Int. J. Sport Psychol., 2023; 54: 175-192
doi: 10.7352/IJSP.2023.54.175

Negative emotion and disordered eating among UK athletes during the COVID-19 pandemic

RYULAH LIM*, SEONG-MIN PARK**, YEOKIL CHO***, PECULIAR AWA****, YONG-EUN SUNG*****

(*) *Institute of Psychiatry, Psychology & Neuroscience, King's College London, University of London,UK*
(**) *Department of Criminal Justice, University of Nevada, Las Vegas, USA*
(***) *Department of Criminal Justice & Criminology, University of Central Missouri, Warrensburg, Las Vegas, MO, USA*
(****) *Department of Criminal Justice & Criminology, University of Central Missouri,Warrensburg, MO, USA*

The COVID-19 pandemic led to many changes for everyone. Social distancing and isolation policies significantly impacted sports and sporting-related activities. The current study examined the relationship between mental well-being and eating behavior among a sample of 478 UK athletes in 2020. Participants completed the Eating Disorder Inventory-2 (EDI-2) and Hospital Anxiety and Depression Scale (HADS). Results of multiple analyses revealed that negative emotion significantly increased disordered eating. age and gender were also significant risk factors for disordered eating. Results carry theoretical and policy implications to offer the best practice for athletes in the future as they transition through changes such as COVID-19.

KEY WORDS: Athlete, COVID-19, Negative emotion, Disordered eating.

1. Introduction

1.1. BACKGROUND

In late 2019, the novel coronavirus (COVID-19) rapidly spread worldwide. On March 11, 2020, the World Health Organization (WHO) declared the coronavirus outbreak a global pandemic. COVID-19 caused significant implications for the mental health and well-being of individuals globally. Alarmingly, the virus rapidly spread across Asia, Europe, and the United

Correspondence to: Yong-eun Sung, Department of Police Administration, Far East University 76-32, Daehak-gil, Gamgok-myeon, Eumseong-gun, Chungbuk, South Korea (Zip 27601) (e-mail: ysung@kdu.ac.kr)

States. The social distancing and isolation policies implemented to curb the spread of the virus significantly impacted athletes. International sporting events, including the Tokyo 2020 Olympics and Euro 2020 tournament, were postponed, or canceled entirely. To protect vulnerable people and the National Health Service (NHS) staff, the UK government first announced a strict nationwide lockdown on March 23, 2020, to tackle the coronavirus outbreak after the first confirmed case on January 29, 2020. People were only allowed to leave their homes once daily for fundamental reasons, such as medical needs, grocery shopping, or exercise. For the athletes who had close contact with teammates, coaches, and staff who tested positive, a 14-day quarantine was recommended (Toresdahl & Asif, 2020).

Athletes' training sessions, events, competitions, camps, and face-to-face meetings were suspended in England, Scotland, and Wales beginning March 17. This closure affected England's national football leagues, the London Marathon, and the 2020 Wimbledon tennis championships. Likewise, sports at all levels were suspended or canceled due to the increased risk of Coronavirus transmission. Athletes were thus only able to train at home without supervision from coaches or staff. Some elite sports clubs had a home-based online training program and virtual meetings. However, most teams could not complete the training as sports facilities were closed (Mann et al., 2020). Therefore, individuals living under these conditions were more likely to experience high stress, anxiety, and depression (Jukic et al., 2020; Lades et al., 2020). For example, a recent study by Di Fronso and colleagues (2020) investigated the impact of COVID-19 on athletes in Italy. The authors compared participants' perceived stress levels before and after the disruption of COVID-19. They then reported that the uncertainty in the athletic context, including suspended or canceled sporting events and contract revisions with sports clubs, ruined the psychological well-being of athletes.

1.2. Disordered Eating Among Athletes

Disordered eating is a pattern of unhealthy or harmful eating behavior to maintain or lose weight (Otis et al., 1997). It occurs across the general population; however, clinical and subclinical eating disorders are more common among athletes than in the general population (Byrne & McLean, 2001; Martinsen et al., 2010; Martinsen & Sundgot-Borgen, 2013; Sundgot-Borgen & Torstveit, 2004). While lay individuals often engage in exercise to burn calories and regulate their eating (Chatterton & Petrie, 2013), athletes regularly have an intensive exercise regime (Currie, 2010; Petrie et al., 2009) and often

attribute sports as their excuse for not eating (Beals, 2004). Therefore, detecting disordered eating habits in athletes is challenging (Drinkwater et al., 2005). This eating behavior can be driven explicitly by sports-specific body image pressure (Sherman & Thompson, 2001) and the aesthetic component in the performance marking criteria (Currie, 2010; Sherman & Thompson, 2001). To maximize their performance (Sundgot-Borgen & Larsen, 1993; Wilmore & Costill, 1992), some athletes engage in unhealthy eating behaviors, including binging, vomiting, dieting, and using laxatives (Sundgot-Borgen & Torstveit, 2010; Greenleaf et al., 2009).

These behaviors can result from unhealthy dieting habits (El Ghoch et al., 2013), an increased focus on athletes' appearance (Thompson & Sherman, 2014), and social pressure from coaches and teammates to achieve or maintain leanness (Sundgot-Borgen, 1994). Interestingly, the prevalence rate also varies based on the type of sports. Athletes competing in leanness sports (Byrne & McLean, 2002; Kong & Harris, 2015; Sundgot-Borgen & Larsen, 1993; Sundgot-Borgen & Torstveit, 2004; Thiemann et al., 2015), such as distance running (Gapin & Petruzzello, 2011), figure skating (Voelker et al., 2014), swimming, diving, and gymnastics (Anshel, 2004) have a higher prevalence rate of disordered eating than those in non-leanness sports and non-athletes in general (Sundgot-Borgen & Torstveit, 2004; Torstveit et al., 2008). A recent systematic review (Mancine et al., 2020) demonstrated that in 6 out of 7 studies, athletes participating in lean sports suffered more from disordered eating than their counterparts in non-lean sports.

1.3. Negative Emotion and Disordered Eating

Research has found a robust, two-way connection between negative emotion (i.e., depression, anxiety, etc.) and eating psychopathology (Kaye et al., 2004; Zaider et al., 2002). Individuals who maintain their disordered eating behavior (fasting or restricting food intake) depend mainly on food-related anxiety (Fairburn et al., 2003; Steinglass et al., 2010). Also, people (who show bulimic behaviors of bingeing and vomiting) have difficulties regulating their emotions, especially negative feelings (Fairburn et al., 2003; Lavender et al., 2015). Engaging in unhealthy eating habits gives them temporal psychological relief from negative mood changes (Kaye et al., 1986); binge eating serves this purpose the most (Fairburn et al., 2003).

Additionally, the comorbidity of disordered eating with anxiety (Godart et al., 2002; Kaye et al., 2004) or depressive disorder (Bushnell et al., 1994; Perez et al., 2004; Santos et al., 2007) has been identified in athlete and

non-athlete population (Giel et al., 2016). For example, Vardar and associates (2007) examined the link between anxiety symptoms and disordered eating habits in 245 female athletes. The study demonstrated that anxiety levels were higher for athletes with disordered eating behaviors than those with regular eating habits. In elite rowing athletes, depression symptoms were also correlated with disordered eating attitudes and more significant concerns about weight (Terry et al., 1999). Furthermore, some research suggests that binge eating can be triggered by negative emotion and impulsivity (Brechan & Kvalem, 2015; Fischer et al., 2003). According to the Transdiagnostic Model of Eating Disorders (Fairburn et al., 2003), an individual who cannot cope with low moods, such as anxiety or depression, is more likely to engage in unhealthy eating, including bingeing. These individuals can redirect their attention from negative mood to disordered eating, potentially culminating in an eating disorder (Fairburn et al., 2003).

1.4. Present Study

The high prevalence of disordered eating among athletes compared with the general population is well-documented (Abbott et al., 2021; Byrne & McLean, 2002; Goodwin et al., 2016; Joy et al., 2016; Souter et al., 2018; Sundgot-Borgen & Torstveit, 2004; Wells et al., 2020). Disordered eating compromises immune function and exacerbates athletes' negative physical consequences, such as energy deficit, injury risk, and muscle loss (Fogelholm, 1994; Loucks, 2004; Mackinnon, 2000; Venkatraman & Pendergast, 2002). Also, it leads to poor athletic performance (El Ghoch et al., 2013; Thein-Nissenbaum et al., 2011; VanHeest et al., 2014). Furthermore, it boosts mental health problems, such as substance abuse, obsessive-compulsive disorders, self-harm, and suicide (Claes et al., 2012; Smith et al., 2013; Weltzin et al., 2012).

Identifying risk factors for disordered eating is critical to better screening at-risk athletes (Striegel-Moore & Bulik, 2007). Consequently, the variables presumed to contribute to the development of disordered eating have been reported extensively (Greenleaf et al., 2009; Sundgot-Borgen & Larsen, 1993; Sundgot-Borgen & Torstveit, 2010; Thompson & Sherman, 2014; Wilmore & Costill, 1992). However, very few studies have explored these variables to ascertain their impact on athletes' eating disorders during highly stressful times, such as the COVID-19 pandemic. The extensive social isolation and lockdown procedures may have significantly impacted athletes' lives. These uncommon circumstances also would prompt athletes to be concerned about the future, thereby decreasing psychological well-being. Using primary data

and survey-based analyses, the current study investigated 478 UK athletes' mental well-being and disordered eating during the COVID-19 pandemic. We answered two research questions: First, what are the risk factors for disordered eating? Second, does negative emotion increase disordered eating?

2. Research Methods

2.1. Procedure

The current study received ethical approval from the Research Ethics Committee at the University of Nottingham (*Reference number: S1269*). From July 1 to 31, 2020, individuals aged 18 years or older, based in the UK, and competing in a sport before COVID-19 restrictions were encouraged to participate in an online survey through Facebook groups. Email invitations were also sent to the committee members of university sports clubs. Before delivering an informed consent form, we presented the survey's introduction. The research participants were provided a six-digit code to enter if they wanted to withdraw at any point after the survey. In line with the Data Protection Act and General Data Protection Regulation (GDPR), all collected data would be kept securely and archived for five years. We asked the participants to answer some demographic questions (age, gender, height, weight, ethnicity, etc.). Next, they completed several standardized questionnaires. All participants were allowed to supply an email address to enter a prize draw for three £25 Amazon vouchers. After the survey, a debrief page was shown with a '*thank you*' message and a list of support options for athletes to use if they so desired. The whole survey was conducted online.

2.2. Participants

Although 501 athletes completed the survey, 23 participants were excluded since their answers were incomplete. As Table I shows, the final sample consisted of 478 participants aged 18 – 53 years ($M = 27.17$, $SD = 8.09$) with a mean weight of 71.72 kg ($SD = 16.21$). Their average height was 171.23 cm ($SD = 11.20$). Two hundred and seventy-two (56.90%) were female, while 42.26% ($n = 202$) were male. However, four preferred to self-describe (0.84%). The mean body mass index (BMI) was 24.50 ($SD = 5.32$). Respondents' race was predominantly White ($n = 431$, 90.17%), which are White British ($n = 391$, 83.05%) and White Other ($n = 34$, 7.11%). There were 47 Non-Whites (9.83%), which are Mixed ($n = 17$, 3.56%), Asian British ($n = 14$, 2.93%), Black British (n = 4, 0.84%), Chinese ($n = 3$, 0.63%), Prefer Not To Say ($n = 2$, 0.42%), and Other ($n = 7$, 1.46%).

2.3. Methodological Analyses

We used the latest version of Mplus 8.8 (Muthén & Muthén, 2017) to estimate sample statistics, bivariate correlation coefficients, two first-order factors, one second-order factor, and multiple regression coefficients. First, we calculated the frequency, percentage, mean, standard deviation, and range of each study variable to describe the research participants' demographic characteristics. Next, bivariate statistics were analyzed by looking at the zero-order correlations between the research variables. Lastly, multiple regression analysis was perfor-

TABLE I
Descriptive Statistics (N = 478)

	N	%	Mean	SD	Range
Dependent variable					
Disordered eating			14.05	12.95	0-67
Independent variable					
Negative emotion			13.46	7.97	0-41
Anxiety			7.71	4.76	0-21
Depression			5.75	3.90	0-20
Control variable					
Age (years)			27.17	8.09	18-53
Height (cm)			171.23	11.20	124.97-210.31
Weight (kg)			71.72	16.21	43-181.4
BMI (kg/m^2)			24.50	5.32	15.02-60.22
Gender					
Female	272	56.90			
Male	202	42.26			
Self-describe	4	0.84			
Race					
White	431	90.17			
Non-White	47	9.83			

med within the context of structural equation modeling (SEM) to determine the influence of each predictor variable on the outcome variable. The present study utilized the Full Information Maximum Likelihood (FIML) technique (Baraldi & Enders, 2010; Cham et al., 2017; Geiser, 2013) to address the issue of missing data. Additionally, Maximum Likelihood (ML) was employed as an estimator (Muthén & Muthén, 2017).

2.4. MEASURES

2.4.1. Disordered eating

Disordered eating in the current study was measured by using Eating Disorder Inventory-2 (EDI-2; Garner, 1991), which is a widely used self-report measure for disordered eating behaviors and characteristics related to eating disorders in the general population (Nevonen & Broberg, 2001). It also assesses eating and shape-related ideas. Within sports psychology, the EDI-2 is applied to study athletes, specifically female athletes, to screen for their disordered eating (Byrne & McLean, 2002; Hallsworth et al., 2005; McNulty et al., 2001). The EDI-2 is a self-reported questionnaire containing 91 items to assess the presence of disordered eating

behavior. Of these items, we employed 23 items in the following three subscales: *Drive for thinness, Bulimia, and Body dissatisfaction*.

These three subscales best assessed disordered eating in the non-clinical population (Garner, 1991). The questions included "I eat when I am upset." It was a six-point scale (1 = always, 6 = never). The respondents were asked to answer what best describes them (Garner, 1991). Items were coded so that higher scores reflected greater disordered eating. The validity of the EDI-2 is widely recognized (Gilbert & Meyer, 2004; Hart & Kenny, 1997). In the present study, internal reliability was excellent for EDI-Drive for thinness (α = .86), EDI-Bulimia (α = .79), and EDI-Body dissatisfaction (α = .89). These results are comparable to other recently conducted studies which sampled an athlete population (Scott et al., 2019; Scott et al., 2020).

2.4.2. Negative Emotion

Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) is a self-assessment measurement widely used to check negative emotion among adults aged 16 – 65 years. It is divided into anxiety (HADS-A) and depression (HADS-D). This scale consists of 14 items (seven items each for anxiety and depression symptoms) with a four-point scale (0 = *not at all*, 3 = *most of the time*). The score for each item indicates the degree of anxiety or depression over the last 14 days.

The questions, such as "*I feel tense or wound up*," were asked to examine the participants' level of anxiety in the present study. In contrast, their level of depression was assessed by asking questions such as "*I have lost interest in my appearance*." It was designed to screen psychiatric symptoms, excluding physical illness-related questions (Zigmond & Snait, 1983). Scores from 0 to 7 for either subscale were considered normal, 8 to 10 as mild, 11 to 14 as moderate, and 15 or above as significantly disordered (Stern, 2014). We verified that the internal consistency for anxiety was excellent (α = .87) along with depression (α = .81). These findings indicated higher reliability than the findings in previous research on athletes (Hálfdanardóttir, 2016; Scott et al., 2019). Using anxiety and depression as two first-order latent variables, we performed a second-order confirmatory factor analysis to obtain a single latent variable (negative emotion), as indicated in Figure 1. A greater score indicated more intense negative feelings.

2.4.3. Control Variables

Six control variables were included in the current analysis to estimate the actual amount of impact that negative emotion exerted on disordered eating. We calculated age in the number of years on a ratio-level measurement. Height was measured in centimeters, while weight was measured in kilograms. Body mass index (BMI) was calculated based on the formula (kg/m^2), which is the self-reported weight in kilograms (kg) divided by height in meters squared (m^2). Gender was dichotomized with female (=1) and non-female (=0). Finally, race was estimated on a binary scale (white = 1, non-white = 0).

3. Research Results

Table II shows the zero-order correlation coefficients for the variables of the current study. Negative emotion (r = 0.4378, p < .001), BMI (r = 0.1907, p <

.001), gender (r = 0.3156, p < .001) were positively related to disordered eating, while age (r = -0.1861, p < .001) and height (r = -0.1760, p < .001) were negatively related to disordered eating. Negative emotion was most strongly related to disordered eating than gender, BMI, height, and age. These correlation coefficients represent the bivariate relationship between disordered eating and each predictor variable without other variables controlled. So, we conducted a multivariate analysis to carve out the true relationship between the dependent variable (disordered eating) and each of the predictor variables (negative emotion, age, height, weight, BMI, gender, and race) when other variables are controlled.

TABLE II
Correlations

	1	2	3	4	5	6	7	8
1. Disordered eating	1							
2. Negative emotion	0.4378***	1						
3. Age	-0.1861***	-0.1996***	1					
4. Height	-0.1760***	-0.1302**	0.0147	1				
5. Weight	0.0821	-0.0309	0.0952*	0.4192***	1			
6. BMI	0.1907***	0.0453	0.0817	-0.2088***	0.7912***	1		
7. Gender	0.3156***	0.2267***	-0.1025*	-0.4745***	-0.4787***	-0.2218***	1	
8. Race	0.0062	-0.0285	0.0963*	-0.0272	-0.0983*	-0.0918*	0.1808***	1

*p < 0.05; **p < 0.01; ***p < 0.001

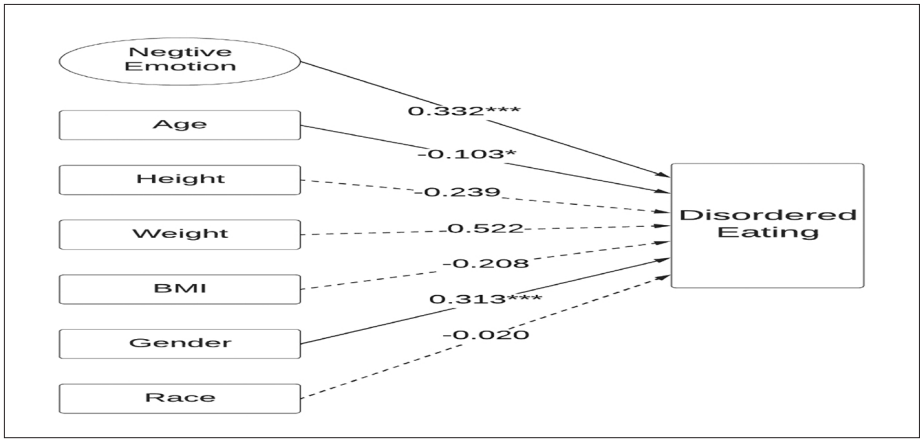

Fig. 1. - Path diagram to predict *Disordered Eating.*
*p < 0.05; **p < 0.01; ***p < 0.001.

Table III shows the estimate of each predictor variable (negative emotion, age, height, weight, BMI, gender, or race) for disordered eating when controlling for all the other study variables. Additionally, Figure 1 displays its path diagram and how the outcome variable (disordered eating) was affected by a latent variable (negative emotion) and each of six manifest variables (age, height, weight, BMI, gender, and race). The current model fit the data relatively well (RMSEA = 0.04; CFI = 0.96; TLI = 0.95; SRMR = 0.04). All the predictor variables in the model explained 30.8% of variance (R^2 = 0.308) of disordered eating (Hu & Bentler, 1998).

TABLE III
SEM Estimate Of Each Predictor Variable For Disordered Eating

	Estimate	**SE.**	**Sig.**
Negative emotion	0.332	0.047	0.000
Age	-0.103	0.040	0.011
Height	-0.239	0.191	0.211
Weight	0.522	0.296	0.078
BMI	-0.146	0.311	0.638
Gender	0.254	0.054	0.000
Race	0.001	0.045	0.978
R-Square	0.308		
N	478		
AIC	17604.331		
BIC	17908.713		
Sample-Size Adjusted BIC (n* = (n + 2) / 24)	17677.019		

Negative emotion ($\beta = 0.332$, $p < 0.01$) was a statistically significant predictor of disordered eating. This indicates that the higher value of negative emotion respondents have, the greater the self-reported value of disordered eating. Among the control variables, age ($\beta = -0.103$, $p < 0.05$) was a statistically significant and negative predictor of increasing disordered eating. This indicates that older participants are less likely to have disordered eating than their younger counterparts. Also, gender ($\beta = 0.254$, $p < 0.001$) was a significant and positive predictor for disordered eating, which means that female respondents are more likely to have disordered eating.

4. Conclusion

4.1. Discussion

The present study found evidence that negative emotion significantly increased disordered eating among UK athletes during the COVID-19 pandemic. The current finding concurs with the literature (Brechan & Kvalem, 2015; Bushnell et al., 1994; Fairburn et al., 2003; Fischer et al., 2003; Giel et al., 2016; Godart et al., 2002; Kaye et al., 2004; Lavender et al., 2015; Perez et al., 2004; Santos et al., 2007; Terry et al., 1999; Vardar et al., 2007; Zaider et al., 2002). An explanation for this can be found in Agnew's (1992, 2001, 2015) General Strain Theory. Agnew suggests that strains result in negative emotions such as anxiety and depression and that these emotions induce deviant behaviors as a corrective action to cope with built-up strains. The UK athletes in our sample might have engaged in disordered eating after feeling depressed and anxious because they experienced more stress during the COVID-19 pandemic. To help deal with highly stressful situations such as the pandemic, we recommend that athletes attend online seminars to nurture positive qualities such as resilience, optimism, and coping mechanisms, that can protect against mental problems. (Brunwasser et al., 2009).

Additionally, we recommend the training and sensitization of coaching staff on how to screen and monitor at-risk athletes to help maintain athletes' mental health. Also, health professionals can monitor athletes' physical and psychological well-being (Jukic et al., 2020). If at-risk athletes are identified, we recommend that health professionals implement appropriate interventions—for example, Cognitive Behavioral Therapy (CBT). Cochrane Systematic Review determined that the treatment effectiveness of CBT was superior for both general anxiety and depression compared to other psychological therapies (Hunot et al., 2007). Research has found that web-based CBT for anxiety and depression has good participant satisfaction rates (Ruwaard, 2013, p. 54) and is effective in the general population (Høifødt et al., 2011; Ruwaard et al., 2012; Spence et al., 2011) even after long-term follow-up (Ruwaard, 2013, p. 53).

Among the control variables of the current study, age and gender emerged as significant risk factors for disordered eating. The present study's findings that age plays a vital role are somewhat predictable, as traditionally, eating disorders develop during adolescence to young adulthood and decrease in later life (Currin et al., 2005). People tend to diet less when they get older, and their psychological functioning improves (Rohde et al., 2017).

Therefore, prevention programs for disordered eating should begin at a younger age.

The study findings regarding the significance of gender to disordered eating support previous research findings (Byrne & McLean, 2001; Martinsen & Sundgot-Borgen, 2013; Sundgot-Borgen & Torstveit, 2004; Udo & Grilo, 2018; Yu et al., 2018). A recent systematic analysis of research between 2000 and 2018 reported that women are estimated to comprise the majority of people who suffer from eating disorders, particularly binge eating disorders (Galmiche et al., 2019). So, policy should consider gender-specific approaches when implementing primary preventive programs, strategies, and curricula.

4.2. Study Limitations and Rtioecommendans for Future Research

The present study filled a gap in the literature by reporting the significant effects of negative emotion, age, and gender on disordered eating among UK athletes during the COVID-19 pandemic; however, there were a few limitations to this study. First, future research would benefit from utilizing more sophisticated means of measuring disordered eating. Men and women display disordered eating differently (Smith et al., 2017), and EDI-2 scales are less reliable for women than men (Anderson et al., 1996; Spillane et al., 2004). Thus, future studies might have to use different measures for males and females.

Second, conducting face-to-face surveys or interviews was not feasible in the present study due to the enforcement of social distancing measures in the UK. Consequently, the current study used an online self-reporting survey. In future research, it can be useful to gather data through face-to-face surveys conducted by medical professionals. Face-to-face data collection methods may be more reliable in detecting ambiguous symptoms of disordered eating, such as bingeing, which online self-reporting surveys may miss (Garner & Myerholtz, 1998, p. 620).

Third, other factors can potentially affect athletes' disordered eating. For instance, previous literature has found the level of competition (Brownell et al., 1987; Lamont-Mills & Christensen, 2006; Picard, 1999) and type of sport (McNulty et al., 2001; Sundgot-Borgen, 1994; Torstveit et al., 2008) can affect eating psychopathology. Therefore, future studies should consider including variables that can influence disordered eating other than those used in the current research. (Di Fronso et al., 2013; Brebner, 2003).

Finally, despite the limitations discussed above, the current study is critical because it aimed to explore the effect of negative emotion on disordered eating on UK athletes during the COVID-19 pandemic. Future studies can adopt additional focus and different research methodologies to investigate the impact of negative emotion on athletes in the UK and globally due to the pandemic. Given the **FINDINGS OF THIS RESEARCH**, training regimens and social interaction, gender-specific approaches, and interventions targeting younger athletes should be encouraged in the uk and beyond to help athletes further manage stress if a situation like the covid-19 pandemic should occur again. this study offers a baseline that now encourages further exploration.

REFERENCES

Abbott, W., Brett, A., Brownlee, T. E., Hammond, K. M., Harper, L. D., Naughton, R. J., ... & Clifford, T. (2021). The prevalence of disordered eating in elite male and female soccer players. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 26*(2), 491-498. https://doi.org/10.1007/s40519-020-00872-0

Agnew, R. (1992). Foundation for a general strain theory of crime and delinquency. *Criminology, 30*(1), 47-88.

Agnew, R. (2001). Building on the foundation of general strain theory: Specifying the types of strain most likely to lead to crime and delinquency. *Journal of Research in Crime and Delinquency, 38*(4), 319-361.

Agnew, R. (2015). Using general strain theory to explain crime in Asian societies. *Asian Journal of Criminology, 10*(2), 131-147. 10.1007/s11417-014-9198-2

Anderson, S. L., Zager, K., Hetzler, R. K., Nahikian-Nelms, M., & Syler, G. (1996). Comparison of Eating Disorder Inventory (EDI-2) scores of male bodybuilders to the male college student subgroup. *International Journal of Sport Nutrition and Exercise Metabolism*, *6*(3), 255-262. https://doi.org/10.1123/ijsn.6.3.255

Anshel, M. H. (2004). Sources of disordered eating patterns between ballet dancers and non-dancers. *Journal of Sport Behavior*, *27*(2), 115.

Baraldi, A. N., & Enders, C. K. (2010). An introduction to modern missing data analyses. *Journal of school psychology, 48*(1), 5-37. https://doi.org/10.1016/j.jsp.2009.10.001

Beals, K. A. (2004). *Disordered eating among athletes: A comprehensive guide for health professionals.* Human Kinetics.

Brebner, J. (2003). Gender and emotions. *Personality and Individual Differences*, *34* (3), 387-394. https://doi.org/10.1016/S0191-8869(02)00059-4

Brechan, I., & Kvalem, I. L. (2015). Relationship between body dissatisfaction and disordered eating: Mediating role of self-esteem and depression. *Eating behaviors*, *17*, 49-58. https://doi.org/10.1016/j.eatbeh.2014.12.008

Brownell, K., Steen, S., & Willmore, J. (1987). Weight regulation practices in athletes: analysis of metabolic and health effects. *Medicine & Science in Sports & Exercise, 19*(6), 546-556.

Brunwasser, S. M., Gillham, J. E., & Kim, E. S. (2009). A meta-analytic review of the Penn Resiliency Program's effect on depressive symptoms. *Journal of consulting and clinical psychology*, *77*(6), 1042. 10.1037/a0017671

Bushnell, J. A., Wells, J. E., McKenzie, J. M., Hornblow, A. R., Oakley-Browne, M. A., & Joyce, P. R. (1994). Bulimia comorbidity in the general population and in the clinic. *Psychological Medicine*, *24*(3), 605-611. https://doi.org/10.1017/S0033291700027756

Byrne, S., & McLean, N. (2001). Eating disorders in athletes: a review of the literature. *Journal of science and medicine in sport*, *4*(2), 145-159. https://doi.org/10.1016/S1440-2440(01)80025-6

Byrne, S., & McLean, N. (2002). Elite athletes: effects of the pressure to be thin. *Journal of science and medicine in sport*, *5*(2), 80-94. https://doi.org/10.1016/S1440-2440(02)80029-9

Cham, H., Reshetnyak, E., Rosenfeld, B., & Breitbart, W. (2017). Full information maximum likelihood estimation for latent variable interactions with incomplete indicators. *Multivariate Behavioral Research, 52*(1), 12-30. https://doi.org/10.1080/00273171.2016.1245600

Chatterton, J. M., & Petrie, T. A. (2013). Prevalence of disordered eating and pathogenic weight control behaviors among male collegiate athletes. *Eating Disorders*, *21*(4), 328-341. https://doi.org/10.1080/02701367.2012.10599833

Claes, L., Jiménez-Murcia, S., Agüera, Z., Castro, R., Sánchez, I., Menchón, J. M., & Fernández-Aranda, F. (2012). Male eating disorder patients with and without non-suicidal self-injury: A comparison of psychopathological and personality features. *European Eating Disorders Review*, *20*(4), 335-338. https://doi.org/10.1002/erv.1161

Currie, A. (2010). Sport and eating disorders-understanding and managing the risks. *Asian Journal of sports medicine*, *1*(2), 63. https://doi.org/10.5812/asjsm.34864

Currin, L., Schmidt, U., Treasure, J., & Jick, H. (2005). Time trends in eating disorder incidence. *The British Journal of Psychiatry, 186*(2), 132-135. https://doi.org/10.1192/bjp.186.2.132

Di Fronso, S., Nakamura, F. Y., Bortoli, L., Robazza, C., & Bertollo, M. (2013). Stress and recovery balance in amateur basketball players: differences by gender and preparation phase. *International Journal of Sports Physiology and Performance*, *8*(6), 618-622. https://doi.org/10.1123/ijspp.8.6.618

Di Fronso, S., Costa, S., Montesano, C., Di Gruttola, F., Ciofi, E. G., Morgilli, L., ... & Bertollo, M. (2020). The effects of COVID-19 pandemic on perceived stress and psychobiosocial states in Italian athletes. *International Journal of Sport and Exercise Psychology*, 1-13. https://doi.org/10.1080/1612197X.2020.1802612

Drinkwater, B., Loucks, A., Sherman, R., Sundgot-Borgen, J., & Thompon, R. (2005). International Olympic Committee Medical Commission Working Group Women in Sport. Position Stand on the Female Athlete Triad. *International Olympic Committee*.

El Ghoch, M., Soave, F., Calugi, S., & Dalle Grave, R. (2013). Eating disorders, physical fitness and sport performance: a systematic review. *Nutrients*, *5*(12), 5140-5160. https://doi.org/10.3390/nu5125140

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: A "transdiagnostic" theory and treatment. *Behaviour research and therapy*, *41*(5), 509-528. https://doi.org/10.1016/S0005-7967(02)00088-8

Fischer, S., Smith, G. T., & Anderson, K. G. (2003). Clarifying the role of impulsivity in bulimia nervosa. *International Journal of Eating Disorders*, *33*(4), 406-411. https://doi.org/10.1002/eat.10165

Fogelholm, M. (1994). Effects of bodyweight reduction on sports performance. *Sports Medicine*, *18*(4), 249-267. https://doi.org/10.2165/00007256-199418040-00004

Galmiche, M., Déchelotte, P., Lambert, G., & Tavolacci, M. P. (2019). Prevalence of eating disorders over the 2000-2018 period: a systematic literature review. *The American Journal of Clinical Nutrition, 109*(5), 1402-1413. https://doi.org/10.1093/ajcn/nqy342

Gapin, J. I., & Petruzzello, S. J. (2011). Athletic identity and disordered eating in obligatory and non-obligatory runners. *Journal of Sports Sciences*, *29*(10), 1001-1010. https://doi.org/10.1080/02640414.2011.571275

Garner, D. M. (1991). *Eating disorder inventory-2* (pp. 48-48). Odessa, FL: psychological assessment resources.

Garner, D. M. (2002). Measurement of eating disorder psychopathology. *Eating disorders and obesity: A comprehensive handbook*, *2*, 141-146.

Garner, D. M., & Myerholtz, L. E. (1998). Eating disorders. In T. Ollendick (Ed.), *Comprehensive clinical psychology* (Vol. 5, pp. 591-628). Oxford, UK: Elsevier Science.

Geiser, C. (2013). *Data analysis with Mplus*. Guilford Press.

Giel, K. E., Hermann-Werner, A., Mayer, J., Diehl, K., Schneider, S., Thiel, A., ... & GOAL Study Group. (2016). Eating disorder pathology in elite adolescent athletes. *International Journal of Eating Disorders*, *49*(6), 553-562. https://doi.org/10.1002/eat.22511

Gilbert, N., & Meyer, C. (2004). Similarity in young women's eating attitudes: Self-selected versus artificially constructed groups. *International Journal of Eating Disorders*, *36*(2), 213f-219. https://doi.org/10.1002/eat.20036

Godart, N. T., Flament, M. F., Perdereau, F., & Jeammet, P. (2002). Comorbidity between eating disorders and anxiety disorders: a review. *International Journal of Eating Disorders*, *32*(3), 253-270. https://doi.org/10.1002/eat.10096

Goodwin, H., Haycraft, E., & Meyer, C. (2016). Disordered eating, compulsive exercise, and sport participation in a UK adolescent sample. *European Eating Disorders Review*, *24*(4), 304-309. https://doi.org/10.1002/erv.2441

Greenleaf, C., Petrie, T. A., Carter, J., & Reel, J. J. (2009). Female collegiate athletes: Prevalence of eating disorders and disordered eating behaviors. *Journal of American College Health*, *57*(5), 489-496. https://doi.org/10.3200/JACH.57.5.489-496

Hálfdanardóttir, B. F. (2016). *Anxiety and Depression Symptoms in Athletes and Their Attitudes Towards These Problems* [Doctoral dissertation, Sigillum University Iceland]. Skemman. https://skemman.is/bitstream/1946/23642/1/Anxiety%20and%20depression%20symptoms%20in%20athletes%20and%20their%20attitudes%20towards%20these%20problems.pdf

Hallsworth, L., Wade, T., & Tiggemann, M. (2005). Individual differences in male body-image: An examination of self-objectification in recreational body builders. *British journal of health psychology*, *10*(3), 453-465. https://doi.org/10.1348/135910705X26966

Hart, K., & Kenny, M. E. (1997). Adherence to the super woman ideal and eating disorder symptoms among college women. *Sex Roles*, *36*(7-8), 461-478. https://doi.org/10.1007/BF02766684

Høifødt, R. S., Strøm, C., Kolstrup, N., Eisemann, M., & Waterloo, K. (2011). Effectiveness of cognitive behavioural therapy in primary health care: a review. *Family practice*, *28*(5), 489-504. https://doi.org/10.1093/fampra/cmr017

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*(4), 424-453. https://doi.org/10.1037/1082-989x.3.4.424

Hunot, V., Churchill, R., Teixeira, V., & de Lima, M. S. (2007). Psychological therapies for generalised anxiety disorder. *Cochrane Database of Systematic Reviews*, (1). https://doi.org/10.1002/14651858.CD001848.pub4

Joy, E., Kussman, A., & Nattiv, A. (2016). 2016 update on eating disorders in athletes: A comprehensive narrative review with a focus on clinical assessment and management. *British journal of sports medicine, 50*(3), 154-162. http://dx.doi.org/10.1136/bjsports-2015-095735

Jukic, I., Calleja-González, J., Cos, F., Cuzzolin, F., Olmo, J., Terrados, N., ... & Krakan, I. (2020). Strategies and solutions for team sports athletes in isolation due to Covid-19. *Sports* 2020, *8*(4), 56. https://doi.org/10.3390/sports8040056

Kaye, W. H., Gwirtsman, H. E., George, D. T., Weiss, S. R., & Jimerson, D. C. (1986). Relationship of mood alterations to bingeing behaviour in bulimia. *Br J Psychiatry*, *149*(4), 479-485. https://doi.org/10.1192/bjp.149.4.479

Kaye, W. H., Bulik, C. M., Thornton, L., Barbarich, N., Masters, K., & Price Foundation Collaborative Group. (2004). Comorbidity of anxiety disorders with anorexia and bulimia nervosa. *American Journal of Psychiatry*, *161*(12), 2215-2221. https://doi.org/10.1176/appi.ajp.161.12.2215

Kong, P., & Harris, L. M. (2015). The sporting body: body image and eating disorder symptomatology among female athletes from leanness focused and nonleanness focused sports. *The Journal of psychology*, *149*(2), 141-160. https://doi.org/10.1080/00223980.2013.846291

Lades, L. K., Laffan, K., Daly, M., & Delaney, L. (2020). Daily emotional well-being during the COVID-19 pandemic. *British journal of health psychology, 25*(4), 902-911. https://doi.org/10.1111/bjhp.12450

Lamont-Mills, A., & Christensen, S. A. (2006). Athletic identity and its relationship to sport participation levels. *Journal of Science and Medicine in Sport*, *9*(6), 472-478. https://doi.org/10.1016/j.jsams.2006.04.004

Lavender, J. M., Wonderlich, S. A., Engel, S. G., Gordon, K. H., Kaye, W. H., & Mitchell, J. E. (2015). Dimensions of emotion dysregulation in anorexia nervosa and bulimia nervosa: A conceptual review of the empirical literature. *Clinical psychology review*, *40*, 111-122. https://doi.org/10.1016/j.cpr.2015.05.010

Loucks, A. B. (2004). Energy balance and body composition in sports and exercise. *Journal of sports sciences*, *22*(1), 1-14. https://doi.org/10.1080/0264041031000140518

MacKinnon, L. T. (2000). Overtraining effects on immunity and performance in athletes. *Immunology and cell biology*, *78*(5), 502-509. https://doi.org/10.1111/j.1440-1711.2000.t01-7-.x

Mancine, R. P., Gusfa, D. W., Moshrefi, A., & Kennedy, S. F. (2020). Prevalence of disordered eating in athletes categorized by emphasis on leanness and activity type–a systematic review. *Journal of eating disorders, 8*(1), 1-9. https://doi.org/10.1186/s40337-020-00323-2

Mann, R. H., Clift, B. C., Boykoff, J., & Bekker, S. (2020). Athletes as community; athletes in community: covid-19, sporting mega-events and athlete health protection. British *Journal of Sports Medicine, 54*(18), 1071-1072. http://dx.doi.org/10.1136/bjsports-2020-102433

Martinsen, M., Bratland-Sanda, S., Eriksson, A. K., & Sundgot-Borgen, J. (2010). Dieting to win or to be thin? A study of dieting and disordered eating among adolescent elite athletes and non-athlete controls. *British journal of sports medicine*, *44*(1), 70-76. http://dx.doi.org/10.1136/bjsm.2009.068668

Martinsen, M., & Sundgot-Borgen, J. (2013). Higher prevalence of eating disorders among adolescent elite athletes than controls. *Medicine & Science in Sports & Exercise*, *45*(6), 1188-1197. https://doi.org/10.1249/MSS.0b013e318281a939

McNulty, K. Y., Adams, C. H., Anderson, J. M., & Affenito, S. G. (2001). Development and validation of a screening tool to identify eating disorders in female athletes. *Journal of the American Dietetic Association*, *101*(8), 886-892. https://doi.org/10.1016/S0002-8223(01)00218-8

Muthén, L. K., & Muthén, B. O. (2017). *Mplus User's Guide* (8th ed.). Los Angeles, CA: Muthén & Muthén.

Nevonen, L., & Broberg, A. G. (2001). Validating the eating disorder inventory-2 (EDI-2) in Sweden. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, *6*(2), 59-67. https://doi.org/10.1007/BF03339754

Otis, C. L., Drinkwater, B., Johnson, M., Loucks, A., & Wilmore, J. (1997). American College of Sports Medicine position stand. The female athlete triad. *Medicine and Science in Sports and Exercise*, *29*(5), i-ix. https://doi.org/10.1097/00005768-199705000-00037

Perez, M., Joiner, T. E., & Lewinsoshn, P. M. (2004). Is major depressive disorder or dysthymia more strongly associated with bulimia nervosa?. *International Journal of Eating Disorders*, *36*(1), 55-61. https://doi.org/10.1002/eat.20020

Petrie, T. A., Greenleaf, C., Reel, J., & Carter, J. (2009). Personality and psychological factors as predictors of disordered eating among female collegiate athletes. *Eating Disorders*, *17*(4), 302-321. https://doi.org/10.1080/10640260902991160

Picard, C. L. (1999). The level of competition as a factor for the development of eating disorders in female collegiate athletes. *Journal of youth and adolescence*, *28*(5), 583-594. https://doi.org/10.1023/A:1021606710398

Rohde, P., Stice, E., Shaw, H., Gau, J. M., & Ohls, O. C. (2017). Age effects in eating disorder baseline risk factors and prevention intervention effects. *International Journal of Eating Disorders*, *50*(11), 1273-1280. https://doi.org/10.1002/eat.22775

Ruwaard, J. J. (2013). *The efficacy and effectiveness of online CBT*. Universiteit van Amsterdam [Host].

Ruwaard, J., Lange, A., Schrieken, B., Dolan, C. V., & Emmelkamp, P. (2012). The effectiveness of online cognitive behavioral treatment in routine clinical practice. *PLoS one*, *7*(7), e40089. https://doi.org/10.1371/journal.pone.0040089

Santos, M., Richards, C. S., & Bleckley, M. K. (2007). Comorbidity between depression and disordered eating in adolescents. *Eating behaviors*, *8*(4), 440-449. https://doi.org/10.1016/j.eatbeh.2007.03.005

Scott, C. L., Haycraft, E., & Plateau, C. R. (2019). Teammate influences and relationship quality are associated with eating and exercise psychopathology in athletes. *Appetite*, *143*, 104404. https://doi.org/10.1016/j.appet.2019.104404

Scott, C. L., Plateau, C. R., & Haycraft, E. (2020). Teammate influences, psychological well-being, and athletes' eating and exercise psychopathology: A moderated mediation analysis. *International Journal of Eating Disorders*, *53*(4), 564-573. https://doi.org/10.1002/eat.23222

Sherman, R. T., & Thompson, R. A. (2001). Athletes and disordered eating: Four major issues for the professional psychologist. *Professional psychology: research and practice*, *32*(1), 27. https://doi.org/10.1037/0735-7028.32.1.27

Smith, A. R., Fink, E. L., Anestis, M. D., Ribeiro, J. D., Gordon, K. H., Davis, H., ... & Crow, S. (2013). Exercise caution: over-exercise is associated with suicidality among individuals with disordered eating. *Psychiatry Research*, *206*(2-3), 246-255. https://doi.org/10.1016/j.psychres.2012.11.004

Smith, K. E., Mason, T. B., Murray, S. B., Griffiths, S., Leonard, R. C., Wetterneck, C. T., ... & Lavender, J. M. (2017). Male clinical norms and sex differences on the Eating Disorder Inventory (EDI) and Eating Disorder Examination Questionnaire (EDE-Q). *International Journal of Eating Disorders, 50*(7), 769-775. https://doi.org/10.1002/eat.22716

Souter, G., Lewis, R., & Serrant, L. (2018). Men, mental health and elite sport: A narrative review. *Sports medicine-open, 4*(1), 1-8. https://doi.org/10.1186/s40798-018-0175-7

Spence, S. H., Donovan, C. L., March, S., Gamble, A., Anderson, R. E., Prosser, S., & Kenardy, J. (2011). A randomized controlled trial of online versus clinic-based CBT for adolescent anxiety. *Journal of Consulting and Clinical Psychology*, *79*(5), 629-642. https://doi.org/10.1037/a0024512

Spillane, N. S., Boerner, L. M., Anderson, K. G., & Smith, G. T. (2004). Comparability of the Eating Disorder Inventory-2 between women and men. *Assessment*, *11*(1), 85-93. https://doi.org/10.1177/1073191103260623

Steinglass, J. E., Sysko, R., Mayer, L., Berner, L. A., Schebendach, J., Wang, Y., ... & Walsh, B. T. (2010). Pre-meal anxiety and food intake in anorexia nervosa. *Appetite*, *55*(2), 214218. https://doi.org/10.1016/j.appet.2010.05.090

Stern, A. F. (2014). The hospital anxiety and depression scale. *Occupational Medicine*, *64*(5), 393-394. https://doi.org/10.1093/occmed/kqu024

Striegel-Moore, R. H., & Bulik, C. M. (2007). Risk factors for eating disorders. *American psychologist*, *62*(3), 181. 10.1037/0003-066X.62.3.181

Sundgot-Borgen, J. (1994). Risk and trigger factors for the development of eating disorders in female elite athletes. *Medicine & Science in Sports & Exercise*. *26*(4), 414-419. https://doi.org/10.1249/00005768-199404000-00003

Sundgot-Borgen, J., & Larsen, S. (1993). Pathogenic weight-control methods and self- reported eating disorders in female elite athletes and controls. *Scandinavian journal of medicine & science in sports*, *3*(3), 150-155. https://doi.org/10.1111/j.16000838.1993.tb00379.x

Sundgot-Borgen, J., & Torstveit, M. K. (2004). Prevalence of eating disorders in elite athletes is higher than in the general population. *Clinical journal of sport medicine*, *14*(1), 25-32.

Sundgot-Borgen, J., & Torstveit, M. K. (2010). Aspects of disordered eating continuum in elite high-intensity sports. *Scandinavian Journal of Medicine & Science in Sports*, *20*, 112-121. https://doi.org/10.1111/j.1600-0838.2010.01190.x

Terry, P. C., Lane, A. M., & Warren, L. (1999). Eating attitudes, body shape perceptions and mood of elite rowers. *Journal of Science and Medicine in Sport*, *2*(1), 67-77. https://doi.org/10.1016/S1440-2440(99)80185-6

Thein-Nissenbaum, J. M., Rauh, M. J., Carr, K. E., Loud, K. J., & McGuine, T. A. (2011). Associations between disordered eating, menstrual dysfunction, and musculoskeletal injury among high school athletes. *journal of orthopaedic & sports physical therapy*, *41*(2), 60-69. https://www.jospt.org/doi/10.2519/jospt.2011.3312

Thiemann, P., Legenbauer, T., Vocks, S., Platen, P., Auyeung, B., & Herpertz, S. (2015). Eating disorders and their putative risk factors among female German professional athletes. *European Eating Disorders Review*, *23*(4), 269-276. https://doi.org/10.1002/erv.2360

Thompson, R. A., & Sherman, R. (2014). Reflections on athletes and eating disorders. *Psychology of Sport and Exercise*, *15*(6), 729-734. https://doi.org/10.1016/j.psychsport.2014.06.005

Toresdahl, B. G., & Asif, I. M. (2020). Coronavirus disease 2019 (COVID-19): considerations for the competitive athlete. *Sports Health*. 2020;12(3):221-224. https://doi.org/10.1177/1941738120918876

Torstveit, M. K., Rosenvinge, J. H., & Sundgot-Borgen, J. (2008). Prevalence of eating disorders and the predictive power of risk models in female elite athletes: a controlled study. *Scandinavian journal of medicine & science in sports*, *18*(1), 108-118. https://doi.org/10.1111/j.1600-0838.2007.00657.x

Udo, T., & Grilo, C. M. (2018). Prevalence and correlates of DSM-5-defined eating disorders in a nationally representative sample of US adults. *Biological Psychiatry, 84*(5), 345-354. https://doi.org/10.1016/j.biopsych.2018.03.014

VanHeest, J. L., Rodgers, C. D., Mahoney, C. E., & De, M. S. (2014). Ovarian suppression impairs sport performance in junior elite female swimmers. *Medicine and science in sports and exercise*, *46*(1), 156-166. https://doi.org/10.1249/mss.0b013e3182a32b72

Vardar, E., Vardar, S. A., & Kurt, C. (2007). Anxiety of young female athletes with disordered eating behaviors. *Eating behaviors*, *8*(2), 143-147. https://doi.org/10.1016/j.eatbeh.2006.03.002

Venkatraman, J. T., & Pendergast, D. R. (2002). Effect of dietary intake on immune function in athletes. *Sports medicine*, *32*(5), 323-337. https://doi.org/10.2165/00007256-200232050-00004

Voelker, D. K., Gould, D., & Reel, J. J. (2014). Prevalence and correlates of disordered eating in female figure skaters. *Psychology of Sport and Exercise*, 15(6), 696-704. https://doi.org/10.1016/j.psychsport.2013.12.002

Wells, K. R., Jeacocke, N. A., Appaneal, R., Smith, H. D., Vlahovich, N., Burke, L. M., & Hughes, D. (2020). The Australian Institute of Sport (AIS) and National Eating Disorders Collaboration (NEDC) position statement on disordered eating in high performance sport. *British journal of sports medicine, 54*(21), 1247-1258. http://dx.doi.org/10.1136/bjsports-2019-101813

Weltzin, T. E., Cornella-Carlson, T., Fitzpatrick, M. E., Kennington, B., Bean, P., & Jefferies, C. (2012). Treatment issues and outcomes for males with eating disorders. *Eating disorders*, *20*(5), 444-459. https://doi.org/10.1080/10640266.2012.715527

Wilmore, J. H., & Costill, D. L. (1992). Nutrition and human performance. *Eating body weight and performance in athletes: Disorders of modern society*, 61-76.

Yu, Z., Indelicato, N. A., Fuglestad, P., Tan, M., Bane, L., & Stice, C. (2018). Sex differences in disordered eating and food addiction among college students. *Appetite, 129*, 12-18. https://doi.org/10.1016/j.appet.2018.06.028

Zaider, T. I., Johnson, J. G., & Cockell, S. J. (2002). Psychiatric disorders associated with the onset and persistence of bulimia nervosa and binge eating disorder during adolescence. *Journal of Youth and Adolescence*, *31*(5), 319-329. https://doi.org/10.1023/A:1015694623574

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta psychiatrica scandinavica*, *67*(6), 361-370.

Manuscript submitted August 2022. Accepted for publication October 2022.