

Risk of Disordered Eating, Exercise Dependence, Body Dissatisfaction, and Fueling Habits in Masters Trail Runners

Original Research

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Abstract

Introduction: Masters-level trail runners comprise a large percentage of trail and ultramarathon racers. Endurance training may increase the risk of developing disordered eating (DE) patterns and exercise dependence (EXD). This study investigated the risk of DE and EXD in masters-level runners, and compared the risk of EXD, body dissatisfaction, injuries, and fueling habits in runners at risk vs. not at risk for DE.

Methods: In this cross-sectional study design, male ($n = 457$) and female ($n = 564$) masters trail runners (41-65 years of age) completed a Qualtrics survey comprising the Disordered Eating Screen for Athletes (DESA-6), Exercise Dependence Scale (EDS-21), and questions pertaining to fueling strategies, dietary preferences, and body image satisfaction.

Results: 46% of females and 32% of males were at risk for DE based on the DESA-6. 80% of female and 79% of male runners were classified as symptomatic for EXD. For the entire population, there was a significant association between DE risk (88.2%) and symptomatic EXD ($\chi^2_1 = 32.5, p < 0.001$). The majority of participants (71.4%) reported being dissatisfied with their weight.

Conclusion: This study demonstrated a high prevalence of DE, EXD, and body dissatisfaction in masters trail runners.

Key Words: masters athlete, nutrition, running

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Introduction

Due to the growing aging population over the past few decades, studies have reported an increase in sports participation by masters athletes ^{1,2}. Masters athletes (≥ 40 yo) are defined as athletes who maintain their physical activity, performance, and health through regular and consistent training ³. The majority of masters athletes

tend to participate in endurance-based activities such as long distance running ², and in the sport of trail and ultra-running, approximately 73% of athletes are over the age of 40 ^{4,5}. Despite the increase in both prevalence and participation in sport for the masters athlete, research is limited in this population.

Trail running has been suggested to have a high prevalence of risk for disordered eating (DE) and exercise dependence (EXD) in athletes ^{6,7}. DE in athletes typically exists on a spectrum of optimal eating to an eating disorder (ED) and is defined as problematic eating behavior such as restricting, skipping meals, and compulsive eating and/or exercise, that fails to meet the DSM-V diagnostic criteria for an ED ⁸. EXD is defined as excessive exercise that leads to uncontrollable physiological and psychological symptoms and overtraining ⁹. While most studies have examined risk

for DE and EXD in males between the ages of 18-35^{10,11} and premenopausal females between the ages of 18-40^{12,13} peri- and post- menopausal females who may experience body dissatisfaction during this mid-life stage may also be at risk for DE, EXD, or ED^{13,14,15}. Further, research suggests that women experience a significantly greater risk of body dissatisfaction during perimenopause¹⁶ and menopause^{14,17}. In another study, male adult athletes experienced more dietary restraint, DE, and more frequent weighing compared to male adolescents, while adult female athletes experienced a more positive body image compared to younger adolescent females¹⁸. Results are not well-understood regarding the relationship between body dissatisfaction and DE in male elite athletes¹⁹. Therefore, examining the relationship of injury risk, fueling status, body dissatisfaction, and DE in this population is critical.

Under fueling, or not meeting energy demands, has been linked to increased prevalence of injury, illness, compromised training quality and consistency, and recovery⁸. Furthermore, research suggests that masters athletes have higher rates of injuries than younger athletes²⁰ and tend to be slower than younger athletes. A recent study examining physiological stress markers and changes in male and female runners (35 ± 8.8 yo) showed that high levels of muscle damage and cardiac stress are prevalent after 100 km ultramarathons regardless of pace or intensity²¹. Therefore, proper fueling during long endurance events irrespective of finishing time is essential for improving recovery. A recent systematic review examining carbohydrate (CHO) intake during an ultra-trail race suggested that the majority of athletes did not meet the guidelines of consuming 90g CHO/h for exercise durations > 2.5 h (60-272 km or 24 h)²². Barriers to adhering to nutrition recommendations during a race include gastrointestinal (GI) distress, nutrition knowledge/beliefs, available resources, and appetite suppression²².

Despite advances in the field of research examining low energy availability (LEA), DE, and EXD in endurance athletes, research tends to focus on young females with few studies examining masters athletes. DE and LEA may cooccur or occur independently of one another⁸ and may be a result of EXD. However, LEA is difficult to assess in masters trail runners due to the Low Energy Availability in Females Questionnaire (LEAF-Q) not being validated in females over the age of 40. Evaluating the risk of DE and EXD in masters ultra-trail runners is warranted given that the majority of participants are over the age of 40 years²³ and the extreme physiological and energy demands associated with high training loads and racing. Additionally, the relationship between body dissatisfaction and DE in male athletes is not well understood, and research is equivocal regarding body dissatisfaction in peri and post-menopausal females. Therefore, the purpose of this study was to: (1) examine the risk of DE, and EXD in masters-level trail runners, (2) compare the risk of EXD, body dissatisfaction, injuries, and fueling habits in runners at risk for DE vs. those not at risk for DE. We hypothesize that those at risk for DE will report greater risk of EXD, body dissatisfaction, more injuries, and insufficient fueling compared to those not at risk for DE.

Scientific Methods

Participants

Recreational and competitive masters trail runners (male and female) between the age of 41-65 were recruited for this study. The study was advertised through trail- and ultra-running media outlets such as magazines, e-mail subscriptions, training groups, and various social media platforms, ensuring diversity in participant selection. All procedures were approved by the institutional review board and each participant provided their consent electronically prior to data collection. Participants were emailed a link to both the informed consent and questionnaire. All data collected were anonymous and used in aggregate and participants were informed that they could withdraw from the study at any point. Participants who completed the entire questionnaire were entered into a raffle for personalized sports nutrition and hydration products.

Protocol

In this cross-sectional study, athletes filled out a 45-question survey using Qualtrics to assess risk for DE and EXD using two validated screening tools (DESA-6, EDS-21) described below. Additional questions were added to the questionnaire and included: age range in years, type of runner (competitive or recreational), total running mileage per week (low <30 miles, moderate 31-60 miles, and high >60 miles), primary race method (road/track, ultra-trail, trail), menopause status, eating disorder prevalence, fueling strategies during racing and training, dietary practices, and body and weight satisfaction.

Disordered Eating Screen for Athletes (DESA-6)

DE prevalence was assessed using the Disordered Eating Screen for Athletes questionnaire (DESA-6). A score ≥ 3 was considered “at risk” for DE. The DESA-6 was developed to identify disordered eating behaviors in athletes and is reliable with a high sensitivity (92%) and specificity (86%) when compared to the Eating Disorder Examination

Questionnaire (EDE-Q) ²⁴. Research suggests higher DESA-6 scores are associated with increased risk for eating disorders as identified by the Eating Disorder Examination (EDE-Q) (0.80, $p < 0.001$) ²⁴.

Exercise Dependence

The Exercise Dependence Scale-21 (EDS-21) was used to assess risk for exercise dependence (EXD) and examined using factor and psychometric analysis ²⁵. The EDS-21 demonstrated internal consistency and test re-test reliability in individuals at risk for EXD scoring higher for perfectionism and behavior compared to those not at risk, and convergent validity showed those at risk for EXD reported more strenuous exercise behavior compared to those not at risk ²⁵. The EDS-21 consists of 21 questions designed to target EXD symptoms based on the DSM-IV criteria for substance dependence ⁹. Seven criteria are used to assess risk/symptoms of EXD and include: 1) tolerance, 2) withdrawal, 3) continuance, 4) lack of control, 5) reduction in other activities, 6) time, and 7) intention. A higher score indicates greater EXD symptoms ^{26,27}. Athletes were further divided into the following categories based on the grading criteria provided by the developers of the survey: non-dependent asymptomatic, non-dependent symptomatic, and dependent symptomatic ⁹. Prior research shows athletes who score into the “non-dependent symptomatic” classification are at high risk of exercise dependence ^{9,28}. For this study, athletes rated as non-dependent symptomatic and dependent symptomatic were classified as “symptomatic for EXD.”

Body and Weight Satisfaction

All participants were questioned about their current satisfaction with their body and body weight (questions are from the DESA-6) as well as a current or prior diagnosis of an eating disorder ²⁹. Questions and responses are included in Table 1.

Table 1. Body dissatisfaction questions and responses.

In the last three months were you trying to achieve or maintain a specific weight?	No (n = 512) Yes (n = 509)
In the past three months have you been dissatisfied with your weight, meaning have you wanted to weigh less?	No (n = 289) Yes, extremely dissatisfied (n = 85) Yes, moderately dissatisfied (n = 209) Yes, slightly dissatisfied (n = 438)
Do you currently struggle with or have a past diagnosis of the following eating disorders?	Anorexia (n = 70) Bulimia (n = 59) Binge eating disorder (n = 49) Eating disorder not otherwise specified (n = 48) Orthorexia (n = 28) No (n = 871)
Do you consciously try to restrict or reduce the overall amount of food that you eat (whether you succeed or not)?	Yes, daily (n = 190) Yes, several times a week (n = 168) Yes, at least once a week (n = 140) Occasionally, maybe twice a month (n = 156) Rarely, a few times a year (n = 187) Never (n = 180)

Dietary and Fueling Behaviors

All participants were questioned about fueling practices during training and competition using questions adapted from Heikura et al ³⁰. Participants were asked if they follow a specific diet plan (“yes” or “no”) and which dietary plan they follow to support training goals (i.e., high carb, keto, intermittent fasting, paleo, vegetarian/vegan, etc.). Participants were asked about typical CHO intake during and post-training and responses were compared to current evidence-based guidelines during exercise of 30-60g/CHO/h lasting 1- 2.5 h, and up to 90g/CHO/h for events lasting > 2.5 h in duration ³¹. Fueling responses were classified as either “insufficient” or “sufficient” CHO intake depending on the duration of the event. Consuming less than 60g CHO/h for endurance events > 2.5 h and less than 30g/h for endurance activities lasting 1-2.5 h were considered “insufficient.”

Statistical Analysis

Results from the Qualtrics Survey were analyzed using Python, Jupyter Notebooks 6.4.8 running pandas and sci.py stats ³². There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = 0.364$). The

data were normality distributed for kurtosis, but were positively skewed. Results of the Shapiro-Wilk test indicated non-normality; however, based on our sample size ($n = 1,021$), we have found that in general, it is said that Central Limit Theorem kicks in at an n of ~ 30 , and the independent-samples t-test can still provide a valid result. It is our understanding that as sample size increases, it is likely that the distribution will be non-normal; therefore, the Shapiro-Wilk test may not be appropriate for sample sizes over 50, and may be susceptible to finding even minor departures from normality. For Chi-square, variables were categorical (e.g., at risk vs not at risk) and measured using a nominal scale, we ensured independence of observations due to random sampling, expected frequency cell did not exceed 5 for the contingency tables, and prior to conducting the Pearson correlation, independence was met due to random sampling. Independent t-tests were used to compare differences between mean scores on the DESA-6 and EDS-21 between independent groups (male vs. female). Pearson correlations were used to examine the strength and direction of the relationship between risk for EXD and DE. To compare observed frequencies from expected frequencies, a Chi-square analysis was employed to analyze categorical data (risk for DE vs. not at risk for DE, and at risk for EXD vs. not at risk for EXD) and to determine if there was a significant association with body satisfaction, and fueling behaviors during training and races (e.g., do they meet the evidence-based guidelines for carbohydrate consumption during training and races). Statistical significance was established at $p < 0.05$. Effect size was calculated using Cohen's d for t-tests, Cramer's phi (φ_c) for chi-square analysis.

Results

Descriptive characteristics

1,021 male and female masters athletes between the ages of 41-65 who self-identified as a "trail or ultra-runner" completed the survey. The majority of runners (89.2%) reported primarily participating in either ultra-trail races (≥ 50 km in length) or trail races (< 50 km in length). 92.8% of runners reported running either low mileage (< 30 mi) or moderate mileage (31-60 mi) each week. Regarding menstrual function, 43.4% of female runners reported regular cycles; however, 13.1% reported amenorrhea or less than three cycles per year and 24.8% reported no menstruation due to peri and post-menopause.

DE and EXD

Of all participants, 46% of females and 32% of males were at risk for DE based on DESA-6 scores. Risk for DE was significantly ($p < 0.001$, $d = 0.33$) higher in females (2.43 ± 1.5) vs. males (1.93 ± 1.5). Regarding EXD, 79% of male and 80% of female runners were classified as symptomatic for EXD, with females scoring significantly higher ($p < 0.001$, $d = 0.43$) on the withdrawal category (11.62 ± 4.0) vs. males (9.86 ± 4.1). No significant differences between males and females were observed for continuance, tolerance, lack of control, reduction in activities, time, and intention scores (Table 2).

Table 2. Total EDS-21 score and subsection scores for the entire population by sex.

	Withdrawal	Continuance	Tolerance	Lack of control	Reduction in activities	Time	Intention	Total
Population ($n = 1,021$)	10.8 ± 4.1	7.7 ± 3.9	9.5 ± 3.6	6.0 ± 3.2	7.2 ± 2.9	9.7 ± 3.2	6.6 ± 3.0	57.5 ± 17.3
Female ($n = 564$)	$11.6 \pm 4.0^{**}$	7.7 ± 3.9	9.4 ± 3.6	6.1 ± 3.4	7.2 ± 3.0	9.9 ± 3.3	6.6 ± 3.0	$58.5 \pm 18.1^*$
Male ($n = 457$)	9.9 ± 4.1	7.6 ± 3.8	9.7 ± 3.6	5.8 ± 2.9	7.2 ± 2.7	$9.5 \pm 3.1^*$	6.7 ± 2.9	$56.3 \pm 16.2^*$

Data are Means $\pm$ SD ** p-value < 0.001 , $^* < 0.01$ (t-test indicates significant difference in scores between males and females)

Injury risk

Female runners were significantly more likely ($\chi^2_3 = 20.8$, $p < 0.0001$, $\varphi_c = 0.14$) to report a stress fracture compared to males. For the entire population, 21.8% of runners experienced three or more injuries that inhibited their ability to train or ended their season early, with no differences between males and females, respectively ($\chi^2_1 = 0.25$, $p = 0.62$, $\varphi_c = 0.02$). The majority of these runners (66.8%) reported missing 22 days or more of training due to reported injuries within the past year with no differences between males and females ($\chi^2_3 = 2.03$, $p = 0.56$, $\varphi_c = 0.04$).

Body dissatisfaction

Roughly half of female (50.9%) and male (48.6%) runners reported trying to achieve or maintain a specific weight, with no significant differences between genders ($\chi^2_1 = 0.44$, $p = 0.50$, $\varphi_c = 0.02$). When asked about weight dissatisfaction, 71.4% of participants reported being dissatisfied with their weight.

Fueling practices

Female (35.1%) runners were more likely to report intentionally eating less on easy training days than males (25.0%) ($\chi^2_1 = 11.8$, $p < 0.001$, $\varphi_c = 0.11$). For the entire population, 26.1% of all runners reported following a specific diet plan. The most common diets were vegan/vegetarian for females (22.3%) and intermittent fasting for males (20.2%) (Table 3).

Table 3. Participant responses regarding specific dietary practices in male and female

	Population (n = 267)	Females (n = 148)	Males (n = 119)
Vegan/Vegetarian	54 (20.2%)	33 (22.3%)	21 (17.6%)
High Protein/Low Carb	43 (16.1%)	25 (16.9%)	18 (15.1%)
Restricted Calorie	20 (7.5%)	16 (10.8%)	4 (3.4%)
Intermittent Fasting	38 (14.2%)	14 (9.5%)	24 (20.2%)
Gluten Free	15 (5.6%)	12 (8.1%)	3 (2.5%)
Ketogenic	11 (4.1%)	5 (3.4%)	6 (5.0%)
High Fat/Low Carb	20 (7.5%)	4 (2.7%)	16 (13.4%)
Periodized Carbohydrates	9 (3.4%)	3 (2.0%)	6 (5.0%)
Low FODMAP	2 (0.75%)	2 (1.3%)	0
Paleo	4 (1.5%)	1 (0.68%)	3 (2.5%)
High Carbohydrate	3 (1.1%)	0	3 (2.5%)
High Calorie	1 (0.37%)	0	1 (0.84%)
Other	47 (17.6%)	33 (22.3%)	14 (11.8%)

Data are reported as n (%).

Most athletes (76.4% females and 64.6% males) self-reported sufficient fueling (>30 g of CHO/h) during short training runs (1-2.5 h) while only 41.7% of female and 47% of male runners reported sufficient fueling for long training runs (>60 g of CHO/h) with similar findings reported for shorter and long races (Figure 1).

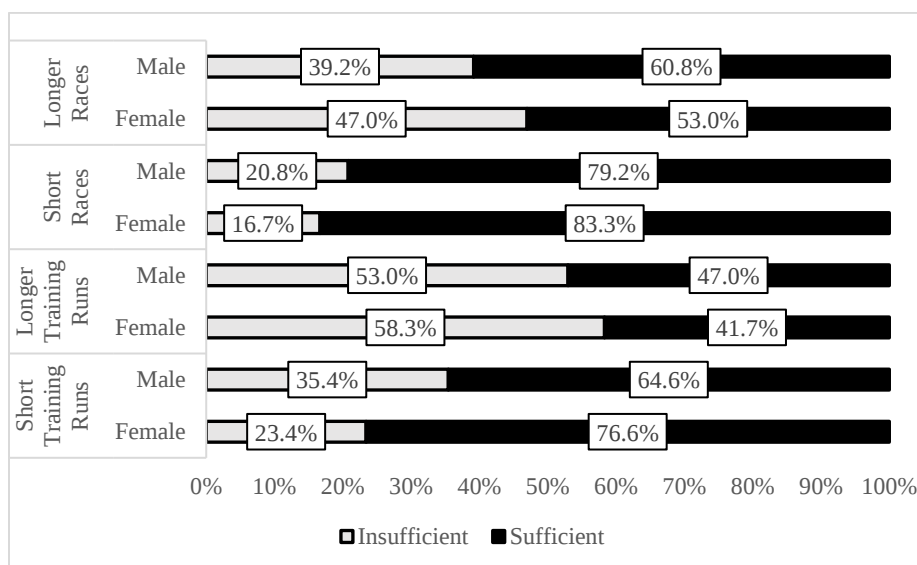


Figure 1: Participant responses for carbohydrate intake during shorter and longer training runs and races.

Associations between risk for EXD, injuries, body satisfaction, and fueling strategies, for those at risk for DE vs. not at risk for DE

For the entire population, runners at risk for DE were more likely to be symptomatic for EXD (88.2%) ($\chi^2_1 = 32.5$, $p < 0.001$, $\varphi_c = 0.18$). Runners at risk for DE had a significantly ($p < 0.001$, $d = 0.81$) greater EXD score (65.5 ± 18.0)

compared to those not at risk (52.2 ± 14.6), with females at risk for DE having a significantly greater EXD score (66.3 ± 18.5) compared to males at risk for DE (64.0 ± 17.0) ($p < 0.001$, $d = 0.13$). Runners with a history of a stress fracture (2.77 ± 1.5) scored higher on the DESA-6 compared to those not at risk (2.04 ± 1.4), with female runners significantly ($p < 0.001$) more likely to score higher on the DESA-6 scale (2.16 ± 1.4) compared to male runners (1.91 ± 1.5). Across all runners, those at risk for DE were more likely to report being moderately (35.8%) or extremely (18.6%) dissatisfied with their weight compared to runners not at risk (10.3 % and 1.5 %, respectively) ($\chi^2_1 = 104.7$, $p < 0.001$, $\varphi_c = 0.32$). Runners at risk for DE were also more likely to report following a specific diet plan ($\chi^2_1 = 127.9$, $p < 0.001$, $\varphi_c = 0.35$) and eat less on easy days ($\chi^2_1 = 110.6$, $p < 0.001$, $\varphi_c = 0.33$) than runners not at risk. Furthermore, athletes at risk for DE were less likely to fuel sufficiently for training runs and races than those not at risk ($p = 0.006$, $d = 0.19$).

Discussion

To our knowledge, this is one of the first studies to examine DE, EXD, injury risk, body dissatisfaction, and fueling habits in masters trail runners. The primary findings from our study suggest many masters runners are at risk for DE, are symptomatic for EXD, and have high body dissatisfaction. Additionally, runners at risk for DE were less likely to fuel sufficiently, specifically during shorter runs compared to longer runs, were more likely to practice dieting behaviors, experience more injuries, and were unhappy with their weight.

The current study suggested that 46% of females and 32% of male masters level trail runners were at risk for DE. Despite limited research in masters athletes, these findings are similar to other studies which reported 21-43% of runners (aged 18-40) to be at risk for DE ^{7,11,12,33}. Henninger et al ⁷ examined risk for DE in male and female trail runners aged 18-40 yo and found that 43% of runners were identified as at risk for DE, with females (47%) at a greater risk ($p < 0.001$) than males (27%) when using the DESA-6. Additionally, the current study reported a higher percentage of male runners at risk for DE (32%) compared to Henninger et al ⁷ who reported 27% of male runners at risk for DE. Previous studies investigating LEA, DE, and exercise addiction risk in endurance athletes (18 to >40 yo) reported that 18.9-21% of athletes were at risk for DE or developing an ED ^{29,34}. These findings suggest that there is a similar prevalence of DE in masters runners compared to younger runners with a higher prevalence in female athletes than males, and a slightly higher prevalence of DE in male masters runners compared to male runners under the age of 40.

Body image may be a mediator factor for disordered eating. The majority of runners (71.4%) in the current study reported being dissatisfied with their current weight. Additionally, runners at risk for DE were more likely to report weight dissatisfaction compared to runners not at risk. Kantanista et al ³⁵ examined body image in female athletes (13-30 yo), and concluded body image was more positive as the age of the athlete increased. Similarly, Anderson et al ³⁶ examined body dissatisfaction in endurance runners (18-71 yo) in relation to Eating Attitudes Test (EAT-26) scores and found that female runners reported greater body dissatisfaction and ED symptoms compared to males. Specifically, higher ratings of body dissatisfaction for appearance ($\beta_s = 0.18$) and performance ($\beta_s = 0.13$) were positively correlated with EAT-26 scores in female runners. Additionally, Séjourné et al ¹⁶ concluded that body image dissatisfaction was significantly higher in peri-menopausal compared to pre-menopausal women, while another study reported that perimenopausal women reported greater calorie restriction compared to pre-menopausal and post-menopausal women ³⁷. Regarding male athletes, the relationship between body dissatisfaction and DE is not well understood ¹⁹, and prior research suggests male elite athletes have a higher rate of DE compared to non-athletes ¹⁹. The current study suggests that body dissatisfaction is not an issue belonging only to females and that males are not immune, which warrants further investigation in male athletes.

The current study found 79% of male runners, and 80% of female runners were classified as symptomatic for EXD, which includes both “at risk” and nondependent symptomatic symptoms. Similarly, Henninger et al ⁷ indicated that 87.3% of runners were symptomatic for EXD. Additionally, another study suggested that 23% of female runners were at risk for exercise addiction (EA) using the Exercise Addiction Index ²⁹, while 2.7% of male and female runners were identified as potentially developing EA ³⁴. Prior research has shown mixed results regarding the prevalence of EXD in runners; therefore, future research is warranted to assess the risk of EXD in runners and other athletic populations.

The current study found a significant association between risk for DE and EXD. This is in agreement with Kuikman et al ¹¹ suggesting that both male and female athletes with DE reported a significantly ($p < 0.0001$) higher total score (males: 68.93 ± 14.15 ; females: 74.81 ± 13.65) on the EDS-21 scale when compared to the control group (males: 58.83 ± 12.78 ; females: 60.16 ± 14.64). In addition, 60.5% of female runners at risk of DE were also at risk for EA in comparison to 13.2% of athletes without DE behavior ²⁹. Although not well understood, prior research suggests that excessive exercise plays a role in the psychopathology of DE ³⁸ and specifically, for secondary EXD, the primary

motive is the need for control and manipulation of body composition ²⁶. Therefore, it is important to understand the relationship between EXD and DE and how EXD, may be a mediating factor for DE and vice versa.

EXD, LEA, and DE may exacerbate injury risk in athletes ^{39,40}. Results from the current study suggest that those at risk for DE were more likely to report a history of a stress fracture or current stress fracture than those not at risk for DE. Furthermore, female trail runners reported more current, or past stress fractures, compared to males. The current study also found that roughly two-thirds of runners (66.8%) reported missing 22 days or more of training due to reported injuries within the past year, with no differences between males and females. Orhan et al ³⁰ found that female distance runners with LEA reported missing more days of training due to injuries and illnesses (35 ± 46 training days) compared to males with LEA (18 ± 22 training days).

It is evident that athletes with reported bone injuries report a high amount of training days lost; however, more research is needed to examine the relationship between DE and injury risk in athletes. In the current study, masters runners reported sufficient fueling practices (≥ 30 g of CHO/h for 1-1.5 h) for shorter runs and races compared to longer runs and races (60-90g of CHO/h for durations > 2.5 h), which is consistent with previous studies ^{7,41}. Pfeiffer et al ⁴¹ found significantly lower CHO intakes in endurance athletes competing in a marathon (35 ± 26 g/h; $p < 0.01$) and 100/150 km cycle races (53 ± 22 g/h; $p < 0.04$), while Henninger et al ⁷ reported that nearly half of trail runners (47.2%) reported fueling insufficiently for 2-4 categories (1-2.5 h, > 2.5 h for races and training runs), with females being more likely to fuel insufficiently during long runs and competitions. Interestingly, the current study found that female runners were more likely to report eating less on training days compared to males. Athletes at risk for DE were also more likely to eat less on training days, insufficiently fuel for training runs and races, and follow a specific diet. Despite the well-known benefits of adequate CHO fueling to support training, the majority of athletes are not fueling sufficiently during long-training runs ²². While GI distress and appetite suppression ²² may be the culprit, lack of nutrition knowledge or education could also be contributing factors leading to inadequate CHO intake during training and racing. Furthermore, long-term, problematic LEA and low carbohydrate availability, may lead to Relative Energy Deficiency in Sport (REDs) and negative health and performance outcomes ⁴². Future research is needed to determine the barrier(s) to meeting sufficient fueling recommendations, particularly in trail runners competing in long runs/races, and the potential consequences of under fueling on health and performance outcomes.

Although this study offers new insights regarding the risk of DE, EXD, and fueling behaviors in masters trail runners, this study is not without limitations. This study utilized survey-based questionnaires and self-reported data which may be more vulnerable to bias, inaccurate reporting, and risk of type 1 error. Furthermore, the cross-sectional nature recruitment method can lead to sampling bias and therefore the study participants may not be fully representative of the masters trail running population. Despite these well-known risks, the survey was anonymous and research evidence suggests that endurance athletes may be more apt to provide accurate reporting compared to the general population ⁴³. Additionally, it is recognized that the carbohydrate fueling questions may not be applicable to runners who reported following a ketogenic diet; however, it is worth noting that those who reported following a ketogenic diet were minimal: 11/267(4.1%) for the entire population, 5/148 (3.4%) for females, and 6/119 (5.0%) for males.

Conclusions

This study suggests a high prevalence of masters trail runners are at risk for DE patterns and EXD. Furthermore, those at risk for DE reported higher body dissatisfaction, more injuries, were more likely to diet, and less likely to fuel adequately. When working with athletes in this population, it is important to assess for DE risk to better assess motivations behind different fueling behaviors. Working with a sports dietitian may help offset some of these challenges by identifying barriers to fueling and providing realistic, individualized, recommendations. Practitioners, coaches, and other healthcare providers should be aware of the increased risk for DE and EXD in this population. More research is needed to examine the factors leading to EXD, DE, and body dissatisfaction in male and female athletes, specifically masters athletes. Future research is also warranted to examine barriers for why athletes are not meeting the evidence based fueling recommendations during training and races.

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