

**DETERMINATION OF THE CORRELATES OF
RISK OF DEVELOPING EATING DISORDERS
BASED ON EXERCISE MOTIVATION,
ANTHROPOMETRIC AND DEMOGRAPHIC
CHARACTERISTICS**

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DECLARATION

I hereby declare that the project work entitled “determination of the correlates of risk of developing eating disorders based on exercise motivation, anthropometric and demographic characteristics” submitted to the Universiti Sains Malaysia (USM) and Universiti Pendidikan Sultan Idris (UPSI), is a record of an original work done by me under the guidance of Prof. Dr. Hairul Anuar Hashim, lecturer of School of Health Sciences, USM, and this project work is submitted in the partial fulfillment of the requirements for the degree of Master of Psychology (Clinical). The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

Disordered eating is a cluster of unhealthy eating habits and weight behaviors, with a negative impact on psychological and physical health. The aim of this study was to explore the prevalence of eating disorders and their risk factors, including anthropometric characteristics, exercise motivation and behaviours among young adults in Malaysia. An online survey was conducted involving 150 participants aged 18 to 35 years, who were randomly recruited through snowball and convenience sampling techniques. The Behavioral Regulation Exercise Questionnaire -3 (BREQ-3), Compulsive Exercise Test (CET), Compensatory Unhealthy Eating Scale (CUES) and Eating Attitudes Test (EAT-26) were administered to determine participants' exercise motivations, likelihood of compulsive exercise, compensatory eating, as well as the prevalence of disordered eating respectively. Using Structural Modelling Equation analysis, with gender and BMI status as moderators, the results revealed adequate model fit. Specifically, exercise motivation positively predicts compulsive exercise, subsequently predicts risks of eating disorders. The results also implicated that autonomous motivation negatively predicts compensatory eating in individuals who were overweight or obese. Among males, compulsive exercise positively predicts compensatory eating, and subsequently predict the risks of developing eating disorders. Compulsive exercise positively predicts the risk of developing eating disorders in individuals with normal weight and positively predicts compensatory eating in overweight/obese. In short, young adults' gender and their BMI statuses seem to differ on some of the risk factors of developing eating disorders. The findings of the current study call for increased awareness, understanding of eating disorders and related risk factors among young adults in Malaysia. In the field of clinical psychology, clinicians are encouraged to consider patients' gender and BMI statuses

as well as to conduct thorough assessments of clinical variables including exercise beliefs and motivation, compensatory eating behaviors to examine the possibility of exercising for unhealthy reasons and the risk of developing eating disorders.

Keywords: eating disorder risk, exercise motivation, compulsive exercise, compensatory eating, young adults

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Eating disorder is a cluster of unhealthy eating habits and weight behaviours, with both short- and long-term negative impact on psychological and physical health (Ackard, 2004), such as fatigue and hormonal abnormalities that may result in menstrual irregularities and decreased bone mineral density (Goldschmidt et al., 2015). Disordered eating has been associated with an excessive desire for thinness, including dieting, skipping meals, and unbalanced eating patterns.

In comparison to other parts of the world, the incidence of eating disorders was increasing in lower- and upper-middle-income nations in South-East Asia (Pengpid & Peltzer, 2018). For example, 11.5 percent of students in South-East Asian nations are at risk of developing an eating problem, with rates varying from below 10% in

Indonesia, Thailand, and Vietnam to 13.8 percent in Malaysia and 20.6 percent in Myanmar (Pengpid & Peltzer, 2018). In Malaysia, the estimated figure of individuals having Anorexia Nervosa (AN) is 1%, while 3% experience Bulimia Nervosa (BN), which would translate between 250,000 to 900,000 sufferers. Furthermore, males account for up to 25% of people with anorexia nervosa or bulimia nervosa, and approximately equally many men and women suffer from binge eating disorder. These disorders—which include anorexia nervosa, bulimia nervosa, and the six eating disorders that fall under the category eating disorder not otherwise specified—occur most commonly during adolescence and early adulthood (i.e., 12 to 30 years old), can last a lifetime, and can have a devastating impact on patients and their families (Carta et al., 2014).

1.2 Background of Study

Eating disorders have been linked to a number of risk factors, including people's misconceptions about what constitutes an ideal body weight and the impact of the media, family, and peers (MacNeill & Best, 2015). In particular, a study of adolescent females with eating disorders found that their ideal body mass index (BMI) was 18.5kg/m², which is considered underweight. This misunderstanding is thought to be caused by a shift in perception, internalisation of unrealistic body sizes, and excessive media exposure to the “ideal” skinny body (MacNeill & Best, 2015). Furthermore, the media appears to depict a V-shaped muscular structure as the ideal male body. Young males indicated unhappiness with their muscularity and stated a wish to either gain or lose weight to improve their muscular composition (Doumit et al., 2018). In addition,

the media tends to promote a V-shaped muscular structure as the ideal male physique. Young males reported dissatisfaction with their muscularity and a desire to acquire or lose weight in order to enhance their muscular composition (Doumit et al., 2018).

While contextual factors such as family and peer perception have a substantial impact on body and appearance, leading to eating disorders (Heiman & Olenik-Shemesh, 2019), other demographic characteristics such as late adolescence and ethnicities have also been linked to eating disorders. For example, it was found that non-Hispanic Black and Hispanic Black participants had a significantly lower lifetime diagnosis of anorexia nervosa compared with their Hispanic and non-Hispanic White counterparts (Udo & Grilo, 2018).

Eating disorders have also been linked to mental health problems such as Posttraumatic Stress Disorder (PTSD) and depression (Doumit et al., 2018; Udo & Grilo, 2018; Heiman & Olenik-Shemesh, 2019). In a study by Breland and colleagues (2018), over half of university students with eating disorders reported PTSD, and eating disorders were found to provide short-term relief from the trauma's impact. Similarly, depression was linked to eating disorder symptomatology, particularly constrained and emotional eating (Doumit et al., 2018).

Furthermore, BMI has been linked to eating disorders. Obese people were shown to be 3.9 times more likely to have an eating disorder (Ngan et al., 2017), whereas people who perceived themselves to be overweight and had a high BMI were

found to exhibit eating disorder symptoms (Azzouzi et al., 2019). Obesity is a serious public-health concern across the world. Malaysia has the highest obesity prevalence among Asian countries, with 64 percent of men and 65 percent of women being obese or overweight, according to the World Health Organization (WHO) (WHO, 2019). Obesity is linked to a number of health issues as well as a number of well-documented discriminatory attitudes and actions in areas such as work, education, and healthcare (Puhl & Brownell, 2001). Discrimination based on a person's physical condition can lead to intense dissatisfaction with their body weight and form, which can lead to eating disorders (Fairburn, 2008).

Eating disorders and obesity do, in fact, have a high rate of comorbidity (da Luz et al., 2018). In a recent research in the United States, 36,306 participants with no history of eating disorders who fulfilled the criteria for Binge Eating Disorder (BED) in the previous 12 months had considerably higher risks of becoming obese (Udo & Grilo, 2018). Another research of 1383 people with eating disorders (123 people with BED and 551 people with BN) found that 87 percent of people with BED and 33% of people with BN experienced obesity at some time in their life (Villarejo et al., 2012). Certain studies show that these diseases may exacerbate or contribute to one another.

Obesity and eating disorders have negative consequences for both physical and mental health. Individuals with these disorders are at risk for a variety of medical issues, including significant cardiovascular and neurological problems, delayed physical development, and a higher chance of death (Rasman et al., 2018; Kitahara et al., 2014). According to studies, AN has a death rate of 5% each decade, making it

one of the main causes of excess mortality when compared to other mental illnesses (Carta et al., 2014). In addition, depression, anxiety, drug abuse disorders, and severe impairments in social functioning are some of the typical mental illnesses that frequently coexist with eating disorders and obesity (Rasman et al., 2018). Females are more likely than males to have mental health issues as a result of obesity (Tronieri et al., 2017).

Exercise is a good thing to do and should be encouraged (Bardone-Cone et al., 2016). In fact, exercise is a critical component in the prevention and treatment of obesity, since it aids in weight reduction and contributes to weight maintenance (Blair & Holder, 2002; Carels et al., 2008). When individuals who have a tendency to exercise excessively to the point of dysfunction are strongly pushed to exercise through training programmes, a conflict arises. To make matters worse, 53.3 percent of normal-weight teenagers believed their weight was abnormal (Zainuddin et al., 2014). A significant predictor of eating disorders is a desire to decrease weight (Barrack et al., 2019). Individuals with obesity are likely to have a high risk of eating disorders.

Indeed, exercise as a means of weight management or maintenance is a prevalent symptom among people with eating disorders, particularly those with AN (Meyer et al., 2008), and “excessive exercise” as an improper compensatory behaviour is included as a diagnostic criteria for BN (Meyer et al., 2008). (American Psychiatric Association, 2013). Excessive exercise, or the quantitative component of exercise in this situation, frequently precedes the beginning of the disorder, and weight loss as a

result of increased activity reinforces and maintains the disorder (Adkins & Keel, 2005). Approximately 80% of patients with AN and 55% of patients with BN are predicted to participate in unhealthy exercise patterns (Davis et al., 1997).

Compulsive exercise, which refers to one of the psychological aspects of exercise, is defined by sticking to strict exercise routines, continuing to exercise despite physical injuries, prioritising exercise over other important activities, feeling anxious if unable to follow regimens, or rigidly imposing exercises before meals or after a binge eating episode (Adkins & Keel, 2005). Compulsive exercise helps to control unpleasant emotions brought on by eating disorders while also encouraging compensatory behaviour. Bardone-Cone and colleagues (2016) further added preoccupations about exercising and motivation of exercises to the psychological aspects and level of exercise to the behavioral aspects.

While the role of exercise training programmes in the treatment of eating disorders is debatable, the outcomes of such programmes for overweight or obese people are very variable. Following months of supervised exercise, some people lose weight, while others maintain or even gain weight (Church et al., 2009; Manthou et al., 2010). According to research, some people may compensate or increase their energy intake (EI) in response to exercise by engaging in compensatory activities such as eating (Unick et al., 2015). Compensatory eating habits after exercise may undermine the positive effect of exercise on energy balance and, in the long term, result in weight increase. Overweight women are less likely to respond favourably to exercise interventions because they are more likely to compensate for the energy expended

during exercise (Hopkins et al., 2014; Unick et al., 2015); however, some studies found no difference in energy intake after exercise for obese and non-obese people (Gibbons et al., 2017).

As previously stated, poor exercise habits have been linked to eating disorders. It is worth identifying the influential factor of these unhealthy exercise behaviors, thereby exploring its association with the engagement in compensatory eating behaviors. There are two types of motivation for exercising, namely controlled motivation where one exercises for externally refereed reasons, and autonomous motivation where the individual is self-determined and the reason to exercise is consistent with intrinsic goals.

Early detection of behaviours linked to disordered eating can lead to earlier treatment, decreasing serious consequences, psychological difficulties, and even death. The long-term health effects of eating disorders including binge eating, bulimia nervosa, and the use of dietary items like diet pills, diet drinks, and excessive exercise highlight the necessity of early intervention (Sharmini, 2016). According to the National Eating Disorder Association (NEDA; 2008), eating disorder attitudes in teenagers can damage students' cognitive growth, behaviour, and academic performance, cause nutrient deficiencies, and increase the risk of illness as well as absenteeism.

1.3 Study Rationale and Problem Statement

In view of the high prevalence of eating disorders among individuals with obesity or overweight and that exercise has been commonly employed for weight control purposes, it is important to examine how exercising patterns becomes unhealthy among these individuals. As will be illustrated in the literature review in Chapter 2, there are some researches regarding the multidimensionality of exercises and its relation to eating disorders, obesity as well as gender. Nonetheless, several gaps in literature need to be addressed.

First, the risk factors of eating disorders such as gender and anthropometric characteristics in Malaysia is yet to be explored. Secondly, there is also a lack of research on whether compulsive exercise and compensatory eating are associated and their roles in increasing the risks of developing eating disorders. Lastly, the function of gender and BMI status in moderating the risks of developing eating disorders has not been consistent. Despite the fact that many study has been done on eating disorders, the causes for the gender disparity in prevalence rates remain unknown. Because of the feminine stigma associated with eating disorders (Franco et al., 1988), it is assumed that boys will under-report the problem (Anderson & Bulik 2004). Furthermore, when boys eat the same amount of food in the same length of time as girls whose behaviour is labelled as bingeing, their behaviour is labelled as normal instead (LaPorte 1996). Furthermore, it is believed that existing eating disorder diagnostic criteria fail to capture disordered eating behaviours unique to boys such as

behaviours aimed towards gaining weight and muscle mass to make up for an underlying dissatisfaction with body image (Anderson & Bulik 2004).

1.4 Research Questions

Hence, research questions for this study include:

- 1 Are there associations among BMI categories, gender, exercise motivation, and risks of developing an eating disorder?
- 2 Is there an association between the risk of developing an eating disorder and compulsive exercise pattern?
- 3 Is there an association between compulsive exercise and compensatory eating?
- 4 Do gender and BMI categories moderate the risk of developing eating disorders and compulsive exercise?

1.5 Research Objectives

The general objective of the present study is to determine the correlates of risk of eating disorder and its association with compulsive exercise and eating patterns among young adults in Malaysia.

Specific objectives are:

- 1 To examine the associations among BMI categories, gender, exercise motivation, and risks of developing an eating disorder.
- 2 To examine the associations between risks of developing an eating disorder and compulsive exercise.
- 3 To examine the associations between compulsive exercise and compensatory eating.
- 4 To examine the moderation effects of gender between the relationship between risk of eating disorder and compulsive exercise and compensatory eating.

1.6 Significance of Current Study

Malaysia has seen rapid urbanisation since transitioning from an agrarian to an industrial-related economy, resulting in significant economic and social changes (Hasan & Nair, 2014) In general, urbanisation has been linked to a harmful impact on mental health, particularly eating disorders (Gorrell, Trainor & Le Grange, 2019). For future public health policy development and prevention, studies on specific variables that lead to maladaptive or unhealthy eating attitudes and behaviour in young people may be essential.

To date, there is a lack of study that examines the correlates of eating disorders and its association with unhealthy exercise and post-exercise eating patterns. This cross-sectional study design will hopefully provide some insights on the risks of developing eating disorder from the aspect of their exercising patterns and post-

exercise compensatory eating behaviors. In regards to the clinical field, this study hopes to add knowledge into the psychological and behavioral dimensions of exercise by measuring specific elements (i.e., compensatory eating and motivation to exercise). Following this, if such differences are established, the multidimensionality of exercise can be taken into account for individuals with obesity and eating disorders, especially when planning for intervention.

Besides that, the study hopes to benefit the community by providing ideas on the development as well as implementation of effective eating disorder and obesity prevention programs that specifically adopts exercise in Malaysia. At the same time, the findings of this study can help individuals who are currently struggling with obesity or at high risk of developing eating disorders to adjust their patterns of exercising in order to achieve the appropriate health benefits. For instance, physical activity has been reported to reduce anxiety, depression, and stress (Nabkasorn et al., 2006), anxiety in eating disorders, given that eating disorders and anxiety often comorbid (Lavender et al., 2013). Therefore, this study aims to investigate the prevalence of eating disorder and its associated factors among young adults in Malaysia.

1.7 Variable Definitions

The independent variables of this study are: (i) motivations for exercising; (ii) Compulsive Exercise; (iii) Compensatory eating; (iv) BMI categories (2 levels:

normal weight, overweight/ obese) and (v) Gender (2 levels: female, male). The dependent variable of this study is the risks of developing eating disorder.

Exercise motivation is defined as a person's motivation to exercise, which can be autonomous or controlled. Autonomous motivation is defined as when a person's motivation to exercise is perceived to be self-determined and consistent with intrinsic goals or outcomes, and it comes from within the person; and controlled motivation is defined as when a person engages in exercise for externally referenced reasons such as gaining rewards or perceived approval from others (Hagger et al., 2014). Autonomous motivation is operationally defined as the total score on the identified and intrinsic regulation subscales from the Behavioral Regulation Exercise Questionnaire (BREQ-3), whereby a higher score indicates higher autonomous motivation. In contrast, controlled motivation is operationally defined as the total score on the external, introjected, and integrated regulation subscales, whereby a higher score indicates higher controlled motivation.

Compulsive exercise is conceptually defined as uncontrollable excessive exercise behaviour with harmful consequences, such as injuries and impaired social relations (Lichtenstein et al., 2017). It is operationally defined as the total score on the Compulsive Exercise Test (CET) whereby a higher score indicates a higher likelihood of engaging in compulsive exercise behaviors. On the other hand, compensatory eating is conceptually defined as one's tendency to increase food intake following an acute exercise episode. It is operationally defined as the total score on the

Compensatory Unhealthy Eating Scale (CUES) whereby a higher score suggests that participants are more likely to engage in compensatory eating.

BMI categories indicate one's weight, whether it is under weight, normal, over weight or obese. The value is obtained by dividing a person's weight (in kg) by the square of height in meters. BMI within 18.5 to $< 25\text{kg/m}^2$ falls within the healthy weight range, whereas BMI higher than 25 to $< 30\text{kg/m}^2$ indicates overweight and BMI higher than 30 kg/m^2 falls within the obesity range (Centers for Disease Control and Prevention; CDC, 2021). In the current study, gender is conceptually defined as the biologically defined and genetically acquired differences between males and females; operationally defined as the distinction between males and females as reported by a respondent.

Lastly, the risk of developing an eating disorder is conceptually defined as one's likelihood of engaging in disordered eating behaviors based on attitudes, feelings, and behaviors related to eating. It is operationally defined as the total scores on the Eating Attitudes Test (EAT-26), whereby a higher score indicates a higher likelihood of eating disorder risk.

1.8 Hypotheses

For Objective 1:

Hypothesis 1:

H0: There will be no associations among BMI categories, gender, exercise motivation, compulsive exercise, compensatory eating, and risks of developing an eating disorder.

H1: There will be significant associations among BMI categories, gender, exercise motivation, compulsive exercise, compensatory eating, and risks of developing an eating disorder.

For Objective 2:

Hypothesis 2:

H0: There will be no significant association between the risk of developing an eating disorder and compulsive exercise.

H1: There will be a significant association between the risk of developing an eating disorder and compulsive exercise.

For Objective 3:

Hypothesis 3:

H0: There will be no significant associations between compulsive exercise and compensatory eating.

H1: There will be significant associations between compulsive exercise and compensatory eating.

For Objective 4:

Hypothesis 4:

H0: There will be no significant moderation effects of gender on the relationships among the risk of an eating disorder, compulsive exercise and compensatory eating.

H1: There will be significant moderation effects of gender on the relationships among the risk of an eating disorder, compulsive exercise and compensatory eating.

Hypothesis 5:

H0: There will be no significant moderation effects of BMI on the relationships among the risk of an eating disorder, compulsive exercise and compensatory eating.

H1: There will be significant moderation effects of BMI on the relationships among the risk of an eating disorder, compulsive exercise and compensatory eating.

CHAPTER 2

LITERATURE REVIEW

This chapter will present a review of literature on exercise patterns among individuals with obesity and/or eating disorders. The multidimensionality of exercise, specifically behavioural and psychological aspects, will be discussed individually and systematically. Finally, this chapter will wrap up with the presentation of the conceptual framework.

2.1 Conceptualization of Exercises

The terms exercise and physical activity will be used interchangeably in this study. Although the two terms are not quite synonymous, physical activity refers to any bodily movement involving skeletal muscles that requires energy expenditure, whereas exercise is a subcategory of physical activity that includes planned, structured,

and repetitive activities aimed at improving or maintaining one or more aspects of physical fitness (Dasso, 2018). Exercise and physical activity have been shown to improve quality of life and decrease the risks of many diseases such as diabetes mellitus, hypertension, and cardiovascular disease.

As mentioned in Chapter 1, individuals with eating disorders tend to engage in unhealthy exercise patterns (Davis et al., 1997), such as exercising excessively. Unhealthy exercise has two components, according to Adkins and Keel (2005): a quantitative dimension and a qualitative or psychological dimension. The measurable and more behavioural components of exercise, such as duration, frequency, and intensity, are referred to as the quantitative dimension of exercise. The qualitative dimension of exercise, on the other hand, refers to psychological elements of exercise, such as guilt and anxiety experienced when exercise sessions are missed, as well as one's reasons for exercise.

2.2 Preoccupation or Obsessive Cognitions about Exercise

Exercise preoccupation or obsessive cognitions about exercise is also a meaningful focus of exercise and eating disorder research (Bardone-Cone et al., 2016). An individual who has obsessive cognitions about exercise might be called a “compulsive exerciser”. At the same time, some researchers also use the term “exercise addiction” (Hailey & Bailey, 1982), “overcommitment to exercise” (Yates et al., 1994), “exercise involvement” (Wolf & Akamatsu, 1994), and so on. The occurrence of compulsive attitudes and behaviours about exercises among individuals with eating disorders has

been well documented (Shroff et al., 2006; Dalle Grave et al., 2008; Vancampfort et al., 2014). Nevertheless, the identification of compulsive exercisers was commonly made based on the amount and intensity of one's exercise activity, with little regard to their personal and psychological meaning. Because improper exercise is linked to a higher rate of chronicity and relapse in people with eating disorders (Dalle Grave et al., 2008; Kostrzewa et al., 2013), it is indeed crucial to understand how it affects core symptoms.

Excessive exercise, eating problems, and certain psychological traits were investigated in 586 college women in a research by Ackard, Brehm and Steffen (2002). Participants were recruited from a university class and administered the Obligatory Exercise Questionnaire (OEQ), Eating Disorders Inventory-2 (EDI-2), Bulimia Test-Revised, and other psychosocial measures. OEQ was used to assess the participants' attitudes and activities related to exercise, whereas EDI-2 was administered to measure psychological and behavioural characteristics of AN and BN. A factor analysis of the OEQ revealed three factors – exercise fixation, exercise frequency, and exercise commitment. Preoccupation with exercise, unpleasant feelings connected with missed exercise, and the use of exercise to compensate for perceived overeating are all examples of exercise fixation. The number and kind of exercise episodes are addressed by exercising frequency. Exercise commitment refers to the belief that exercise sessions should not be skipped on a regular basis. Exercise fixation, independent of exercise frequency, is significantly linked with measures of psychological maladjustment, according to the authors, who indicate that preoccupations with workouts might be crucial to understanding how they contribute to eating disorder psychopathology.

Following this, a study was done by Grilo, White and Masheb (2012) to examine the overvaluation of shape/weight in ethnically diverse obese patients with BED seeking treatment in primary care. The study recruited 142 participants (105 females and 37 males) who were required to be obese, with a BMI of higher than 30, and meet proposed DSM-5 criteria for BED. These participants were given a battery of self-report measures (i.e. EDE, Beck Depression Inventory and Rosenberg Self-Esteem Scale) to assess the specific features of eating disorders such as restraint, eating concern, shape concern and weight concern, and their psychological well-being. Participants in the overvaluation group showed substantially higher levels of eating-disorder psychopathology, worse psychological functioning, and anxiety disorder comorbidity than those who did not overvalue their shape/weight, according to the authors. This data shows that overvaluation is substantially linked to increased eating-related psychopathology and psychological distress, rather than just reflecting concerns similar to obesity or binge eating frequency. To put it another way, people with BED are concerned about their weight, shape, and appearance, which can lead to obsessive exercise. Several noteworthy potential limitations in the study include the lack of generalizability of findings to obese patient groups with different clinical characteristics such as medical co-morbidities that may differ in the nature of their weight/ shape concerns or have different priorities regarding health and appearance (Grilo et al., 2012).

2.3 Unhealthy Exercises Pattern

Addictive behaviour can include unhealthy exercise patterns such as exercise dependency or obsessive activity. Primary or secondary dependency can exist. Primary exercise dependency occurs when people exercise purely for the psychological benefits of exercising, whereas secondary exercise dependence happens when people exercise to help with a more serious mental disease such as weight reduction, mood control, or eating disorders (Cook & Luke, 2017). Exercise dependency can be classified as an addictive behaviour because it exhibits symptoms similar to those seen in other addictive behaviours, such as mood instability and tolerance, relapses, and loss of control over the behaviour, abstinence syndrome, and dedicating too much time to the behaviour (Hausenblas & Downs, 2002; Szabo, 2018).

Based on a systemic review of 34 past studies on the prevalence of risk for exercise dependence by Marques and colleagues (2018), the prevalence of risk for exercise dependence was estimated to be between 3 and 7% of regular exercisers and the university student population, and between 6 and 9% of the athletes population. The studies were identified from science electronic databases up to June 2018. All empirical studies that were selected included participants who were regular exercisers. However, these studies administered questionnaires to measure the risk index of exercise dependence symptoms, instead of the diagnosis. Some of the questionnaires involved include the Exercise Dependence Scale (EDS), Exercise Addictive Inventory (EAI), Consumptive Habits Questionnaire and so on to assess for compulsive risk for exercise. Although it was indicated in the study that discrepancies seemed to occur between these past research, the researchers explained the potential impacts of cultural differences, types of exercise and the instruments used to assess the risk for exercise dependence. In particular, the prevalence of exercise dependency risk as evaluated by

EAI appears to be greater than the prevalence as measured by the EDS. The researchers highlighted that different instruments used to assess exercise dependence risk can result in variable degrees of prevalence, therefore they suggested adopting a standardised instrument in diverse groups and in populations that are comparable across settings. Excessive exercise in non-athletes who exercise to cope with psychological discomfort can generate problems, leading to addictive behaviour with harmful physiological and psychological effects (Marques et al., 2018).

Furthermore, while planning therapy for people with eating disorders, Bratland-Sanda and colleagues (2011) underlined the need of screening for both quantitative and qualitative characteristics of exercise practises. Duration, intensity, frequency, kind of exercise, motivations for exercise, compulsiveness, and exercise dependency characteristics such as tolerance, withdrawal symptoms, loss of control, and persistence are all included in the data. The authors wanted to see if there were any links between exercise dependency score and the quantity of physical activity disorder symptoms in patients with long-term eating disorders and non-clinical controls in their study. A total of 112 female participants (59 inpatients, 53 controls) were involved in this cross-sectional study and were administered assessments such as Eating Disorders Examination (EDE), exercise dependence scale, reasons for exercise inventory, and MTI Actigraph accelerometer. Results of the study indicated that there were positive associations between vigorous, but not moderate physical activity, exercise dependence score and eating disorder symptoms in patients with eating disorders (Bratland-Sanda et al., 2011). Vigorous physical activity was negatively associated with eating disorder symptoms and was not correlated with exercise dependence score for non-clinical controls. Bratland-Sanda and colleagues (2011)

suggested exercise for negative affect regulation, instead of weight or appearance, and amount of vigorous physical activity could explain participants' exercise dependence score in both groups. Some limitations of the study include having a small sample size that would prevent causal conclusions or generalization, and the possibility that patients' amount of physical activity could have been influenced by hospitalization. While the findings of this study allow for better differentiation of exercising features in both patients with eating disorders or those in non-clinical sample, it is important to note the positive associations among exercise dependence score, vigorous physical activity and eating disorder symptoms in the treatment of longstanding eating disorders.

On the contrary, Shroff and colleagues (2006) explored the features associated with excessive exercise across subtypes of eating disorders in a study. The study included 1857 female probands as well as their affected relatives who were assessed for psychological and personality features that have been shown to be associated with, and may underlie vulnerability to eating disorders, specifically AN, BN, and eating disorder not otherwise specified (ED-NOS; Shroff et al., 2006). These participants were assessed through the semi-structured clinical interview as well as test batteries. The participants were separated into different studies based on their diagnosis, specifically AN, BN and AN Trios study. AN Study included participants who met the diagnostic criteria on DSM-IV for AN; BN study, participants who met diagnostic criteria of BN; and AN Trios study, participants who met criteria for AN along with their parents. Across all three studies, the participants' relatives were required to have a lifetime history of AN, BN or ED-NOS. Following that, based on their responses on The Structure Interview for Anorexic and Bulimic Disorders, the individuals were

classified as either excessive exercisers or no/regular exercisers (SIAB). Excessive activity was shown to be the most prevalent symptom of the purging subtype of AN, according to the study's findings. Excessive exercisers also had a lower BMI, were younger, scored higher on anxiety, perfectionism, and eating disorder symptom evaluations, had more obsessions and compulsions, and were more persistent than those who did not. In conclusion, high levels of activity are associated to AN, particularly the purging subtype, as well as a myriad of anxious temperament and personality characteristics in women with eating disorders (Shroff et al., 2006).

Another study revealed that individuals who simply engaged in compensatory compulsive activities had a reduced chance of developing eating disorders than those who engaged in eating-related compensatory behaviours in a non-clinical sample of 1158 college students (Schaumberg et al., 2014). The EDE Questionnaire was completed by the participants, who were separated into three groups: those who did not support purging activities, those who just endorsed workouts, and those who used laxatives or vomited. The groups' chances of acquiring eating problems were compared. The findings revealed that over half of the respondents used exercise as a compensatory technique, but they did not vary on EDE-Q subscales from comparable community and college groups. These data show that compensatory exercise does not necessarily contribute to eating disorders. Individuals who reported compensatory behaviours were also shown to be more likely to be overweight than those who did not indicate compensatory behaviour usage. The cross-sectional design of the study has many flaws, particularly in terms of the rates of exercise reported by individuals. Participants may have overreported their exercise as a compensatory behaviour on the

EDE questionnaire and underreported vomiting and laxative usage, according to the authors, because exercising is a more culturally sanctioned way of weight control.

In contrast, exercise dependence has been shown to be prevalent in population that show no indication of eating disorders measured by failing to achieve the published cut-off score in testing questionnaire for eating disorders. A case in point is a recent meta-analysis found that 11.4% of gym users had exercise dependence in the absence of indicated eating disorders (Trott et al., 2020). Previous research has found substantial variations in the prevalence rates of eating dependency in people with and without eating disorders, with exercise dependence in those without eating disorders having consistently lower prevalence rates than people with eating disorders (Dalle Grave et al., 2008; Bratland-Sanda et al., 2011). Indeed, according to a comprehensive analysis of nine studies looking at the incidence of exercise dependency in adults, exercise dependence is more than three and a half times more common as a comorbidity to an eating disorder than in those who don't have an eating disorder (Trott et al., 2021).

2.4 Motivations for Exercising

Self-determination theory (SDT; Deci & Ryan, 2000) is a popular theoretical framework for investigating motivation in exercises. The theory proposes six different forms of motivation including amotivation, external regulation, introjection, identification, integration, and intrinsic regulation. Individuals' reasoning or reasons for engaging in activities are reflected in the many types of motivation, which are