who run to increase positive feelings) (as cited in Hamer & Karageorghis, 2007; Weinstein & Weinstein, 2014). A study conducted with 147 adolescents revealed that, adolescents who have higher engagement with physical activity, also reported lower stress and depression (Norris, Carroll & Cochrane, 1992). Additionally, adolescents were chosen to assigned to either high or moderate intensity aerobic training, flexibility training or control group for 10 weeks. Adolescents who were in high intensity training reported less stress, anxiety and depression compared to other groups (Norris, Carroll & Cochrane, 1992). Another study revealed that, 30 minutes of aerobic exercise increases the positive well-being and decreases the psychological distress and both were continue to last up to 60 min after the exercise (Cox, Thomas & Davis, 2001).

1.1.2. Anorexia Analogue Hypothesis

This hypothesis supported that excessive exercise is a version of male anorexia nervosa (Weinstein & Weinstein, 2014). Exercise dependents have

similarities with anorexic patients in terms of their personality characteristics (Hamer & Vlachopoulos, 2002) such as inhibition of anger, extraordinary self-expectations, denial of debility, tolerance to physical discomfort and tendency towards depression, obsessions about eating habits and lean body mass (Yates, Leehey & Shisslak, 1983). Anorexic women give overemphasis on physical appearance because of an identity resolution, similarly men with low self-esteem may experience physical unattractiveness may ended up in engaging in excessive exercise (Hamer & Karageorghis, 2007). However, in literature there are some different findings for that hypothesis. An empirical study compares, obligatory runners and anoxia nervosa patients by screening them with Minnesota Multiphasic Personality Inventory (MMPI) and found that anorexic patients suffer more psychopathology than obligatory runner (Blumenthal, O'toole & Chang, 1984). Exercise dependence is not seen as much pathological as anorexia nervosa.

1.1.3. Sympathetic Arousal or Habituation Hypothesis

Exerciser increases the level of exercise to reach the same level of arousal which is resulted in habituation effect (Weinstein & Weinstein, 2014). Exercise causes a decrease in sympathetic nervous system output (catecholamines) (Hamer & Karageorghis, 2007). This adaptation causes a high level of energy usage which resulted in fatigue and decreased arousal (Hamer & Karageorghis, 2007). As a result, individuals need to engage high levels of exercise in order to reach the same physiological arousal (Thompson & Blanton, 1987).

1.1.4. β -Endorphin Hypothesis

Exercise stimulates of β -Endorphin and this may have resulted in an addictive behavior (Weinstein & Weinstein, 2014). Heavy exercise causes an increase in the endorphin release which helps to create a euphoric feeling (Leuenberger, 2006). In the literature, this feeling applying to runners is called “runner’s high” (Boecker et al., 2008). Even though there are mixed findings about the endorphin release and exercise, there are some studies found strong evidence about the endorphin release. Boecker et. al. (2008), scanned 10 athletes by PET, they found opioid receptor reduction in prefrontal and limbic area and their euphoria level was significantly increase after running.

Endocannabinoid system has a close interaction with dopamine which may have a function in reward system (Dietrich & McDaniel, 2004). Endurance exercise activate the endocannabinoid system which produce effects similar to runner’s high and produce sedation, feeling of wellbeing, reduced attentional capacity, impaired working memory and difficulties in time estimations (Dietrich & McDaniel, 2004).

Joutsa et. al. (2012) conducted a study with 24 male participants. Half of them have gambling problem and half of them are control group. They used PET scan during playing slot machine gambling task having two outcomes, high-reward and low-reward. According to the results both groups release striatal dopamine during high and low reward tasks and there is a positive correlation between them. They couldn’t find any significant difference between dopamine release between gamblers and controls, but there is a correlation between dopamine release and gambling symptom severity. It has been found that, food stimulation to obese binge

eaters also increases the dopamine release (Wang, Geliebter & Volkow, 2011) and video game playing increase the dopamine release (Weinstein, 2010).

1.1.5. Cytokine Hypothesis

Cytokines are messengers between immune system and brain (Hamer & Karageorghis, 2007). Cytokines influence behavior through central nervous system (Hamer & Karageorghis, 2007). Exercise stimulates IL-6 cytokin release which effects mood and behavior such as increased fatigue, sleep and poorer concentration and increased anxiety and depression (Hamer & Karageorghis, 2007) which is similar symptoms during exercise withdrawal. Chronic over production of IL-6 cytokin, may contribute in exercise dependence (Weinstein & Weinstein, 2014). Individuals need to exercise regularly to gain the temporary relief that cytokine-induced symptoms provide (Weinstein & Weinstein, 2014).

1.2. Attentional Bias

Attentional bias is a phenomenon refers to hyperattention to a stimulus (Murris & Merckelbach, 1998). In order to study attentional bias, researches developed and use many paradigms and methods such as; eye tracking (Lochbuehler et. al., 2011), dot probe (Townshend & Duka, 2001), flicker (Brevers, 2011) and modified versions of stroop task (Cox, Yeates & Regan, 1999; Field, 2005; Boyer & Dichenson, 2003). In this study, Stroop task is going to be explained in detail.

In literature, one of the most common groups studied for attentional bias is individuals who have addictions. Attentional bias is an important concept for addicts. Addicts show an attentional bias towards addiction-related stimuli by the automatic cognitive mechanism that can easily captures the stimuli from the environment. This

bias is meaningful in the clinical concept (Field, Munafò & Franken, 2009). That's why there are many studies conducted to understand this concept. Waters and Feyerabend (2000), pointing some important issues about having an attentional bias. First, having an attentional bias, it is easier to catch the substance-related stimuli in the environment. This becomes a handicap if addict is trying to be avoid. Second, the automatic thinking that addicts had may reveal a conditioning response that leads individual to use the substance. Third, attentional bias towards substance related stimuli would affect mood and interrupt their thoughts during daily activities. These important effects of attentional bias lead researchers to investigate attentional bias in detail.

There are plenty of studies investigating attentional bias in various of dependencies. Attentional bias has studied with cannabis users (Field et al., 2004), internet game addicts (Zhou et al., 2012), smokers (Mogg et al., 2005), gamblers (Boyer & Dickerson, 2003), cocaine users (Hester et al., 2006) and heavy drinkers (Field et al., 2007). All studies showed that those people who have a particular dependence show attentional bias. Here, some of those examples will be explained;

1.2.1. Attentional Bias in Substance Dependencies

Cox, Yeates and Regan (1999) conducted a study with heavy and light social drinkers. They used emotional stroop task containing alcohol related and control words. Results showed that, heavy drinkers react slower to alcohol related words compared to light drinkers. Another study with alcohol consumers was conducted by Townshend and Duka (2001). They studied with non-dependent heavy social drinkers and occasional social drinkers whether they have an attentional bias for

alcohol related stimuli. They used dot probe task contains alcohol related pictures and words. According to the latencies in dot probe responses, compared to the occasional social drinkers, heavy social drinkers showed an attentional bias for alcohol related stimuli.

In 2011, Lochbuehler, Voogd, Scholte and Engels conducted a study with smokers. They used 33 university students and showed them a movie part which contains 14 smoking scenes. Eye tracking device was used to keep track how long, how fast and how many times they fixated to the smoking cues. They found that smokers have an attentional bias for smoking related cues, they fixate more, fixate faster and they fixate longer.

In 2005, Field published an attentional bias study with cannabis dependency. 22 university students participated to the study, who regularly smoke cannabis. They used modified stroop task contains 16 cannabis related words and 16 neutral words. They apply stroop by cards and experimenter records the reaction times and errors. Results indicated that, participants who are cannabis dependent show attentional bias, participants who are not cannabis dependent didn't show any bias for cannabis related words. They also found a positive correlation between cannabis craving and frequency of cannabis use.

In 2011, Liu et. al. conducted a study with cocaine dependents. They used modified version of stroop task contains cocaine related words. According to their results, cocaine dependent participants showed an attentional bias towards cocaine related words.

1.2.2. Attentional Bias in Behavioral Dependencies

Dependence is not restricted with substances and alcohol. It has been showed that some behaviors have a potential to become addictive such as sex, gambling, internet use, video games and exercise (Terry, Szabo & Griffiths, 2004). Because of having similar features with substance dependencies, attentional bias studies were conducted for behavioral dependencies too.

Boyer & Dicherson (2003), studied attentional bias with poker machine players. 60 participants were divided into two group; high control over their gambling behavior and low control over their gambling behavior. They used emotional stroop task consisted of 32 neutral, 32 drug related and 32 gambling related words. They found that, participants who have low control over their gambling behavior react significantly slow to the gambling related words compared to neutral and drug related words and no significant effect found in participants who have high control over their gambling behavior. Brevers et. al. (2011) conducted another study with individuals who have gambling problem. 40 problematic gamblers and 35 control participants were in the study. They used flicker paradigm. They were showing two images which differ in a one aspect, pictures are either neutral or gambling-related and their eye movements were also recorded. Results indicated that, problematic gamblers react faster to gambling cues compared to neutral cues, they showed more eye saccades towards gambling pictures and fixate more and longer to gambling pictures.

Metcalf and Pammer (2011), conducted an attentional bias study with online gamers. They used 40 online gamers and 19 non-gamers. They used modified stroop

task consisted of 20 game related, 20 neutral and 20 negative words. Results indicated that online game addicts had longer reaction times to negative and game related words compared to neutral words.

1.3. Addiction Stroop Task

Original Stroop task is designed by Stroop for his doctoral thesis (Cox, Fadardi & Pothos, 2006). In the original task, participants encounter with a word written in a color. Participants should name the ink color ignoring the word itself. There are two kind of trials in the task; congruent (the word red written in red ink) and incongruent (the word red written in blue ink). It is found that during the task, participants were slower to react incongruent trials compared to congruent trials. This is called the Stroop effect (Cox, Fadardi & Pothos, 2006; Williams, Mathews & MacLeod, 1996)

In the original Stroop task, there are two conflicting and parallel processing dimensions; perceptual (task relevant) and semantic (task irrelevant) (Lovett, 2002; Cox, Fadardi & Pothos, 2006). In order to understand this conflict, some explanations emerged. According to the “horserace” view, the information (word versus color) which arrives first causes interference to the other (Lovett, 2002). The other view is about the automaticity of the information processing. According to this view, the conflict in original Stroop task is trying to be explained by the fact that, reading words is more automatic, easier and faster than naming the ink color because reading words is a more common and well learned process (Cox, Fadard, & Pothos, 2006). This automaticity means that reading requires less attentional resources, that’s why it is easily interferes with color naming (Lovett, 2002). Cohen, Dunbar & McClelland (1990) proposed a model, describe that by training, the strength of the

processing pathway for automatic responses will increase and make it more difficult to ignore a well-known practice (word reading) during a task. Lovett (2002) proposed an integrative model to understand Stroop called “not just another model of Stroop” (NJAMOS) which emphasize executive cognitive functioning. This theory integrates individuals’ previous learnings, current factors and the ability to modify previously learned information to the current situation which is referred as executive cognitive functioning. This makes individuals to vary based on their cognitive abilities to perform Stroop task (as cited in Cox, Fadardi & Pothos, 2006).

Beside the original Stroop, there is a modified version of Stroop task which were using for attentional bias studies. In this version, researchers use list of words depending on the purpose of the study in the Stroop task. There is an emotional Stroop task, which is using for emotionally salient stimuli, and there is an addiction Stroop task which is using for addictions (Cox, Fadardi & Pothos, 2006). For modified Stroop task, interference is computing by the difference between participant’s response time to related stimuli and neutral stimuli. This difference gives us how the attention distracted by attentional bias (Cox, Fadard, & Pothos, 2006).

Theories trying to explain the original Stroop task is not perfectly explaining addiction-Stroop. For example, in the original Stroop task, the frequency of exposure is one of the explanations to understand the interference. However, in emotional Stroop task the interference cannot be explained by this. Mogg, Bradley, Millar & White (1995) studied attentional bias with individuals who have general anxiety disorder. Participants received cognitive behavioral therapy, and tested before and

after the CBT. In the first test, they found an attentional bias towards negative words, after 2 months-they received CBT- their attentional bias was disappeared. Similar findings were found in the Mathews, Mogg, Kentish and Eysenck (1995). They tested anxious patients before and after the psychological treatment. Attentional bias, that they found in the initial task, disappeared by the time and treatment. Even though cognitive therapy needs a high exposure to related stimuli during the process, their attentional bias disappeared rather than getting stronger.

Dehaene, Kerszberg and Changeux (1998) identify the term “global workspace” in order to understand the processes underlying cognitively effortful tasks. This workspace consists of perceptual, motor, memory, attentional and evaluative processors which is activated during stroop task (Dehaene, Kerszberg & Changeux, 1998). More effort needed by the global work space if there is more effortfull tasks such as ignoring addiction related stimuli in the stroop task (Cox, Fadardi & Pothos, 2006). According to the theory, the interferes occur between; the time need to acquire a difficult task such as ignoring to salient stimuli to name the color and time need to acquire an easy task like naming color of a neutral stimuli (Cox, Fadardi & Pothos, 2006). However, Fadardi and Cox (2006) still found attentional bias from dependent drinkers compared to social drinkers when they controlled their general cognitive functioning.

Addiction Stroop task differs from original Stroop task in some aspects. Theories trying to explain the original Stroop task are not applicable to addiction Stroop (Cox, Fadardi & Pothos, 2006). In addiction Stroop, rather than having two conflicting dimensions as in the original Stroop, there is another mechanism which is

trying to be understood; the reason behind why some salient words have a priority in processing compared to other neutral words (Cox, Fadard, & Pothos, 2006).

1.3.1. Why showing attentional bias towards addiction-related stimuli?

There are some possible reasons why addicts show an attentional bias towards addiction-related stimuli in addiction-stroop task.

Incentive Sensitization Theory. Robinson and Berridge (1993) presented a paper about incentive sensitization theory, which is a biopsychology theory that tries to explain the mechanisms that make individual to become addicted to a drug and how attentional bias develops. According to the theory, natural behaviors such as eating, drinking, sex and exercise activate brain's rewards system and motivate individuals to achieve that reward (Brené et. al., 2007; Weinstein & Weinstein, 2014). This reward system responds and attribute incentive salience to those natural rewards (Kelley & Berridge, 2002). Incentive salience is a psychological process which is controlled by mesocorticolimbic system that assists to directing behavior to natural rewards (Robinson, Robinson & Berridge, 2013). This system raises the perception and focus the attention to any cue related with the reward (Robinson, Robinson & Berridge, 2013) and generate an attentional bias (Robinson & Berridge, 2008). Attribution of incentive salience can also occur without conscious awareness, drug user's attention may directed to the stimuli even the individual without noticing it or it may also happening with a conscious craving (Thomsen, Fjorback, Møller & Lou, 2014; Robinson & Berridge, 2008). Repeated drug taking behavior caused permanent and developing neuroadaptations that causes changes in the brain which is normally attribute incentive salience to natural rewards (Robinson & Berridge, 1993;

Robinson & Berridge, 2008; Robinson, Robinson & Berridge, 2013). As a result, neural system becomes sensitive and starts to attribute incentive salience to drugs in a pathological way (Thomsen, Fjorback, Møller & Lou, 2014; Robinson & Berridge, 2008). By the sensitization of the dopamine-related systems that connect the ventral tegmental area (VTA) to targets in the nucleus accumbens, neostriatum, amygdala, ventral pallidum, and prefrontal cortex (Robinson, Robinson & Berridge, 2013), the neural mechanisms for incentive salience amplify and normal level of “wanting” become excessive level of “wanting” even without “liking” it (Waters & Feyerabend, 2000). Becoming more sensitive the dopamine related systems, attribute more incentive salience to the stimuli which resulting in having more attentional bias (Waters & Feyerabend, 2000). That provokes individuals to get the drug and become more undetected to relapse (Robinson, Robinson & Berridge, 2013). According to Robinson, Robinson and Berridge (2013), there are 3 components in drug use; “liking”, “wanting” and “learning”. All these components may become a reason for an individual to get the drug. However incentive sensitization theory puts more emphasis on “wanting” component because of its role in use and relapse. (Robinson, Robinson & Berridge, 2013). Even though “liking” and “wanting” are simultaneously effecting the drug use in the early stages, only the “wanting” become sensitive and develops during the addiction (Robinson, Robinson & Berridge, 2013). Some people who become drug tolerant, reported that, even though they don’t receive much pleasure by getting the drug, they had the urge to take it more and more. (Robinson, Robinson & Berridge, 2013). Attribution of incentive salience, create an attentional bias and increase the motivation to do that addictive practice (drink alcohol, drug use, gambling etc.) (Cox, Fadardi & Pothos, 2006).

Emotion, mood and goals. Addiction related stimuli can gain emotional valence through conditioning and this emotional valence may result in an attentional bias (Cox, Fadardi & Pothos, 2006). Emotional valence can be gained through either positive reinforcement (experiencing positive affect by taking the drug) or negative reinforcement (eliminating withdrawal symptoms by taking the drug) and both emerge automatically when an addict encounters an addiction-related stimuli (Cox, Fadard, & Pothos, 2006). Individuals' mood is also affecting Stroop interference. Individuals who have high trait anxiety respond slowly to the threat-related stimuli compared to low trait anxiety in emotional Stroop task (Richards & Millwood, 1989). Rape victims with Post Traumatic Stress Disorder (PTSD) show greater interference in Stroop task toward threat words (Cassiday, McNally & Zeitlin, 1992). And consistency between the emotional valence of the stimuli and individuals' current mood, affects the response latencies (Hermans, De Houwer & Eelen, 1996).

Memory. Addicts have a biased memory about addiction related stimuli which is activated during the presence of the stimuli (Cox, Fadardi & Pothos, 2006). Smokers have both positive and negative attributions towards smoking, however they recall more positive attributions than negative (Litz, Paynr & Colletti, 1987). When addicts encounter with addiction-related stimuli, memories related to that activated in the short-term memory and this increases the interference because of having more cognitive load in the short-term memory (Cox, Fadardi & Pothos, 2006).

1.4. Exercise and Attentional Bias

Definitions, mechanisms and explanations of exercise dependence were presented previously. Because of having many similarities with other addictions, it is expected that exercise dependent would have an attentional bias. In literature, there is no study investigating attentional bias in exercise dependence. However, there are few studies investigated attentional processes related to physical activity related stimuli and attitudes towards physical activity.

In 2006, Berry wandering despite having many positive effects of exercise on health, why health promotions have little or no impact on exercise behavior. Construction of health promotion messages and who and how people receive those messages is the main motivation behind this research. Berry believed that there must be an automatic cognitive process while receiving the messages and individuals' exercise related self-schemas would affect that automatic process. Two experiments were designed to measure attentional bias by emotional Stroop task. In the first experiment it is hypothesized that, exercisers schematics will show attentional bias to exercise related words compared to who didn't have an exercisers schema. In the second experiment, they keep the exercise and neutral words and add sedentary life style words (unmotivated, lazy, inactive etc.) and they expect that non-exerciser schematics will show attentional bias towards sedentary life style words. 36 male and female undergraduate students participated. They conducted a pilot study in order to detect exercise related words and sedentary words. They used 12 exercise and 12 control words for the first experiment. They gave Exercise Schema Questionnaire (Kendzierski, 1988) to participants for grouping. Participants received the practice trial first. Task is applied on a computer, words are written in four color; blue, green, red and yellow in a grey background. Participants are naming the color into a

microphone and a research assistant coding the responses. They found that exerciser schematics show an attentional bias for exercise related words. For the second experiment, they add sedentary life style words and they still found attentional bias towards exercise related words among exerciser schematics and additionally they found attentional bias towards sedentary life style words among nonexercisers.

In 2009, Calitri, Lowe, Eves and Bennett investigating the relation between implicit and explicit attitudes towards physical activity and attention. They proposed that there is a positive relationship between implicit attitude and previous physical activity and previous physical activity may cause an attentional bias towards exercise related words. They used dot probe task to measure attentional bias. They conducted a pilot study to determine exercise related words. Females were dominant in their study, 72% of their participants were female. They didn't tell the primary objectives of the study. Participants finished dot probe and EAST (Extrinsic Affective Simon Task) -measure implicit attitudes toward physical activity- first, and then complete other questionnaires. They found that, previous physical engagements might have an impact on implicit attitudes and selective attention towards exercise cues. Implicit attitudes may guide individuals to attend to cues which they have strong implicit about it.

In 2011, Berry, Spence and Stolp conducted another research investigating attentional bias on exercise related images. Their motivation is similar with the previous research (Berry, 2006) which is trying to understand how physical activity advertisements were processed among individuals. In this study they were investigating explicit and implicit attention and attentional bias towards exercise

related images by using visual probe task among high and low active individuals. They didn't find any relationship between gender, activity level and explicit attention. However, they found that most active women had an attentional bias towards exercise related images and less active women have an attentional bias towards control images. For men, they showed a general attentional bias towards exercise related images however they didn't find any group differences.

1.5. Aim of the Study

Although there are many studies investigating attentional bias on various dependencies, there is no study investigating attentional bias among individuals who have exercise dependence symptoms. Because of exercise dependence showing similar properties like other dependencies, it is expected that exercise dependents will have an attentional bias. Similar studies in the literature investigating attentional bias towards exercise related stimuli were use different grouping methods such as exercise schematics (Berry, 2006), participants' activity levels (Berry, Spence & Stolp, 2011) and physical activity level-implicit and explicit attitudes (Calitri et. al., 2009). This study aims to study exercise as a type of behavioral dependency and group individuals based on DSM criterias which is tested by Exercise Dependence Scale (EDS) developed by Hausenblas and Downs in 2002. EDS is proposed to measure primary exercise dependence (Hausenblas & Smoliga, 2017). Participants were grouped into three based on EDS in; risk for dependence, nondependent-symptomatic and nondependent-asymptomatic. The reason to using three groups is that, it is not necessarily that an individual shows dependence symptoms if they are spend great amount of time exercising. For example, even though professional athletes spend most of the time for exercising, it is not mean that they have exercise dependence (Freimuth, Moniz & Kim, 2011). Symptomatic group will separate these

kind of individuals. Only men will have participated to the study, because men are at more risk than women in primary exercise dependence (Hausenblas & Downs, 2002b; Hausenblas & Smoliga, 2017). Szabo et. al. (2013) found higher exercise dependence scores on men compared to women among university athletes. Addition-stroop task will be used to measure attentional bias across groups. In the study, participants will be screened for their social physique anxiety by Social Physique Anxiety Scale (SPAS) and all analysis will be conducted by Bayesian statistics too in order to obtain Bayesian information criterion (see below). The main purpose of using Bayesian statistics is the fact that it gives evidence both for null and alternative hypothesis that is not possible to obtain with Null Hypothesis Testing (NHST).

1.5.1. Social Physique Anxiety

Social physique anxiety is a concern about other individuals' evaluations about the ones' physical appearance which resulted in feeling anxious (Frederick & Morrison, 1996). Hart, Leary and Rejeski (1989) developed Social Physique Anxiety Scale (SPAS) in order to measure this concept. There are many researchers conducted to examine the relationship between social physique anxiety and exercise behavior. Cook et. al. (2015) found that social physique anxiety scores significantly predict exercise dependence scale scores among female runners and may be a factor in the development of secondary exercise dependence. Individuals with high social physique anxiety were more likely to do fitness related exercises rather than team sports and these exercises help to decrease social anxiety because they are helping to increase muscle mass and better body appearance (Frederick & Morrison, 1996).

Literature gives evidence about the relationship between exercise behavior and social physique anxiety. In literature, there are also studies investigating the relationship between body dissatisfaction which is a very close concept with social physique anxiety and cognitive processes. Men who have high body dissatisfaction fixate more and longer to the idealized muscular male body image in an attentional bias study conducted with eye tracking device, result are similar for women who have a bias towards thin bodies (Cho & Lee, 2013). Females who have high body dissatisfaction showed attentional bias toward shape/weight related words in an attentional probe task (Smith & Rieger, 2006).

The rationale behind adding social physique anxiety to this research is to examine the relationship between social physique anxiety and exercise dependence and excluding participants who have high anxiety from study in order to protect the attentional bias's that may caused by social physique anxiety rather than exercise dependence.

1.5.2. Bayesian Statistics

In psychological research, null-hypothesis significance testing (NHST) is very commonly use (Masson, 2011). In NHST there are two hypotheses; null and alternative which give two opposed explanations for a phenomenon (Ortega & Navarrete, 2017). NHST conducted to collected data and if the acquired p value lower than .05, it is presumed that this reject the null hypothesis and gives evidence of the alternative hypothesis (Kruschke, 2010; Masson, 2011; Ortega & Navarrete, 2017). There are some criticisms directed to NHTS testing and interpretation.

NHST gives evidence against the null hypothesis, but not gives evidence for alternative hypothesis (Ortega & Navarrete, 2017). Experimenter's intentions are important in NHST, this may resulted in different p values depending on the the intention of the experimenter (Wagenmakers, 2007). NHST has no limit for data collection, by increasing the sample size the probability to reject the null hypothesis increase (Ortega & Navarrete, 2017) and experimenter may stop the data collection when they reach the desired significant p value (Wagenmakers, 2007). NHST makes interpretations based on a hypothetical data distribution not the actual observed data (Wagenmakers, 2007; Ortega & Navarrete, 2017).

Bayesian information criterion (BIS) in Bayesian hypothesis testing is recommended for an alternative to NHST. In Bayesian, interpretations are based on distribution of the hypothesis (collected data), not like sampling distributions in NHST (Ortega & Navarrete, 2017). Bayesian method evaluate the strength of an evidence for both null and alternative hypothesis (Masson, 2011)

Table 1

Interpretation of PBIC values (Masson, 2011)

P_{BIC}	Evidence
.50 - .75	Weak
.75 - .95	Positive
.95 - .99	Strong
>.99	Very strong

1.6. Hypotheses

Main purpose of this study is to examine attentional bias in exercise dependence. So following hypothesis will be testing in this study;

1. It is expected that exercise dependence group will have significantly longer reaction times to fitness related words than neutral words compared to other groups.
2. It is expected that exercise dependence group will have significantly more errors on fitness words than neutral words compared to other groups.

Additional to our main purpose, SPAS scores will be analyzed among participants. Following hypothesis expected considering SPAS scores;

3. It is expected that, there is a negative correlation between exercise dependence scores and social physique anxiety scores.

CHAPTER 2

METHOD

2.1. Participants

48 male participants aged between 19 to 36 ($M = 25$, $SD = 4.34$) participate to the study. There is no significant age difference between groups; $F(2, 47) = 1.607$, $p = .212$. Participants were recruited from fitness centers and universities by using the snowball sampling method. They all voluntarily took part in the study. % 10 of them were high school graduates, % 90 were university. Based on Exercise Dependence Scale (EDS), 16 participants were assigned to “risk for dependence” group, 16 to “nondependent-symptomatic” group and “16 to “nondependent-asymptomatic” group. Exercise frequencies are; 4-5 days in a week for risk for dependence group and 3 days in a week for symptomatic group in average. 52% (≤ 30) has low social physique anxiety, 40% (31 to 39) has moderate social physique anxiety and 8% (≥ 40) has high social physique anxiety based on the criterias used in Chu, Bushman and Woodard (2008). 4 participants; 2 from asymptomatic group, 1 from symptomatic and 1 from risk for dependence group were excluded from the study because of having high social physique anxiety. Analyses will be conducted with 44 participants. The inclusion criteria for participants is being male, doing

fitness or not doing any kind of exercise. Participants who are doing other kind of exercises than fitness and participants who have colorblindness were excluded from the study.

2.2. Research Design

The experimental task (stroop) used a 3 (group) x 2 (word type) mixed factorial design. Group variable has 3 levels; risk for dependence, symptomatic, asymptomatic, word type variable has 2 levels; fitness, neutral. Participants' reaction times (RTs) and errors were measured as dependent variables. The word type was the within-subjects factor and groups were the between-subjects factor.

2.3. Materials

2.3.1 Diagnostic Tests

Exercise Dependence Scale (EDS) was developed by Hausenblas and Downs in 2002 (see Appendix 1). The scale is used to identify exercise dependence. It uses DSM IV criteria for substance dependence and abuse. The Exercise dependence scale identifies individuals who are at risk for exercise dependence, nondependent but symptomatic and nondependent and asymptomatic. The exercise dependence scale evaluates 7 sub-components of exercise dependence; withdrawal effects, continuance, tolerance, lack of control, reduction in other activities, time and intention effects. The scale has 3 statements measuring each 7 sub-components, and have 21 statements in total. Each item has six point Likert response option, 1 = "Never" and 6 = "Always". Components scored as 1 or 2 are asymptomatic, 5 or 6 are symptomatic. Individuals who score 3 or more sub-components as symptomatic are classified as at risk for exercise dependence. The Turkish adaptation of Exercise Dependence Scale was made by Yeltepe and İkizler in 2007. In 2006, Gürbüz and Aşçı conducted a study in order to test the reliability and validity of the scale. They

studied with 183 participants. They reported that the internal consistency of the total scale was .90.

Social Physique Anxiety Scale (SPAS) was developed by Hart, Leary and Rejeski in 1989 (See Appendix 2). The scale measures individuals' anxiety level and their perception on others evaluation about their physical appearance (Ballı & Aşçı, 2006). Scale has 12 items with a 5-point Likert scale. On 5 items (1., 2., 5., 8., and 11.) scores are reversed. Getting higher scores mean higher anxiety level about their physical appearance. Turkish adaptation of Social Physique Anxiety was made by Ballı and Aşçı in 2006. Test-retest correlation coefficients for two factor structure were 0.80 for factor 1 and 2 for females and .76 for factor 1 and .77 for factor 2 for males. Test-retest correlation coefficients for whole test was .88 for females and .81 for males. Internal consistency coefficients for two factor structure was .77 for factor 1 and .69 for factor 2 for females, .75 for factor 1 and .68 for factor 2 for males. For a one factor structure, .81 for females and .77 for males (Ballı ve Aşçı, 2006). The Body Image Satisfaction Questionnaire (BISQ) was also administered and a negative correlation was found between it and the Social Physique Anxiety Scale and correlation coefficients were between 0.43 and 0.57 (Ballı ve Aşçı, 2006). Chu, Bushman & Woodard (2008) separated SPAS scores into 3 groups. Participants who scored ≥ 40 were high, 31 to 39 were moderate and ≤ 30 were low in anxiety. In this study we applied this criterias, and participants who has high social physique anxiety will be excluded from the study.

Colorblindness Task. A video developed by University of London (Barbur, Harlow & Plant, 1994) was used in this study. In the video a colored square was

moving around by flickering and changing colours. Participants were asked to focus on the square and report if they were unable to see the square anymore. People who have color deficiency, would be unable to see the moving square at some point.

2.3.2 Experimental Tasks

Addiction Stroop Task. Addiction stroop task was used to test whether fitness related words would emotionally arouse risk for dependence group and would cause a bias that affects their reaction times and accuracy of their responses. Words that were used in the task determined by the pilot study (see next section). Addiction stroop task was designed in Psychopy. 20 fitness related words from the pilot study (see next section) and 20 neutral words were used in the task. Fitness words and neutral words were matched by syllabus and length. Fitness words were separated in 2 groups F1 (Fitness1) and F2 (Fitness2) each consisted of 10 words. They were matched in ratings from pilot study, length and syllabus. Same procedure was applied to neutral words N1 (Neutral1) and N2 (Neutral2). 4 blocks (N1, N2, F1 and F2) each contain 10 words and 40 trials were counterbalanced for each participant. Words are presented in the screen in random order. Each word appearing in the screen in red, blue, green and yellow in each block. Words are appearing in a grey background and stays in the screen until participant respond to it. Words are positioned in the middle of the display with 0.2 height in Arial font.

2.4 Pilot Study

A Pilot study was conducted with 31 participants. Pilot study participants were not participating to the main study. There were no inclusion criteria for pilot study participants. Snowball method was used. Preliminary research about fitness was done to find fitness-related words and terms to use in the pilot study. 33 fitness-

related words were determined by the experimenter. The list containing 33 fitness related words were given to each participant and asked them to rate each word from 0 to 5 (5= very related, 0=not related) based on their relatedness with fitness. Total ratings were calculated for each word and 20 words were chosen based on the highest ratings to use in the study.

Table 2

Total word ratings from the pilot study (descending)

Words	Mean	SD
Fitness	4,74	0,72
Antrenman	4,48	0,88
Kardiyo	4,48	1,04
Mekik	4,48	0,95
Isınma	4,48	0,88
Şınav	4,45	0,91
Kondisyon	4,42	0,61
Sixpack	4,42	0,94
Squat	4,39	0,66
Egzersiz	4,39	0,87
Dambıl	4,35	0,93
Ağırlık	4,29	0,73
Kas	4,26	0,98
Barfiks	4,16	1,05
Halter	4,03	1,18
Spinning	4,00	1,14
Atletik	3,90	1,17
Esneklik	3,81	1,06
Bicep	3,74	1,22
Adonis	3,74	0,88

2.5 Design and Procedure

Participants were instructed about the study in brief. Informed consent was taken from each participant. First, colorblindness task was applied to participants to make sure that they have no trouble with perceiving colors. They were excluded from the study if they have. There were 2 participants excluded from the study because of having colorblindness and didn't receive the addition-stroop task. Exercise Dependence Scale was given to participants, and scores calculated by the experimenter immediately to place participants in one of the three experimental groups: "at risk for exercise dependence", "nondependent-symptomatic" or "nondependent-asymptomatic. Short demographical information was taken from participants. Experimenter asked participants their name and surname, age, education, and how often they were doing fitness in a week. Addition stroop task was applied in Macbook air 13 inches laptop. Participants were informed about the task and asked them to press the appropriate button as fast as and as accurate as possible according to the word's color and ignore the word itself. Colored stickers were placed on the keyboard for participants to see which button they will press. They use index and middle fingers both of their hands to press the buttons. Responses associated with each button were counterbalanced. Half of the participants receive the buttons corresponding to blue (q) and green (w) placed on the left side of the keyboard, yellow (o) and red (p) will be placed on the right side of the keyboard, for other half red (q) and yellow (w) will be placed on the left side of the keyboard, green (o) and blue (p) will be placed on the right side. Practice trial was given to participant before the experiment to make sure that they learn the task and able to press the buttons without looking at the colored stickers on the keyboard. Participants received practice trial only once. Practice trials have 20 words and 80 trials. Words are different from the experimental task. Two practice trial tasks were

designed for each keyboard design with the same words. Participants took both the practice trial and experimental trial with the same keyboard design. After the practice trial, participants will receive the real task (see figure 1). Their reaction times and error were recorded in an excel file by Psychopy. Lastly, participants received the Social Physique Anxiety Scale (SPAS).

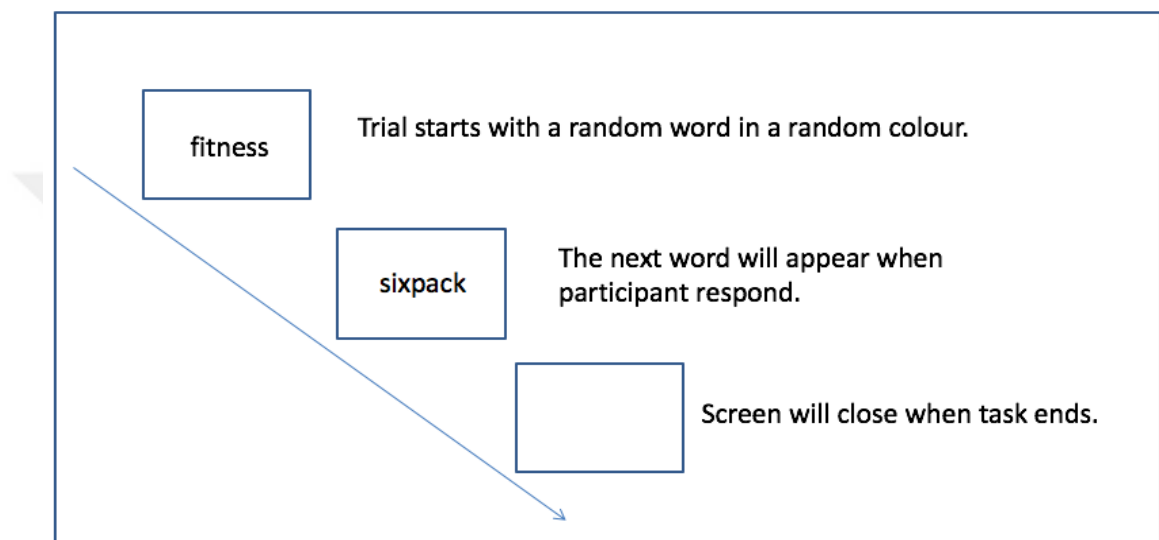


Figure 1. Stroop Task Paradigm

CHAPTER 3

RESULTS

Before the analysis, data screening was performed. Data was screened for missing values, univariate and multivariate outliers for the reaction time, error and scales data. There were no missing values. There was one multivariate outlier according to Mahalanobis distance .001 criterion. Square root transformation was applied to the data, however multivariate outlier didn't disappear. So, that outlier was deleted from the data. There were no univariate outliers in the data.

During the data collection, reaction times and error rates were recorded for each trial. The analysis will be conducted for word type, reaction times and error rates whether there will a significant difference among each group. Additionally, SPAS scores were obtained from each participant. The relation between EDS and SPAS scores will be examined. For each analysis, additional Bayesian analysis was conducted and will be reported.

Participants who scored more than 40 from SPAS were excluded from the study because of having high social physique anxiety. There were 4 participants met

the criterion. Analyses will be conducted with 43 participants; 14 risk for dependence, 15 symptomatic and 14 asymptomatic group.

3.1. Group Comparisons on Reaction Times and Errors

3.1.1. Reaction Times

As stated in the first hypothesis, it is expected that exercise dependence group will have significantly longer reaction times on fitness related words than neutral words compared to other groups. Participants' RTs were analyzed by using a 3 (group; risk for dependence, asymptomatic, symptomatic) x2 (word type; fitness, neutral) repeated measures ANOVA.

The assumption of sphericity was not calculated for word type because of having only two levels. ANOVA results indicated that there is no significant interaction between word type and group, $F(2, 40) = .1077$, $p = .350$, $\eta^2_p = .051$ (see table 3). Our main hypothesis rejected, there is no significant difference between group RTs on fitness words and neutral words. However, ANOVA results gives a significant main effect of word type, $F(1, 40) = 11.082$, $p = .002$, $\eta^2_p = .217$. There is a significant RT difference between fitness words ($M = 843$, $SD = 141$) and neutral words ($M = 814$, $SD = 137$). There is a general tendency to react slower to the fitness words than neutral words among all participants. Levene's test for equality of variances was not violated for the present analysis. There is no significant main effect of group on RT, $F(1, 40) = 1.365$, $p = .267$, $\eta^2_p = .064$. Bayesian analysis conducted to give additional support for our hypothesis.

Bayesian analysis gives strong evidence that there is no significant group and word type interaction $p(H_0|D) = .98$ and positive evidence that there is no significant main effect of group $p(H_0|D) = .91$. Bayesian analysis gives weak evidence that there

is no significant word type effect $p(H_0|D) = .03$ which means that there is 97% probability that alternative hypothesis is true. Bayesian results are consistent with our findings.

Table 3

Mean And Standart Deviation of RTs for Fitness And Neutral Words Across Groups

	Reaction Times (ms)			
	Fitness		Neutral	
	Mean	SD	Mean	SD
Risk for Dependence	813	140	802	135
Symptomatic	892	137	855	148
Asymptomatic	819	140	780	125

3.1.2. Errors

Second hypothesis stated that exercise dependence group will have significantly more errors on fitness words than neutral words compared to other groups. Participants' errors were analyzed by using a 3 (group; risk for dependence, asymptomatic, symptomatic) x2 (word type; fitness, neutral) repeated measures ANOVA.

The assumption of sphericity was not calculated for word type because of having only two levels. ANOVA results indicated that there is no significant interaction between word type and group, $F(2, 40) = .186$, $p = .831$, $\eta^2 = .009$ (see table 4). Our main hypothesis rejected, there is no significant difference between groups' errors on fitness and neutral words. In addition, there is no significant main

effect of word type on errors, $F(1, 40) = .017$, $p = .896$, $\eta^2 = .000$. Levene's test for equality of variances was not violated for the present analysis there is no significant main effect on group on errors, $F(1, 40) = .416$, $p = .663$, $\eta^2 = .020$.

Bayesian analysis conducted to give additional support to our hypothesis. Bayesian analysis give strong evidence that there is no significant word type and group interaction $p(H_0|D) = .97$. and positive evidence that there is no significant word type effect $p(H_0|D) = .87$. and strong evidence that there is no significant group effect $p(H_0|D) = .97$. Bayesian results are consistent with our findings.

Table 4

Means and Standart Deviations of Errors for Fitness and Neutral Words Across Groups

	Errors			
	Fitness		Neutral	
	Mean	SD	Mean	SD
Risk for Dependence	2.86	3.04	2.50	1.95
Symptomatic	2.13	1.51	1.93	1.79
Asymptomatic	2.07	2.30	1.79	1.42

3.1.3. Correlation between SPAS and EDS

In order to test our third hypothesis which expects negative correlation between SPAS scores and EDS scores, a Pearson Correlation was conducted. There is a significant and negative correlation between EDS and SPAS total scores, $r(43) = -.338$, $p = .027$. This means that participants who are at risk for exercise dependence

have lower social physique anxiety and participants who are asymptomatic have higher social physique anxiety (see table 5). Our third hypothesis was confirmed.

Table 5

Mean and SD of EDS and SPAS scores among each group

	EDS		SPAS	
	Mean	SD	Mean	SD
Risk for Dependence	94.07	13.51	26.29	5.17
Symptomatic	62.93	12.45	28.47	4.72
Asymptomatic	32.14	6.93	30.21	6.49

CHAPTER 4

DISCUSSION

This study was conducted with 43 males who grouped in three based on Exercise Dependence Scale; risk for dependence, non-dependent symptomatic and non-dependent asymptomatic. An addiction-stroop task was designed with fitness related words and neutral words. Task was applied by computer and participants' reaction times and errors were recorded to assess whether there is an attentional bias in exercise dependents towards fitness related words. Participants' SPAS scores are also examined. Even though there are many studies investigating attentional bias in dependencies, there is no study investigating attentional bias on exercise dependence. This study aims to fill that gap in the literature.

4.1. Summary of Results

We proposed that a) exercise dependence group would have significantly slower reaction times to fitness related words than control words compared to other groups b) exercise dependence group would make significantly more errors on fitness related words than neutral words compared to other groups c) significant and negative correlation expecting between SPAS and EDS scores.

Our findings suggested that a) exercise dependence group has no significantly slower reaction times to fitness related words compared to other groups. However, in all groups there is general tendency to react slower to fitness related words than neutral words, b) exercise dependence group has no significantly more errors to fitness related words compared to other groups and c) there is a significant and negative correlation found between SPAS and EDS scores. In sum, only our third hypothesis confirmed. Hypothesis 1 and 2 were rejected. All these findings were also analyzed with Bayesian statistics, results are consistent.

4.2. Literature

Our results were inconsistent with the dominant literature which found attentional bias towards various dependencies. Our results were also different from Berry (2006) and Calitri et. al. (2009) which studied attentional bias towards exercise related pictures and words.

However, our results showed similarities with the study conducted by Berry, Spence and Stolp (2011). They didn't find any significant difference between RTs to exercise related images and control images among men and they found a general tendency to have an attentional bias towards exercise-related pictures among men. Similar to ours, individuals who has internet gaming disorder would not show an attentional bias towards computer-related words in addiction-stroop task (Jeromin, Rief & Barke, 2016).

4.3. Theoretical Implications

Our main purpose was to find group differences on RTs on fitness related words. However, even though all men showed a bias towards fitness related words,

we didn't find any group difference, especially for exercise dependence group. Additional to the NHST, Bayesian analysis also gives good evidence that there is no attentional bias.

One explanation for this might be the difficulties in differentiating primary exercise dependence. Failure in separating primary exercise dependence from others may also eliminate the desired results. According to Hamer and Karageorghis (2007) accurately identifying ED is very challenging because lack of any universally agreed measures and diagnostic criterias. Even though there are different diagnostic criteria's were offered from different researchers, exercise dependence still is not in the diagnostic manuals (ICD-10 or DSM-5) (Lichtenstein et. al., 2017). Until now, there are several questionnaires and scales developed in order to measure exercise dependence symptoms; The Negative Addiction Scale (Hailey & Bailey, 1982), The Obligatory Exercise Questionnaire (Thompson & Pasman, 1991), The Running Addiction Scale (Chapman & De Castro, 1990), The Exercise Dependence Questionnaire (Ogden, Veale & Summers, 1997), The Exercise Beliefs Questionnaire (Loumidis & Wells, 1998) and The Exercise Addiction Inventory (Terry, Szabo & Griffiths, 2004) and Exercise Dependence Scale (Hausenblas & Downs, 2002a). Unfortunately, only EDS has a Turkish adapted version.

Another difficulty in identifying ED is coming from the co-existing disorders with exercise dependence such as; eating disorders, muscle dysmorphia and obsessive-compulsive disorder (Lichtenstein et. al., 2017). Excessive exercising is highly common among anorexic individuals (Davis et. al., 1995). Cook et. al. (2013) measure secondary exercise dependence by using Goldfarb Fear of Fat Scale

(Goldfarb, Dykens & Gerrard, 1985) which is using as an assessment tool for bulimia, with EDS and found higher EDS scores in secondary exercise dependence group compared to primary.

There is also a debate whether primary exercise dependence is really exist. Veale (1995) was discussing whether primary exercise dependence exists. Individuals experiencing primary exercise dependence don't seek for psychological help (Veale, 1995). According to Veale (1995) there might be three reasons for this; first, participants might function well in family, social environment and health. Second, they are denying that they have a problem. Third, they don't believe in the help that is giving or they don't know if there is a help. So, according to Veale, primary exercise dependence exists but very rare. Some researches claim that exercise dependency is always a secondary condition and primary exercise dependence is not exist (Lichtenstein et. al., 2017).

To summarize, even though there is a growing interest towards exercise dependence, there is no common agreement about the definition, diagnosis and measurement methods of primary exercise dependence in literature. Additionally, comorbid disorders cause more trouble during this phase. When the situation is that complicated, identifying primary exercise dependence might be more difficult then it seems. Wider and more detailed assessments are needed to identify primary exercise dependence. This might be one of the distinctive features from the substance dependencies such as alcohol and drug addiction which are diagnosed more easily with universally accepted methods. Difficulties in identifying exercise dependence might affect our results.

4.3.1. Why men react slower to fitness related words?

The general tendency to react slower to fitness-related words among men can be explained by being exposed to “ideal male body” regularly from different resources; televisions, movies, magazines, billboards and social media. Researches about media influence on male body image gained importance. Magazines and media expose muscular male images daily and the ideal male body image become more muscular by years (Pope, Olivardia, Gruber & Borowiecki, 1999). Pope et. al. (1999) found out that action toy figures become more muscular compare to their predecessors over years. Law and Labre (2002), examined male images in popular magazines published in a 30 year period (1967-1997). Over years, men images become more muscular and lean and v-shaped body (broad shoulder, narrow waist) image become more common (Law & Labre, 2002). Andersen & DiDomenico (1992) examined 10 popular male and female magazine advertisements; they found that there is a dominance of diet articles in female magazines, and body shape change articles in male magazines. Even the lead artists in action movies are also very muscular (Law & Labre, 2002).

Similarly, social media which 79% of young people using it has an impact too (Carrotte, Prichard, Lim, 2017). There is a growing trend in social media called “fitspiration”, in broad terms “fitness inspiration” (Carrotte, Prichard, Lim, 2017). A cross-sectional study conducted in Australia reported that, 38% of the participants following fitness and health related pages, 31% fitspiration pages (Carrotte, Vella & Lim, 2015). These pages contains self-taken pictures, before and after images, fitness tips, fitness videos, etc. (Carrotte, Prichard & Lim, 2017). Those self taken pictures generally contains muscular men who are showing his stomachs, biceps and pectoral

muscles (Carrotte, Prichard & Lim, 2017). Men are exposed to ideal male body image from different sources both voluntarily and involuntarily. Being exposed all these unrealistic body image and exercise related stimuli around environment create sensitivity about their body (Lorenzen, Grieve & Thomas, 2004) and this may have resulted in having an attentional bias.

There is a study conducted to investigate the effect of frequency of exposure on attentional bias. Albery et. al. (2015) investigating whether frequency of alcohol related cue exposure effects stroop interference among drinkers. Exposure from the environment defined as hours spent in bars/pubs/nightclubs. For the heavy drinkers, there is no difference between high and low exposure. However, high exposure causes more interference in the stroop task among light drinkers. Exposure didn't affect heavy drinkers whom already reach to a threshold by having an active involvement with alcohol, however this is not the case for light drinkers (Albery et. al., 2015). Ideal body image exposure may affect all participants especially non-dependents. This might be the reason to have a general bias.

In this study, even though words that are using in addiction-stroop were matched in terms of length and syllabus, they couldn't match in terms of frequency because of the lack of frequency information that fitness words. Burt (2002) reported that low frequency words causes more interference than high frequency words. If the fitness related words have lower frequency rates, than this would cause an attentional bias towards those words among all participants.

4.3.2. Social Physique Anxiety and Exercise

As we expected, SPAS has a negative correlation with EDS. Literature has some consistent findings like our study. Whether there is a dominance literature about the body dissatisfaction among women, Furnham & Calnan (1998) reported that 69 percent of their male participants were dissatisfied with their bodies. Unrealistic muscular male body image televisions, magazines, billboards and movies, and this create sensitivity and awareness about their body (Lorenzen, Grieve & Thomas, 2004). (Carrotte, Prochard & Lim, 2017). Leit, Gray & Pope (2002) reported that, being exposed to muscular figures in advertisements resulted in body dissatisfaction among men whom have a desire to have a V-shaped body (Furnham, Badmin & Sneade, 2002; Andersen & DiDomenico, 1992; Law & Labre, 2002; Cho & Lee, 2013) and increase the distance between the perception of their masculinity and their ideal masculinity. Mens' body satisfaction decreased after they exposed to muscular men images and stay constant after they exposed to non-muscular men images (Lorenzen, Grieve & Thomas, 2004). According to the social comparison theory, people have tendency to compare their selves to other people, being exposed to ideal body images cause negative feelings because of seeing the discrepancy between the ideal body image and theirs' (Nikkelen et. al., 2012). This discrepancy can cause social physique anxiety. Pope et. al. (2000) reported that male college students from Austria, France and USA would like to have more muscle mass (min. 12 kg) than they have. There is a negative relationship between body image satisfaction and social physique anxiety (Koyuncu, 2010). Body dissatisfaction resulted in feelings of insufficiency and unattractiveness and trying to fulfill this by doing exercise (Duggan & McCreary, 2004).

In order to reach the ideal male body shape presented in media, excessive exercise needed (Nikkelen et. al., 2012) and according to men, comparing to doing a diet, exercise is a basic and convenient strategy to change body shape (Furnham & Calnan, 1998). Gyms have a role in physical fitness and self-presentation (Crawford & Eklund, 1994). Exercise helps to anxious people to control their body shape (Cook et. al., 2015). McAuley, Bane, Rudolph and Rox (1995) established that physique anxiety reduces over time by engaging in regular physical activity. Hurst, Hale, Smith and Collins (2000) found significantly lower social physique anxiety among male experienced body-builders and weightlifters than inexperienced bodybuilders. There is a relationship between being physically active and some psychological aspects such as self-esteem and positive body perception. Lowery et. al (2005) stated that physical fitness related behaviors lead to positive self-esteem and body image, which may have resulted in lower social physique anxiety.

In sum, men are dissatisfied with their bodies and wanted to achieve a muscular body. A convenient way to do that for men is to do a physical activity. However there is a reciprocal relationship between physical activity and physique anxiety. Literature is consistent with our findings.

4.3.3. Methodological Issues

During the data collection phase, potential participants were chosen depending on whether they are doing fitness or not. EDS was giving to participants before the Stroop task, this may create priming effect across all participants. And this may have affected their attention. However, there are studies using this kind of procedural order still found attentional bias among participants. For example,

Lubman et. al. (2000) gave the questionnaires assessing participants's opiate addictions and then apply the experimental task, also studies including craving assessment gives the questionnaire before and after the experimental task such as Cousijn et. al. (2013) studying with cannabis dependence and found attentional bias towards cannabis related words among dependent cannabis smokers compared to non-dependent cannabis smokers in modified-stroop task. In another scenario, blind study can be conducted. Participants received the stroop task first, and then fill the EDS and SPAS. But in this time there will be a risk for participant loss. Calitri et. al. (2009) and Berry (2006) conducted the study without telling the primary purpose of the study and participants did experimental tasks first and then other applications.

4.4. Limitations

In order to assessing Exercise Dependence, even though there are many scales and questionnaires developed to asses Exercise Dependence, only EDS has a Turkish adapted version. This restricts the ability to compare with other scales to receive more strong evidence for exercise dependence. Additionally to the restriction of the assessment tools, self-report measure may not be a good way to measure. Because when the topic is exercise and body, men may ashamed about their own body and this dissatisfaction about it (Nikkelen et. al., 2012). Beside self-report measures, a clinical opinion would be very helpful to make better judgments and eliminate unrealistic responses.

Another limitation is, participants attended to the task when they are available. This available time may be before or after their exercise. This may affect individuals' attentions. Exercise dependents show withdrawal symptoms when they don't exercise, therefore testing them before the exercise, participants may have a

craving for exercise and this make them more sensitive to related stimuli. Maybe these conditions may affect their attention and the result.

In the addiction-stroop task, time limit may be set to the stimulus presentation in the screen. Not having a limit may lead participants to respond slowly and affect their performances. With the time limit, the stimulus that they miss during the task can be also added to the analysis beside the errors for further support.

4.5. Future Directions

This study couldn't find an attentional bias in exercise dependents. For future studies, this study may be replicated with more participants and including females.

In future, in order to distinguish individuals who have primary exercise dependence, participants should be screened for comorbidity disorders in detail. Tools assessing eating disorders and body image disorders can be used.

Also participants who have primary and secondary exercise dependence can be compared based on their reaction times. More distinct word categories can be added to the stroop task such as body related words, exercise related words and neutral words. Participants' reaction times were examined by comparing among words and groups according to those.

Beside the stroop task, other attentional bias methods may be used to measure such as eye tracking device, visual probe task etc. Some studies reported that pictorial stimuli have better ecological validity (Brignell et. al., 2009). Because of having a visual nature of exercise and body related concepts, it would be a better

method to use pictorial stimuli. However, even though Berry, Spence and Stolp (2011) conducted the study with visual probe task. They had similar findings with us.



REFERENCES

- Albery, I. P., Sharma, D., Noyce, S., Frings, D., & Moss, A. C. (2015). Testing a frequency of exposure hypothesis in attentional bias for alcohol-related stimuli amongst social drinkers. *Addictive Behaviors Reports*, 1, 68-72.
- Andersen, A. E., & DiDomenico, L. (1992). Diet vs. shape content of popular male and female magazines: A dose-response relationship to the incidence of eating disorders?. *International Journal of Eating Disorders*, 11(3), 283-287.
- Anshel, M. H. (1991). A psycho-behavioral analysis of addicted versus non-addicted male and female exercisers. *Journal of Sport Behavior*, 14(2), 145.
- Baekeland, F. (1970). Exercise deprivation: Sleep and psychological reactions. *Archives of General Psychiatry*, 22(4), 365-369.
- Ballı, Ö. M., & Aşçı, F. H. (2006). Sosyal fizik kaygı envanterinin geçerlilik ve güvenilirlik çalışması. *Spor Bilimleri Dergisi*, 17(1), 11-19.
- Bamber, D., Cockerill, I. M., & Carroll, D. (2000). The pathological status of Exercise dependence. *British Journal of Sports Medicine*, 34(2), 125-132.
- Barbur, J. L., Harlow, A. J., & Plant, G. T. (1994). Insights into the different exploits

of colour in the visual cortex. *Proceedings of the Royal Society of London B: Biological Sciences*, 258(1353), 327-334.

Berlin, A. A., Kop, W. J., & Deuster, P. A. (2006). Depressive mood symptoms and fatigue after exercise withdrawal: the potential role of decreased fitness. *Psychosomatic Medicine*, 68(2), 224-230.

Berry, T. R. (2006). Who's even interested in the exercise message? Attentional bias for exercise and sedentary-lifestyle related words. *Journal of Sport and Exercise Psychology*, 28(1), 4-17.a

Berry, T. R., Spence, J. C., & Stolp, S. M. (2011). Attentional bias for exercise related images. *Research Quarterly for Exercise and Sport*, 82(2), 302-309.

Blumenthal, J. A., O'toole, L. C., & Chang, J. L. (1984). Is running an analogue of anorexia nervosa?: An empirical study of obligatory running and anorexia nervosa. *JAMA*, 252(4), 520-523.

Boecker, H., Sprenger, T., Spilker, M. E., Henriksen, G., Koppenhoefer, M., Wagner, K. J., ... & Tolle, T. R. (2008). The runner's high: opioidergic mechanisms in the human brain. *Cerebral Cortex*, 18(11), 2523-2531.

Boyer, M., & Dickerson, M. (2003). Attentional bias and addictive behaviour: automaticity in a gambling-specific modified Stroop task. *Addiction*, 98(1), 61-70.

- Brené, S., Bjørnebekk, A., Åberg, E., Mathé, A. A., Olson, L., & Werme, M. (2007). Running is rewarding and antidepressive. *Physiology & Behavior*, 92(1), 136-140.
- Brevers, D., Cleeremans, A., Bechara, A., Laloyaux, C., Kornreich, C., Verbanck, P., & Noël, X. (2011). Time course of attentional bias for gambling information in problem gambling. *Psychology of Addictive Behaviors*, 25(4), 675.
- Brignell, C., Griffiths, T., Bradley, B. P., & Mogg, K. (2009). Attentional and approach biases for pictorial food cues. Influence of external eating. *Appetite*, 52(2), 299-306.
- Burt, J. S. (2002). Why do non-color words interfere with color naming?. *Journal of Experimental Psychology: Human Perception and Performance*, 28(5), 1019.
- Calitri, R., Lowe, R., Eves, F. F., & Bennett, P. (2009). Associations between visual attention, implicit and explicit attitude and behaviour for physical activity. *Psychology and Health*, 24(9), 1105-1123.
- Carrotte, E. R., Prichard, I., & Lim, M. S. C. (2017). “Fitspiration” on Social Media: A Content Analysis of Gendered Images. *Journal of Medical Internet Research*, 19(3).
- Carrotte, E. R., Vella, A. M., & Lim, M. S. (2015). Predictors of “liking” three types

Of health and fitness-related content on social media: a cross-sectional study.
Journal of Medical Internet Research, 17(8).

Cassiday, K. L., McNally, R. J., & Zeitlin, S. B. (1992). Cognitive processing of trauma cues in rape victims with post-traumatic stress disorder. *Cognitive Therapy and Research*, 16(3), 283-295.

Chapman, C. L., & De Castro, J. M. (1990). Running addiction: measurement. *J Sports Med Phys Fitness*, 30, 283-90.

Cho, A., & Lee, J. H. (2013). Body dissatisfaction levels and gender differences in attentional biases toward idealized bodies. *Body Image*, 10(1), 95-102.

Chu, H. W., Bushman, B. A., & Woodard, R. J. (2008). Social physique anxiety, obligation to exercise, and exercise choices among college students. *Journal of American College Health*, 57(1), 7-14.

Cohen, J. D., Dunbar, K., & McClelland, J. L. (1990). On the control of automatic processes: a parallel distributed processing account of the Stroop effect. *Psychological review*, 97(3), 332.

Cook, B., Karr, T. M., Zunker, C., Mitchell, J. E., Thompson, R., Sherman, R., ... & Wonderlich, S. A. (2013). Primary and secondary exercise dependence in a community-based sample of road race runners. *Journal of Sport and Exercise Psychology*, 35(5), 464-469

- Cook, B., Karr, T. M., Zunker, C., Mitchell, J. E., Thompson, R., Sherman, R., ... & Crosby, R. D. (2015). The influence of exercise identity and social physique anxiety on exercise dependence. *Journal of Behavioral Addictions*, 4(3), 195-199.
- Cousijn, J., Watson, P., Koenders, L., Vingerhoets, W. A. M., Goudriaan, A. E., & Wiers, R. W. (2013). Cannabis dependence, cognitive control and attentional bias for cannabis words. *Addictive Behaviors*, 38(12), 2825-2832.
- Coverley Veale, D. D. (1987). Exercise dependence. *Addiction*, 82(7), 735-740.
- Cox, W. M., Fadardi, J. S., & Pothos, E. M. (2006). The addiction-stroop test: Theoretical considerations and procedural recommendations. *Psychological Bulletin*, 132(3), 443.
- Cox, R. H., Thomas, T. R., & Davis, J. E. (2001). Positive and negative affect associated with an acute bout of aerobic exercise. *Journal of Exercise Physiology Online*, 4(4).
- Cox, W. M., Yeates, G. N., & Regan, C. M. (1999). Effects of alcohol cues on cognitive processing in heavy and light drinkers. *Drug and Alcohol Dependence*, 55(1), 85-89.
- Crawford, S., & Eklund, R. C. (1994). Social physique anxiety, reasons for exercise,

and attitudes toward exercise settings. *Journal of Sport and Exercise Psychology*, 16(1), 70-82.

Davis, C., Kennedy, S. H., Ralevski, E., Dionne, M., Brewer, H., Neitzert, C., & Ratusny, D. (1995). Obsessive compulsiveness and physical activity in anorexia nervosa and high-level exercising. *Journal of Psychosomatic Research*, 39(8), 967-976.

Dehaene, S., Kerszberg, M., & Changeux, J. P. (1998). A neuronal model of a global workspace in effortful cognitive tasks. *Proceedings of the National Academy of Sciences*, 95(24), 14529-14534.

Dietrich, A., & McDaniel, W. F. (2004). Endocannabinoids and exercise. *British Journal of Sports Medicine*, 38(5), 536-541.

Duggan, S. J., & McCreary, D. R. (2004). Body image, eating disorders, and the for muscularity in gay and heterosexual men: The influence of media images. *Journal of Homosexuality*, 47(3-4), 45-58.

Esch, T., & Stefano, G. B. (2010). Endogenous reward mechanisms and their importance in stress reduction, exercise and the brain. *Archives of Medical Science: AMS*, 6(3), 447.

Fadardi, J. S., & Cox, W. M. (2006). Alcohol attentional bias: drinking salience or cognitive impairment?. *Psychopharmacology*, 185(2), 169-178.

Field, M. (2005). Cannabis 'dependence' and attentional bias for cannabis-related words. *Behavioural Pharmacology*, 16(5-6), 473-476.

Field, M., Christiansen, P., Cole, J., & Goudie, A. (2007). Delay discounting and the alcohol Stroop in heavy drinking adolescents. *Addiction*, 102(4), 579-586.

Field, M., Mogg, K., & Bradley, B. P. (2004). Cognitive bias and drug craving in recreational cannabis users. *Drug and Alcohol Dependence*, 74(1), 105-111.

Field, M., Munafò, M. R., & Franken, I. H. (2009). A meta-analytic investigation of the relationship between attentional bias and subjective craving in substance abuse *Psychological Bulletin*, 135(4), 589.

Frederick, C. M., & Morrison, C. S. (1996). Social physique anxiety: Personality constructs, motivations, exercise attitudes, and behaviors. *Perceptual and Motor Skills*, 82(3), 963-972.

Freimuth, M., Moniz, S., & Kim, S. R. (2011). Clarifying exercise addiction: differential diagnosis, co-occurring disorders, and phases of addiction. *International Journal of Environmental Research and Public Health*, 8(10), 4069-4081.

Furnham, A., Badmin, N., & Sneade, I. (2002). Body image dissatisfaction: Gender differences in eating attitudes, self-esteem, and reasons for exercise. *The Journal of psychology*, 136(6), 581-596.

Furnham, A., & Calnan, A. (1998). Eating disturbance, self-esteem, reasons for exercising and body weight dissatisfaction in adolescent males. *European Eating Disorders Review*, 6(1), 58-72.

Furst, D. M., & Germone, K. (1993). Negative addiction in male and female runners and exercisers. *Perceptual and Motor Skills*, 77(1), 192-194.

Goldfarb, L. A., Dykens, E. M., & Gerrard, M. (1985). The Goldfarb fear of fat scale. *Journal of Personality Assessment*, 49(3), 329-332.

Gürbüz, B., & Aşçı, F. H. (2006). Egzersiz bağımlılığı ölçeği-21'in egzersiz katılımcıları için psikometrik özelliklerinin değerlendirilmesi-ön çalışma. *Gazi Beden Eğitimi Ve Spor Bilimleri Dergisi*, 2, 3-10.

Hailey, B. J., & Bailey, L. A. (1982). Negative addiction in runners: A quantitative approach. *Journal of Sport Behavior*.

Hamer, M., & Karageorghis, C. I. (2007). Psychobiological mechanisms of exercise dependence. *Sports medicine*, 37(6), 477-484.

Hamer, M., & Vlachopoulos, S. P. (2002). Motives for exercise participation as predictors of exercise dependence among endurance athletes. *Journal of Sports Medicine and Physical Fitness*, 42(2), 233.

Hart, E. A., Leary, M. R., & Rejeski, W. J. (1989). The Measurement of Social

Physique Anxiety. *Journal of Sport and exercise Psychology*, 11(1), 94-104.

Hausenblas, H. A., & Downs, D. S. (2000). Exercise dependence: a systematic review. *Psychology of Sport and Exercise*, 3(2), 89-123.

Hausenblas, H. A., & Downs, D. S. (2002a). How much is too much? The development and validation of the exercise dependence scale. *Psychology and Health*, 17(4), 387-404.

Hausenblas, H. A., & Downs, D. S. (2002b). Relationship among sex, imagery and exercise dependence symptoms. *Psychology of Addictive Behaviors*, 16(2), 169.

Hausenblas, H., & Smoliga, J. (2017). Keep on running: exercise addiction in men. *Trends in Urology & Men's Health*, 8(5), 8-11.

Hermans, D., De Houwer, J., & Eelen, P. (1996). Evaluative decision latencies mediated by induced affective states. *Behaviour Research and Therapy*, 34(5), 483-488.

Hester, R., Dixon, V., & Garavan, H. (2006). A consistent attentional bias for drug-related material in active cocaine users across word and picture versions of the emotional Stroop task. *Drug and Alcohol Dependence*, 81(3), 251-257.

Hurst, R., Hale, B., Smith, D., & Collins, D. (2000). Exercise dependence, social

physique anxiety, and social support in experienced and inexperienced bodybuilders and weightlifters. *British Journal of Sports Medicine*, 34(6), 431-435.

Jeromin, F., Rief, W., & Barke, A. (2016). Using two web-based addiction Stroops to measure the attentional bias in adults with Internet Gaming Disorder. *Journal of behavioral addictions*, 5(4), 666-673.

Joutsa, J., Johansson, J., Niemelä, S., Ollikainen, A., Hirvonen, M. M., Piepponen, P., ...& Hietala, J. (2012). Mesolimbic dopamine release is linked to symptom severity in pathological gambling. *Neuroimage*, 60(4), 1992-1999.

Kelley, A. E., & Berridge, K. C. (2002). The neuroscience of natural rewards: relevance to addictive drugs. *Journal of Neuroscience*, 22(9), 3306-3311.

Kendzierski, D. (1988). Self-schemata and exercise. *Basic and Applied Social Psychology*, 91, 45-59.

Koyuncu, M., Tok, S., Canpolat, A. M., & Catikkas, F. (2010). Body image satisfaction and dissatisfaction, social physique anxiety, self-esteem, and body fat ratio in female exercisers and nonexercisers. *Social Behavior and Personality: An International Journal*, 38(4), 561-570.

Kruschke, J. K. (2010). What to believe: Bayesian methods for data analysis. *Trends in Cognitive Sciences*, 14(7), 293-300.

Law, C., & Labre, M. P. (2002). Cultural standards of attractiveness: A thirty-year look at changes in male images in magazines. *Journalism & Mass Communication Quarterly*, 79(3), 697-711.

Leit, R. A., Gray, J. J., & Pope, H. G. (2002). The media's representation of the ideal male body: A cause for muscle dysmorphia?. *International Journal of Eating Disorders*, 31(3), 334-338.

Leuenberger, A. (2006). Endorphins, exercise, and addictions: a review of exercise dependence. *The Premier Journal for Undergraduate Publications in the Neurosciences*, 3, 1-9.

Lichtenstein, M. B., Hinze, C. J., Emborg, B., Thomsen, F., & Hemmingsen, S. D. (2017). Compulsive exercise: links, risks and challenges facedent. *Psychology Research and Behavior Management*, 10, 85.

Litz, B. T., Payne, T. J., & Colletti, G. (1987). Schematic processing of smoking information by smokers and never-smokers. *Cognitive Therapy and Research*, 11(3), 301-313.

Liu, S., Lane, S. D., Schmitz, J. M., Waters, A. J., Cunningham, K. A., & Moeller, F. G. (2011). Relationship between attentional bias to cocaine-related stimuli and impulsivity in cocaine-dependent subjects. *The American Journal of Drug and Alcohol Abuse*, 37(2), 117-122.

Lochbuehler, K., Voogd, H., Scholte, R. H., & Engels, R. C. (2011). Attentional bias in smokers: exposure to dynamic smoking cues in contemporary movies. *Journal of Psychopharmacology*, 25(4), 514-519.

Lorenzen, L. A., Grieve, F. G., & Thomas, A. (2004). Brief report: Exposure to muscular male models decreases men's body satisfaction. *Sex Roles*, 51(11-12), 743-748.

Norris, R., Carroll, D., & Cochrane, R. (1992). The effects of physical activity and exercise training on psychological stress and well-being in an adolescent population. *Journal of Psychosomatic Research*, 36(1), 55-65.

Loumidis, K. S., & Wells, A. (1998). Assessment of beliefs in exercise dependence: The development and preliminary validation of the exercise beliefs questionnaire. *Personality and Individual Differences*, 25(3), 553-567.

Lowery, S. E., Kurpius, S. E. R., Befort, C., Blanks, E. H., Sollenberger, S., Nicpon, M. F., & Huser, L. (2005). Body image, self-esteem, and health-related behaviors among male and female first year college students. *Journal of College Student Development*, 46(6), 612-623.

Lovett, M. C. (2002). Modeling selective attention: Not just another model of Stroop (NJAMOS). *Cognitive Systems Research*, 3(1), 67-76.

Lubman, D. I., Peters, L. A., Mogg, K., Bradley, B. P., & Deakin, J. F. W. (2000).

Attentional bias for drug cues in opiate dependence. *Psychological Medicine*, 30(1), 169-175.

Lyons, H. A., & Cromey, R. (1989). Compulsive jogging: exercise dependence and associated disorder of eating. *The Ulster Medical Journal*, 58(1), 100.

Mathews, A., Mogg, K., Kentish, J., & Eysenck, M. (1995). Effect of psychological treatment on cognitive bias in generalized anxiety disorder. *Behaviour Research and Therapy*, 33(3), 293-303.

McAuley, E., Bane, S. M., Rudolph, D. L., & Lox, C. L. (1995). Physique anxiety and exercise in middle-aged adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 50(5), P229-P235.

Masson, M. E. (2011). A tutorial on a practical Bayesian alternative to null-hypothesis significance testing. *Behavior Research Methods*, 43(3), 679-690.

Metcalf, O., & Pammer, K. (2011). Attentional bias in excessive massively multiplayer online role-playing gamers using a modified Stroop task. *Computers in Human Behavior*, 27(5), 1942-1947.

Mogg, K., Bradley, B. P., Millar, N., & White, J. (1995). A follow-up study of cognitive bias in generalized anxiety disorder. *Behaviour Research and Therapy*, 33(8), 927-935.

Mogg, K., Field, M., & Bradley, B. P. (2005). Attentional and approach biases for

smoking cues in smokers: an investigation of competing theoretical views of addiction. *Psychopharmacology*, 180(2), 333-341.

Mondin, G. W., Morgan, W. P., Piering, P. N., Stegner, A. J., Stotesbery, C. L., Trine, M. R., & Wu, M. Y. (1996). Psychological consequences of exercise deprivation in habitual exercisers. *Medicine & Science in Sports & Exercise*.

Morris, M., Steinberg, H., Sykes, E. A., & Salmon, P. (1990). Effects of temporary withdrawal from regular running. *Journal of Psychosomatic Research*, 34(5), 493-500.

Morris, P., & Merckelbach, H. (1998). Specific phobias. *Comprehensive Clinical Psychology*, 6, 461-474.

Nikkelen, S. W., Anschutz, D. J., Ha, T., & Engels, R. C. (2012). Influence of visual attention on male body dissatisfaction after idealized media exposure. *Psychology of Men & Masculinity*, 13(3), 308.

Ogden, J., Veale, D., & Summers, Z. (1997). The development and validation of the Exercise Dependence Questionnaire. *Addiction Research*, 5(4), 343-355.

Ortega, A., & Navarrete, G. (2017). Bayesian Hypothesis Testing: An Alternative to Null Hypothesis Significance Testing (NHST) in Psychology and Social Sciences. In *Bayesian Inference*. InTech.

Pierce, E. F., Daleng, M. L., & McGowan, R. W. (1993). Scores on exercise

dependence among dancers. *Perceptual and Motor Skills*, 76(2), 531-535.

Pope, H. G., Olivardia, R., Gruber, A., & Borowiecki, J. (1999). Evolving ideals of male body image as seen through action toys. *International journal of eating disorders*, 26(1), 65-72.

Pope Jr, H. G., Gruber, A. J., Mangweth, B., Bureau, B., Decol, C., Jouvent, R., & Hudson, J. I. (2000). Body image perception among men in three countries. *American Journal of Psychiatry*, 157(8), 1297-1301.

Richards, A., & Millwood, B. (1989). Colour-identification of differentially valenced words in anxiety. *Cognition and Emotion*, 3(2), 171-176.

Robinson, T. E., & Berridge, K. C. (1993). The neural basis of drug craving: an incentive-sensitization theory of addiction. *Brain Research Reviews*, 18(3), 247-291.

Robinson, T. E., & Berridge, K. C. (2008). Review. The incentive sensitization theory of addiction: some current issues. *Philosophical Transactions Biological Sciences*, 363, 3137-3146.

Robinson, M. J., Robinson, T. E., & Berridge, K. C. (2013). Incentive salience and the transition to addiction. *Biological Research on Addiction*, 2, 391-9.

Rosa, D. A., De Mello, M. T., Negrão, A. B., & de Souza-Formigoni, M. L. O.

(2004). Mood changes after maximal exercise testing in subjects with symptoms of exercise dependence. *Perceptual and Motor Skills*, 99(1), 341-353.

Smith, E., & Rieger, E. (2006). The effect of attentional bias toward shape-and weight- related information on body dissatisfaction. *International Journal of Eating Disorders*, 39(6), 509-515.

Sussman, S., Lisha, N., & Griffiths, M. (2011). Prevalence of the addictions: a problem of the majority or the minority?. *Evaluation & The Health Professions*, 34(1), 3-56.

Szabo, A., De La Vega, R., Ruiz-Barquín, R., & Rivera, O. (2013). Exercise addiction in Spanish athletes: Investigation of the roles of gender, social context and level of involvement. *Journal of Behavioral Addictions*, 2(4), 249-252.

Terry, A., Szabo, A., & Griffiths, M. (2004). The exercise addiction inventory: A new brief screening tool. *Addiction Research and Theory*, 12(5), 489-499.

Thompson, J. K., & Blanton, P. (1987). Energy conservation and exercise dependence: A sympathetic arousal hypothesis. *Medicine & Science in Sports & Exercise*, 19(2), 91-99.

Thompson, J.K., & Pasman, L. (1991). The obligatory exercise questionnaire. *The*

Behavior Therapist, 14, 137.

Thomsen, K. R., Fjorback, L. O., Møller, A., & Lou, H. C. (2014). Applying incentive sensitization models to behavioral addiction. *Neuroscience & Biobehavioral Reviews*, 45, 343-349.

Townshend, J., & Duka, T. (2001). Attentional bias associated with alcohol cues: differences between heavy and occasional social drinkers *Psychopharmacology*, 157(1), 67-74.

Veale, D. (1995). Does primary exercise dependence really exist. *Exercise Addiction: Motivation for Participation in Sport and Exercise*, 1-5.

Villella, C., Martinotti, G., Di Nicola, M., Cassano, M., La Torre, G., Gliubizzi, M. D., ... & Conte, G. (2011). Behavioural addictions in adolescents and young adults: results from a prevalence study. *Journal of Gambling Studies*, 27(2), 203-214.

Weinstein, A. M. (2010). Computer and video game addiction—a comparison between game users and non-game users. *The American journal of drug and alcohol abuse*, 36(5), 268-276.

Weinstein, A., & Weinstein, Y. (2014). Exercise addiction-diagnosis, biopsychological mechanisms and treatment issues. *Current pharmaceutical design*, 20(25), 4062-4069.

- Wagenmakers, E. J. (2007). A practical solution to the pervasive problems of p-values. *Psychonomic bulletin & review*, 14(5), 779-804.
- Wang, G. J., Geliebter, A., Volkow, N. D., Telang, F. W., Logan, J., Jayne, M. C., ... & Wong, C. T. (2011). Enhanced striatal dopamine release during food stimulation in binge eating disorder. *Obesity*, 19(8), 1601-1608.
- Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal*, 174(6), 801-809.
- Waters, A. J., & Feyerabend, C. (2000). Determinants and effects of attentional bias in smokers. *Psychology of Addictive Behaviors*, 14(2), 111.
- Williams, J. M. G., Mathews, A., & MacLeod, C. (1996). The emotional Stroop task and psychopathology. *Psychological Bulletin*, 120(1), 3.
- Yates, A., Leehey, K., & Shisslak, C. M. (1983). Running—an analogue of anorexia?. *New England Journal of Medicine*, 308(5), 251-255.
- Yeltepe, H., & İkizler, H. C. (2007). Egzersiz bağımlılığı ölçeği-21'in Türkçe geçerlilik ve güvenilirlik çalışması. *Bağımlılık Dergisi*, 8(1), 29-35.
- Zhou, Z., Yuan, G., & Yao, J. (2012). Cognitive biases toward Internet game-related

pictures and executive deficits in individuals with an Internet game addiction.

PloS One, 7(11), e48961.



APPENDIX 1

Egzersiz Bağımlılık Ölçeği-21 Hausenblas & Symons Downs (2002)

Açıklamalar: Aşağıdaki ölçeği kullanırken, lütfen soruları mümkün olduğunca dürüst olarak cevaplayınız. Sorular, şu andaki egzersiz inançlarınız ve son 3 ay içinde davranışlarınız ile ilişkilidir. Lütfen cevaplarınızı her bir ifadenin yanındaki boşluğa yazınız.

1	2	3	4	5	6
Asla	Nadiren	Bazen	Genellikle	Sık Sık	Daima

1. Huzursuzluktan sakınmak için egzersiz yaparım -----
2. Tekrarlayan fiziksel problemlere rağmen egzersiz yaparım -----
3. İstediğim etkiye/yararlara ulaşmak için sürekli olarak egzersiz şiddetimi artırırım -----
4. Egzersiz yapma süremi azaltamıyorum -----
5. Aile ya da arkadaşlarımla zaman geçirmek yerine egzersiz yaparım -----
6. Egzersiz yapmak için çok fazla zaman harcarım -----
7. Yapmayı düşündüğümden çok daha uzun süre egzersiz yaparım -----
8. Endişeli hissetmekten sakınmak için egzersiz yaparım -----
9. Yaralandığımda bile egzersiz yaparım -----
10. İstediğim etkiye/yararlara ulaşmak için sürekli olarak egzersiz sıklığımı artırırım -----
11. Egzersiz yapma sıklığımı azaltamıyorum -----
12. Okul ya da işime konsantre olmam gerektiğinde bile egzersiz yapmayı düşünürüm ----

13. Serbest zamanlarımın çoğunu egzersiz yaparak geçiriyorum -----
14. Umduğumdan daha uzun süre egzersiz yaparım -----
15. Gergin hissetmekten sakınmak için egzersiz yaparım -----
16. Devam eden fiziksel problemlere rağmen egzersiz yaparım -----
17. İstediğim etkiye/yararlara ulaşmak için sürekli olarak egzersiz süremi artırırım -----
18. Egzersiz şiddetimi azaltamıyorum -----
19. Egzersiz yapmayı seçiyorum böylelikle aile ya da arkadaşlarımla zaman geçirmekten kurtuluyorum -----
20. Zamanımın büyük bir çoğunluğu egzersiz için harcanıyor -----
21. Planladığımdan daha uzun egzersiz yaparım -----

APPENDIX 2

Anket No: _____

SOSYAL FİZİK KAYGI ENVANTERİ

(SPAS)

Sosyal Fizik Kaygı Envanteri dış görünüşünüzün başkaları tarafından değerlendirilmesinin size neler hissettirdiğini değerlendiren bir envanterdir.

Bu bir test değildir. “Doğru” veya “Yanlış” yanıt yoktur, içtenlikle yanıtlamanız önemlidir.

Sosyal Fizik Kaygı Envanterinde (SPAS) yer alan her soruda size göre uygunluk derecesine karşılık gelen kutunun içine “X” işareti koyarak cevaplandırınız.

Örnek:	Tamamen Yanlış	Genellikle Yanlış	Bazen Yanlış Bazen Doğru	Genellikle Doğru	Tamamen Doğru
Fiziksel görünüşümden hoşnutum.			X		

Sosyal Fizik Kaygı Envanteri

		Tamamen Yanlış	Genellikle Yanlış	Bazen Yanlış Bazen Doğru	Genellikle Doğru	Tamamen Doğru
1.	Fiziksel görünüşümden hoşnutum.					
2.	Beni çok zayıf veya çok şişman gösteren kıyafetleri giymekten hiç endişe duymam.					
3.	Fiziki görünümüm hakkında takıntılı olmamayı isterdim.					
4.	Diğer insanların kilom veya kas gelişimim hakkında olumsuz yargıları olduğu konusunda endişeye kapıldığım zamanlar olur.					
5.	Aynaya baktığım zaman fiziksel görünüşümden dolayı kendimi iyi hissederim.					
6.	Fiziksel görünüşümün çekici olmayan bölgeleri, belirli sosyal ortamlarda sinirli olmama neden olur.					
7.	Başkalarının yanımdayken fiziksel görünüşümden endişelenirim.					
8.	Diğer insanlara, fiziğimin ne kadar hoş görüldüğü konusunda son derece rahatım.					
9.	Diğer insanların fiziğimi incelediğini bilmek beni rahatsız eder.					
10.	Fiziksel görünümümü diğer insanlara göstereceğim zaman çok utangaç olurum.					
11.	Başkaları bariz bir biçimde vücuduma baktıklarında kendimi genellikle rahat hissederim.					
12.	Mayoluyken vücudumun şeklinden dolayı kendimi sıklıkla sinirli hissederim.					