

RED-S Pre Consensus Delphi Questionnaire

Dear respondent,

Thank you for your commitment to the RED-S in dance consensus project. There are currently good levels of consensus and guidance from sport on the management of RED-S but we currently lack some understanding whether the literature and practice from sport can be applied in dance.

The aim of the questionnaire is to identify areas of RED-S - surveys, early identification, profiling and management - where we have agreement in the management of dancers. Results from this questionnaire will guide the consensus meeting on January 11th where areas of weak or no consensus will be discussed.

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'.

RED-S Questionnaires

Please answer the following questions to the best of your ability on the use of questionnaires in RED-S management

1

Please provide your name in the text box below

2

Questionnaires play a key role in the diagnosis and management of RED-s patients within the dance population?

	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"/>

3

Questionnaires play a key role in routine screening (e.g. annual) of asymptomatic dancers?

	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"/>

4

The questionnaires currently available are valid and appropriate for use within the dance population?

	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

The following questionnaires are appropriate for use in suspected RED-s 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"/>

6

The following questionnaires are appropriate for use in routine screening of asymptomatic dancers:

	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"/>

MANAGEMENT OF RED-S in a dance context

Please answer the following questions to the best of your ability on the use on RED-S management

7

Do you agree that increasing calorie intake is one of the primary goals of RED-S 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"/>

8

Do you agree that decreasing ballet workload is one of the primary goals of RED-S management?

	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree	Out of scope
Statement 1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9

Do you agree that the specific intervention of a liquid meal supplement is an effective tool increasing total calorie intake in a dance population?

	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

Is a liquid meal supplement superior to real food when attempting to address calorie deficit?

	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

Is 45 kcal/kg fat free mass per day enough energy intake for a dancer?

	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

Increase calorie intake is the most effective way to restore normal menstrual cycle?

	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

Use of oral contraceptive pill should not be considered for restoration of normal menses?

	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

Use of transdermal estradiol 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"/>

15

Use of transdermal oestrogen is an appropriate and efficacious way of restoring 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"/>

16

Use of bisphosphonates is an appropriate and efficacious way of restoring bone structure in some cases?

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

17

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
for men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
for women	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18

Use of leptin appropriate and efficacious way of restoring appetite?

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

19

Resistance training is an effective strategy to promote good bone health?

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

20

Where there is a deficiency Vitamin D supplementation of 1000-2000 IU/Day is the best daily dose to restore Vit D levels in the blood?

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

21

Endocrine function will correct itself if the tenants of increase energy intake and manage workload are followed?

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

22

Metabolic function will correct itself if the tenants of increase energy intake and manage workload are followed?

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

23

Every ballet company or school should have a RED-s audit and action plan aimed at pro-actively addressing established risk factors within a dance environment?

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

24

Every ballet company or school should have a RED-s emergency action plan?

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

25

Every ballet company or school should have a RED-s internal education curriculum?

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

26

Every ballet company or school should have a RED-s management and referral pathway?

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

27

Culture of high workload is a risk factor within a dance environment?

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

28

Culture of underfuelling is a risk factor within a dance environment?

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

29

A culture built on aesthetics is a risk factor within a dance environment?

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

30

A lack of understanding of RED-s is a risk factor for RED-S within a dance environment?

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

31

A culture of skipping meals is a risk factor for RED-s within a dancer environment?

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

The risk management table outlined in the IOC consensus update Mountjoy et al (2014) is sufficient in the dance environment?

Table 1 Relative Energy Deficiency in Sport risk assessment model for sport participation (modified from Skårderud et al)^{1,40}

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

○ ○ ○ ○ ○ ○

The RTD decision making process outlined in the IOC consensus update Mountjoy et al (2014) is sufficient in the dance environment?

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 athlete 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

○ ○ ○ ○ ○ ○

DIAGNOSIS of RED-S in dance

Please answer the following questions to the best of your ability on the use on RED-S diagnosis

34

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

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

35

Diagnosis of RED-S is considered a diagnosis of exclusion and may require multiple measures. Functional hypothalamic amenorrhea can be present in RED-S females. Ultrasound is an important tool to exclude structural causes?

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

36

Bone stress injuries can present in RED-S patients. Bone biochemistry assessment is a useful tool after any bone stress episodes?

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

37

Bone stress injuries can present in RED-S patients. Bone mineral density assessment is a useful tool after one stress episode?

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

38

Bone stress injuries can present in RED-S patients. Bone mineral density assessment is a useful tool after two bone stress episodes?

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

39

Diagnosis of RED-S is considered a diagnosis of exclusion and may require multiple measures. MSK injuries can present in RED-S patients. Poor biomechanics, muscle capacity and sharp increases in training load are important exclusions.

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

40

Diagnosis of RED-S is considered a diagnosis of exclusion and may require multiple measures. Reduced muscle endurance, aerobic capacity and co-ordination can present in RED-S patients and muscle capacity (e.g. calf capacity), aerobic capacity (e.g. FTP, MAS) and balance testing (e.g. star excursion) can help support a diagnosis of RED-S?

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

41

Reduced well-being can present in RED-S patients and collecting well-being scores on a daily basis can help support a diagnosis of RED-S?

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

42

Reduced sleep can present in RED-S patients and collecting sleep scores on a daily basis can help support a diagnosis of RED-S?

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

43

Reduced libido can present in RED-S patients. Questionnaires including libido can help support a diagnosis of RED-S?

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

44

Dental screens looking at oral mucosa, perioral tissue, teeth and periodontal diseases can help support a diagnosis of RED-S?

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

45

Diagnosis of RED-S is considered a diagnosis of exclusion and may require multiple measures. Cardiac ECG can help support a diagnosis of RED-S?

Strongly
Disagree

Disagree

Neutral

Agree

Strongly
agreeOut of
scope

BLOOD MARKERS in the early detection and management of RED-S

The purpose of this section is for us to understand what bloods tests practitioners use, firstly as a screening / early detection tool and secondly additional tests for clinical cases where RED-S may be suspected.

How strongly do you agree with the following statements:

46

Blood test play a key role in the diagnosis and management of RED-s patients within the dance population?

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

47

Blood tests play a key role in routine screening (e.g. once, twice a year) of asymptomatic dancers?

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

48

Please select the bloods you would select if you were screening for nutritional deficiency, LED and bone health issues once or twice a year?

- Full blood count
- Ferritin
- B12
- Folate
- Serum Iron
- Transferrin +- Saturation
- ESR
- Renal function
- Liver fucntion
- Magnesium
- Total Cholesterol
- TSH
- Free T4
- PTH
- LH
- Oestrodiol
- Testosterone (free and or total)
- FSH

- Progesterone
- Free T3
- Reverse T4
- SHBG
- IGF-1
- HbA1C
- Serum Glucose
- Coeliac screen
- 25 Hydroxy - Vitamin D
- Zinc
- Iodine
- Copper
- Vitamin B1
- Vitamin B2
- Vitamin C
- Vitamin E

49

Please select any bloods you would routinely do if there was a clinical issue, and you were considering RED-S as a differential?

- Full blood count
- Ferritin
- B12
- Folate
- Serum Iron
- Transferrin +- Saturation
- ESR
- Renal function
- Liver fucntion
- Magnesium
- Total Cholesterol
- TSH
- Free T4
- PTH
- LH
- Oestrodiol
- Testosterone (free and or total)
- FSH

Progesterone

50

Please use the text box to suggest any additional blood tests you would use as screening tool?

51

Please use the text box to suggest any additional blood tests you would use if there was a clinical issue and you were considering RED-S as a differential?

Iodine

Copper

Vitamin B1

Vitamin B2

Vitamin C

Vitamin E