2026 年度中京大学大学院入試

＊著作権の都合により、実際の入試問題から出典表記を一部改めています

スポーツ科学研究科　スポーツ科学専攻

博士後期（博士）課程

[後期日程]

一般用

【 外国語：専門英語 】

１０時００分～１２時００分

2026年度中京大学大学院スポーツ科学研究科 博士後期(博士)課程[後期日程]
[外国語:専門英語]

「2023 International Olympic Committee's (IOC) consensus statement on Relative Energy Deficiency in Sport (REDs)」から抜粋した、下記の文章を読み各問について解答しなさい。

The magnifying impact of LCA in the context of REDs

①Most low energy availability (LEA) intervention studies are also accompanied by a substantial reduction (25%–60%, depending on magnitude of LEA) in carbohydrate (CHO) ingestion, resulting in concurrent low carbohydrate availability (LCA). In the real world, the magnitude of LCA is likely to be even greater considering the emphasis on protein intake during periods of calorie restriction. Recently, several investigations have elucidated CHO's energy-independent or magnifying role in Relative Energy Deficiency in Sport (REDs)-related health outcomes. There have been several short-term (≤6 days) investigations in male endurance athletes comparing the effects of high energy and high CHO availability, high energy with low CHO (<3 g CHO/kg BM/day) but high fat (LCHF), or low energy with low to moderate CHO availability diets on bone, immunity and iron biomarkers. These studies have reported increases in bone resorption biomarkers with a concomitant impairment in biomarkers of bone formation, as well as increased postexercise concentrations of interleukin-6 (IL-6) and hepcidin after LCA. These findings suggest deleterious effects on bone, immunity and iron biomarkers as a result of LCA, sometimes in the absence of LEA. More recently, a 3-day intervention in young females also showed a 264% increase in hepcidin with a low energy, low CHO diet compared with only a 69% increase in hepcidin with isocaloric low energy but higher CHO diet. Additionally, ~3.5 weeks of LCHF diet in elite endurance athletes resulted in impaired markers of bone remodelling both at rest as well as around exercise (up to 3 hours postexercise), and elevated postexercise IL-6 concentrations compared with an isocaloric high CHO treatment. Six studies since 2019 have shown an energy-independent and/or magnifying impact of LCA in the accelerated development of REDs outcomes. Accordingly, LEA intervention studies need to also control and account for CHO intake and need to be of longer duration to determine long-term adaptation.

Symptomology overlap between REDs and OTS

REDs and overtraining syndrome (OTS) are syndromes involving the hypothalamic–pituitary–adrenal axis and have no single validated diagnostic biomarker; they feature a complex overlap of symptoms that hinge on a diagnosis utilising exclusion criteria. ②Accordingly, a recent narrative review found that 18 of 21 identified OTS-based studies showed indications of LEA and LCA due to large increases in training while failing to compensate with increased energy intake (EI), and thus may have demonstrated REDs outcomes rather than OTS. It is important to note that LEA and/or LCA, although challenging to assess, should be excluded from an OTS diagnosis as LEA is the underlying aetiology for a REDs diagnosis.

Time-course of LEA resulting in REDs

Although acute mild periods of LEA do not always lead to adverse outcomes, problematic LEA exposure leads to REDs. Our scientific understanding of the time-course of LEA leading to validated physiological and psychological signs/symptoms are still emerging, largely due to difficulties in accurately assessing and controlling for EA in prospective research. Emerging definitions highlight short-term LEA as a few days to weeks, medium-term as weeks to months and long-term as months to years. ③However, time-course cut-offs require further scientific validation, may differ between males and females and change with the severity and duration of LEA dose. Still, some signs/symptoms and REDs outcomes that appear to present temporally to various exposure periods of LEA have emerged. Importantly, some short-term signs or symptoms during the acute assessment may only represent a snapshot of a current LEA state and require the exclusion of other potential aetiologies (differential diagnoses). Such signs or symptoms do not always reflect a problematic LEA exposure leading to REDs.

Mental health outcomes of REDs

The sports community has prioritised the mental health of elite-level athletes as evidenced by a sharp rise in consensus statements and prevalence studies on this theme. ④A parallel focus has been the increased awareness of the risk factors for and the consequences of REDs, where psychological factors contributing to LEA and mental health consequences have been highlighted, although less well understood. Recent qualitative studies involving mainly subelite endurance athletes provide support for this premise, reporting that LEA from intentional (eg, weight regulation) or unintentional (eg, failing to consciously increase EI with increased exercise energy expenditure) origins can be associated with short-term positive results such as performance improvements or social approval from the coach and the sports culture. ⑤These short-term 'positive' outcomes make it more challenging for athletes to recognise the longer-term potential health and performance implications of exposure to problematic LEA.

Disordered eating (DE) behaviours, eating disorders (EDs) and/or REDs are common among certain athlete cohorts. LEA and DE behaviours, which exist along the spectrum between optimised nutrition and clinical EDs, may occur in isolation or together. A prior history of DE behaviours or an ED might perpetuate a continued under-fuelling of energy and must therefore be considered an important risk factor for developing REDs. DE behaviours and EDs may be exacerbated by social media influence, societal pressures, the athlete's training/coaching entourage, a belief that a specific physique/weight/appearance will improve performance and/or overall body dissatisfaction. Given the potentially serious outcomes of DE behaviours and EDs, prevention, early identification, and timely interventions should be prioritised.

⑥ Psychological indicators associated with problematic LEA and REDs are mood disturbances/fluctuations, cognitive dietary restraint, drive for thinness, reduced sleep quality and perfectionistic tendencies. Depressive symptoms and affective disorders, subjectively reported reduced well-being, primary or secondary exercise dependence/addiction, anxiety related to injury and/or recovery, sport-specific issues such as difficulty coping with weight requirements and the development of EDs are additional adverse mental health outcomes associated with problematic LEA and REDs. However, we must recognise that the picture is still unclear regarding the dynamics of mental health and DE behaviours according to sex and level of competition, as well as in athletes with physical disabilities. Furthermore, studies are required to (1) ascertain why many athletes experience few or no negative mental health consequences in the early stages of problematic LEA exposure and (2) to better understand the reciprocal function of the different psychological variables. As perceived stress appears to be common for many mental health concerns related to LEA and REDs, a heightened focus should be placed on developing psychologically safe environments surrounding athletes. Details on creating safe sport environments are outlined in the International Olympic Committee's (IOC) consensus statement on mental health in elite athletes.

問 1　下線部①～⑥について、日本語に翻訳しなさい。なお、略語については正式名称を記載しなさい。

問 2　持久系男性アスリートを対象に利用可能な炭水化物を減少させた際の影響について、本文中の内容を踏まえ日本語で説明しなさい。

問 3　LEA の短期、中期、長期の期間について、本文中の内容を踏まえ日本語で説明しなさい。

問 4　LEA の意図的、非意図的な要因について、本文中の内容を踏まえ日本語で説明しなさい。

問 5　食行動の異常、摂食障害を悪化させる要因について、本文中の内容を踏まえ日本語で説明しなさい。