

RED-S in dance - follow up Delphi questionnaire

Dear respondent,

Thank you for your commitment to the RED-S in dance consensus project. The consensus day was a great success with lots a great discussion and information to gather from the expert panel. Following the Nominal Group Technique we were able to table new suggestions for RED-s management solutions, think of new questions and to identify areas of future research.

The aim of this questionnaire is to identify follow on from the consensus meeting and review the same set of questions that did not reach consensus last round. This time the difference is we have re-worded some of the questions or we have added new ones for further clarification of some concepts. The objective being that we have even more answers to questions reach consensus automatically through this process.

Like before, please if you could answer all questions to the best of your ability. The scoring scale is a 5 point Likert scale from 'strongly disagree' to 'neutral' to 'strongly agree'.

Where you do not feel comfortable answering because certain questions may be outside your scope of practice or experience please check the box 'out of scope'.

Please know that in this questionnaire we refer to RED-S (relative energy deficiency in sport) as RED-D (relative energy deficiency in dance) to reflect the unique environments and demands of dance warranting its own management framework approach and title.

Thank you very much for your participation!

Section 1 - Questionnaires and RED-D

This next set of questions pertains to the use of questionnaires or surveys in the screening and diagnosis of RED-D

1

Please type your name

2

Are the following questionnaires useful in supporting a clinical diagnosis in suspected RED-D patients (within the dance population)?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Eating disorder examination questionnaire (EDE-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low energy availability in females questionnaire (LEAF-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low energy availability in males questionnaire (LEAM-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Female athlete screening tool (FAST)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dance-specific energy availability questionnaire (DEAQ)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brief eating disorder in athletes questionnaire (BEDA-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3

The following questionnaires are appropriate for use in routine screening/profiling of dancers to help identify early identification asymptomatic or unreported RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Eating disorder examination questionnaire (EDE-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low energy availability in females questionnaire (LEAF-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Low energy availability in males questionnaire (LEAM-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Female athlete screening tool (FAST)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dance-specific energy availability questionnaire (DEAQ)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brief eating disorder in athletes questionnaire (BEDA-Q)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

SECTION 2 - RED-D management

This next set of questions pertain to the management of RED-D

4

Do you agree that increasing nutritional intake is one of the primary considerations of RED-D management?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5

Do you agree that evaluating and modifying dance workload is a key consideration in RED-D management?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6

Do you agree that individual assessment of nutritional requirements relative to energy demands is a recommended management tool in RED-S cases?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7

Increasing energy availability is fundamental to restoring a normal menstrual cycle in RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8

Use of the oral contraceptive pill should not be considered in the management of RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9

Use of transdermal oestradiol therapy with cyclic oral progestin is an efficacious management strategy in restoring normal bone health in some cases?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10

For men, in selective cases, use of bisphosphonates under the guidance of a specialist is an appropriate and efficacious way of restoring bone structure?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11

For women, in selective cases, use of bisphosphonates under the guidance of a specialist is an appropriate and efficacious way of restoring bone structure?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12

Use of insulin-like growth factor 1 is an appropriate and efficacious way of restoring bone structure in some cases?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

13

Structured resistance training can be an effective strategy to promote good bone health?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

14

Vitamin D supplementation of 1000-2000 IU/Day (or equivalent) is the best daily dose to maintain Vit D levels in the blood?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

15

In Vit D deficiency, do you agree that the deficiency restoring dose needs more research?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

16

Do you agree that the risk management table outlined in the IOC consensus update Mountjoy et al (2014) needs adaptation for use in dance?

Table 1 Relative Energy Deficiency in Sport risk assessment model for sport participation (modified from Skårderud *et al*)¹⁴⁰

High risk: no start red light	Moderate risk: caution yellow light	Low risk: green light
<ul style="list-style-type: none"> ▶ Anorexia nervosa and other serious eating disorders ▶ Other serious medical (psychological and physiological) conditions related to low energy availability ▶ Extreme weight loss techniques leading to dehydration induced haemodynamic instability and other life-threatening conditions 	<ul style="list-style-type: none"> ▶ Prolonged abnormally low % body fat measured by DXA or anthropometry using The International Society for the Advancement of Kinanthropometry ISAK¹⁴¹ or non-ISAK approaches¹⁴² ▶ Substantial weight loss (5–10% body mass in 1 month) ▶ Attenuation of expected growth and development in adolescent athlete ▶ Abnormal menstrual cycle: FHA amenorrhoea >6 months ▶ Menarche >16 years ▶ Abnormal hormonal profile in men ▶ Reduced BMD (either from last measurement or Z-score < -1 SD). ▶ History of 1 or more stress fractures associated with hormonal/menstrual dysfunction and/or low EA ▶ Athletes with physical/psychological complications related to low EA/ disordered eating - ECG abnormalities- Laboratory abnormalities ▶ Prolonged relative energy deficiency ▶ Disordered eating behaviour negatively affecting other team members ▶ Lack of progress in treatment and/or non-compliance 	<ul style="list-style-type: none"> ▶ Healthy eating habits with appropriate energy availability ▶ Normal hormonal and metabolic function ▶ Healthy BMD as expected for sport, age and ethnicity ▶ Healthy musculoskeletal system

BMD, bone mineral density; DXA, dual-energy X-ray absorptiometry; EA, energy availability; FHA, functional hypothalamic amenorrhoea; ISAK, International Society for the Advancement of Kinanthropometry

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Do you agree that the decision making process outlined in the IOC consensus update Mountjoy et al (2014) needs adaptation for use in dance?

Table 2 The Relative Energy Deficiency in Sport Decision-based Return-to-Play Model (modified from Creighton *et al*¹⁴³)

Steps	Risk modifiers	Criteria	Red-S-specific criteria
Step 1 Evaluation of health status	Medical factors	Patient demographics Symptoms Medical history Signs Laboratory tests Psychological health Potential seriousness	Age, sex (see Yellow light column of table 1) Recurrent dieting, menstrual health, bone health Weight loss/fluctuations, weakness Hormones, electrolytes, ECG and DXA Depression, anxiety, disordered eating/eating disorder Abnormal hormonal and metabolic function Stress fracture
Step 2 Evaluation of participation risk	Sport risk modifiers	Type of sport Position played Competitive level	Weight sensitive, leanness sport Individual vs team sport Elite vs Re-creational
Step 3 Decision modification	Decision modifiers	Timing and season Pressure from sthlete External pressure Conflict of interest Fear of litigation	In/out of season, travel, environmental factors Desire to compete Coach, team owner, athlete family and sponsors If restricted from competition

DXA, dual-energy X-ray absorptiometry.

Strongly Disagree Disagree Neutral Agree Strongly agree Out of scope

Answer ○ ○ ○ ○ ○ ○

Section 3 - Diagnosis of RED-D

The next questions pertain to the diagnosis of RED-D in dancers

18

Diagnosis of RED-D is considered a diagnosis of exclusion and requires multiple measures. Functional hypothalamic amenorrhea can be present in RED-D females. Endocrinological blood tests are an effective tool to understand potential causes?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19

Functional hypothalamic amenorrhea can be present in RED-D females. Gynaecological ultrasound should be considered as one tool to exclude structural causes?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

20

Bone stress injuries can present in RED-D patients. Bone biochemistry assessment, including 25-Hydroxy Vitamin D, calcium, phosphorus, alkaline phosphatase, and albumin is an important tool after any bone stress episodes?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21

Bone stress injuries can present in RED-D patients. Bone mineral density assessment could be considered after one bone stress episode in adults?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

22

Bone stress injuries can present in RED-D patients. Bone mineral density assessment should be performed after two bone stress episodes?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23

Due to lack of specificity: biomechanical, muscle capacity, aerobic capacity and balance assessment shouldn't be used to support a diagnosis of RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24

Due to lack of specificity well-being scores on a daily basis should not be used to help support a diagnosis of RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25

Inadequate quality of sleep can be associated with RED-D and enquiring about this can help support a diagnosis of RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

26

Reduced libido can be a symptom of RED-D and can support a clinical diagnosis?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

27

Dental assessment looking at oral mucosa, perioral tissue, teeth and periodontal diseases can be a helpful indicator of an eating disorder in RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

28

Bradycardia is associated with RED-D, however ECG is not be a useful investigation to help support a diagnosis of RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

29

Assessment of basal metabolic rate is a valid method of identifying dancers with RED-D?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 4 - Blood analysis and RED-D

The next section's questions pertain to the use of blood analysis and RED-D

30

It is good practice to use blood markers to screen for nutritional deficiency, low energy availability and bone health issues once or twice a year in asymmetric dancers. The tests that may be requested are **FBC, Ferritin, B12, Folate, ESR, Renal function, Liver function, TSH, Free T4, LH, Oestradiol, testosterone, FSH, Free T3, prolactin, 25 Hydroxy-Vitamin D.**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

31

If you were considering RED-D as a differential diagnosis in someone with a clinical presentation, the blood tests that should be ordered are the same as in the previous questions but you may also decide to add other tests that include **bone biochemistry, serum iron, transferrin and magnesium?**

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Answer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Section 5 - Further Questions

Please make use of the boxes below if you have feedback or further suggestions regarding the sections and questions above

32

Please if you have any feedback regarding questionnaires use the text box below

33

Please if you have any feedback regarding management of RED-D use the text box below

34

Please if you have any feedback regarding diagnosis of RED-D use the text box below

35

Please if you have any feedback regarding blood analysis and RED-D use the text box below

36

Please if you have any feedback regarding areas of future research or any other suggestions please use the text box below

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