



# Exercise addiction in CrossFit: Prevalence and psychometric properties of the Exercise Addiction Inventory☆



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## ABSTRACT

**Introduction:** CrossFit is a mix of aerobic and anaerobic exercise regimes with the stated goal of improving fitness and physical performance. It is growing in popularity and has a strong community known to motivate and push the participants to maximal performance. The negative consequences of these extreme exercise patterns have rarely been described. The prevalence of injuries in CrossFit is high but exercise addiction and harmful exercise attitudes have not yet been assessed. The aim of this study was to measure the prevalence of exercise addiction in CrossFit and to evaluate the reliability and validity of the Exercise Addiction Inventory (EAI) in a CrossFit population.

**Methods:** We invited crossfitters to participate in an online survey using Facebook groups. A total of 603 regular crossfitters completed the EAI and additional questions concerning exercise amounts and negative exercise attitudes and beliefs. We used principal component analyses and structural equation models to test the psychometric properties of the EAI and to describe the characteristics of the addicted crossfitters.

**Results:** We found that 5% of the crossfitters were addicted to exercise and that young males had a higher risk. The EAI had good internal reliability (0.73) and construct validity. Thus we found significant positive associations between exercise addiction and the tendency to exercise in spite of injury, feelings of guilt when unable to exercise, passion turning into obsession and taking medication to be able to exercise.

**Conclusions:** Exercise addiction is prevalent in CrossFit and needs further exploration. The EAI is recommended for research in CrossFit communities and applied settings.

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## 1. Introduction

In the 1990s a new form of exercise emerged in the US (Belger, 2012). Greg Glassmann created a workout program called CrossFit that was founded as a fitness company in 2000. Promoted as both a physical exercise philosophy and also as a competitive fitness sport, CrossFit workouts incorporate elements from high-intensity interval training, Olympic weightlifting, plyometrics, powerlifting, gymnastics, calisthenics, indoor rowing, running and other exercises. It is a strength and conditioning program consisting of a mix of aerobic and anaerobic exercises with the stated goal of improving fitness and physical performance with specific attention to cardiovascular and respiratory endurance, strength, flexibility, power, speed, coordination, agility, and balance. Hour-long classes at affiliated gyms, or “boxes”, typically include a warm-up, a skill development segment, the high-intensity “workout of the day” (or WOD), and a

period of individual or group stretching. Some gyms also often have a strength-focused movement prior to the WOD. Performance on each WOD is scored to encourage competition and to track individual progress.

CrossFit programming is decentralized but its general methodology is used by thousands of private affiliated gyms, fire departments, law enforcement agencies, and military organizations (Belger, 2012). In just 15 years CrossFit has turned into a worldwide sport with several thousand affiliated gyms. See Fig. 1 (<https://map.crossfit.com>).

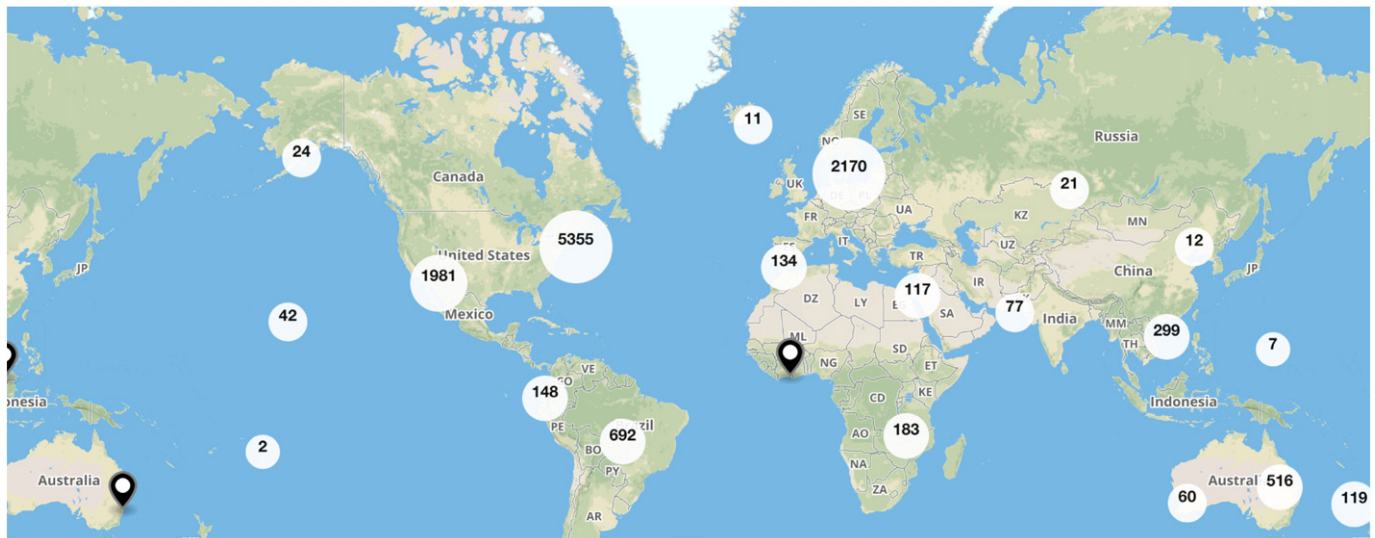
The community that spontaneously arises when people do these workouts together is known to be strong. In fact, the communal and social aspects of CrossFit are key components of its effectiveness (Murphy, 2012). The CrossFit community is known to use extreme catchphrases like: “Strong is the new skinny”, “Sweat is your fat crying”, “Everyday is a chance to get better” and “Repeat after me: I can do this”. These statements flourish on CrossFit websites and social media and are thought to motivate and push people to put all of their efforts into every training session. With a community known to motivate and push the participants to maximal performance there could be negative consequences such as injuries, excessive exercise and addiction.

Hak et al. found that 73.5% of a population of crossfitters had sustained an injury during CrossFit training and 7% required surgical

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<https://map.crossfit.com>

Fig. 1. Number of CrossFit centers worldwide.

intervention. Shoulder and spine injuries were the most common. This injury incidence was found to be similar to injury incidences in weight lifting and gymnastics (Hak, Hodzovic, & Hickey, 2013).

Despite the potential of losing control over exercise in sport settings with extreme exercise regimes, exercise addiction in CrossFit has not yet been explored. Exercise addiction has been described since the 1970s and is characterized by increasing exercise amounts, tolerance, withdrawal symptoms and continuing exercise in spite of pain and injury (Adams & Kirkby, 2002; Berczik et al., 2012; Hausenblas & Downs, 2002a; Landolfi, 2013). Addiction to exercise belongs to the group of behavioral addictions where you get addicted to the benefits and rewards of your own activity (Brown, 1997; Griffiths, 1996). Exercise can lead to positive emotions, wellness, energy, enhanced self-esteem and identity, and thus the behavior may develop into an addictive pattern. It is not defined as a psychiatric disorder but has been observed in connection with mood disorders (Weinstein et al., 2015), eating disorders (Blaydon & Lindner, 2002; Bratland-Sanda et al., 2010) and other behavioral addictions (Muller, Loeber, Sochtig, Te Wildt, & De Zwaan, 2015; Villeda et al., 2011).

Exercise addiction has been identified in runners (Chapman & De Castro, 1990; Zarauz & Ruiz-Juan, 2011), fitness exercisers (Lejoyeux, Guillot, Chalvin, Petit, & Lequen, 2012; Ogden, Veale, & Summers, 1997; Parastatidou, Georgios, Theodorakis, & Vlachopoulos, 2012; Sicilia & Gonzalez-Cutre, 2011), triathletes (Blaydon, Lindner, & Kerr, 2002; Youngman, 2014), sport students (Lindwall & Palmeira, 2009; Szabo & Griffiths, 2007) and football players (Lichtenstein, Larsen, Stöving & Bredahl, 2014). The prevalence of exercise addiction ranges from 3% to 29% in the different sport cultures. The prevalence rate in CrossFit needs to be investigated to clarify whether a problem of addiction exists in these communities. According to the philosophy, the community spirit and the high intensity exercise it could be expected that exercise addiction also exists in CrossFit settings and perhaps even has higher prevalence rates than in regular fitness exercisers.

Different measures have been used to identify symptoms of exercise addiction. The Exercise Addiction Inventory (EAI) is a quick self-report instrument that consists of 6 items that are directly related to the theoretical concepts of behavioral addictions (Griffiths, Szabo, & Terry, 2005; Terry, Szabo, & Griffiths, 2004). The scale has been used in different countries and sport settings and has demonstrated good reliability and validity (Griffiths et al., 2015; Lichtenstein, Christiansen, Bilenberg, & Stöving, 2014; Lichtenstein, Larsen, et al., 2014; Mónok et al., 2012). The psychometric properties of the EAI have not previously been tested

scientifically in a CrossFit-context. Thus we need to know if the inventory is useful to identify exercise addiction in crossfitters. It is important to explore if those with EAI-symptoms of addiction experience problematic attitudes and beliefs connected to their exercise regimes. The Obligatory Exercise Questionnaire (Thompson & Pasman, 1991) and the Exercise Dependence Scale (Hausenblas & Downs, 2002b) include items (missing in the EAI) related to feelings of guilt and obsession and they estimate the tendency to exercise in spite of pain and injury. Therefore, we added items related to these aspects of negative addiction. We also wanted to see if those with addiction were willing to take medication to be able to exercise, since this is a negative consequence of addiction.

### 1.1. Aims

The aim of this study was to estimate the prevalence of exercise addiction in CrossFit settings and to characterize those with addiction. Further, we wanted to test the psychometric properties of the Exercise Addiction Inventory in a CrossFit population.

## 2. Materials and methods

### 2.1. Participants

By using Facebook we invited exercisers in ten CrossFit groups geographically spread in Denmark in both rural and urban areas. The participants were invited to respond to an online survey where they were informed about the purposes of the study. By participating in the study they gave permission for scientific use. Further they were informed that all participation was anonymous since we did not register any personal and confidential information about the participants.

All members of the CrossFit groups were invited to participate without any exclusion criteria. The data collection took place from 7th of October to 7th of November 2014. A total of 635 crossfitters participated in the survey. We excluded those who reported not performing CrossFit training ( $n = 32$ ). The final number of participants was 603. The gender distribution consisted of 270 females (45%) and 328 males (55%).

### 2.2. Measurements

To measure exercise addiction we used the validated Danish version of the Exercise Addiction Inventory (EAI). The six EAI-items related to addiction are responded on a five-point Likert scale ranging from 1

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