

Appendices

Appendix 1. Background and expertise of consensus group members

Working Group Members			
Initials	Country	Degree (area) Work title Work institution	Expertise
SG	United States	DPT (Physical Therapy) Associate Professor Samuel Merritt University	Physiotherapist with specialties in orthopaedic and neurologic physical therapy, and owner of performing arts clinical practice Author of injury surveillance study in circus arts Co-editor of science section of the Journal of Circus Arts, Life and Science Former circus artist and coach
DM	Australia	PT, PhD Head Physiotherapist at the National Institute of Circus Arts (NICA)	Author of injury surveillance study in circus arts and co-author on 2 studies on rehabilitation in circus Co-editor of science section of the Journal of Circus Arts, Life and Science
JN	Australia	BSc (Hons), PhD (Dance and exercise science) Postdoctoral Research Fellow and Lecturer Western Australian Academy of Performing Arts	Lead author of research related to injuries, physiologic demand, fitness and psychologic benefits in pole dance Pole artist and coach
JS	The Netherlands	PhD Medicine Professor Performing Arts Medicine Director of the Performing Artist and Athlete Research Lab (PEARL) Codarts University of the Arts, Rotterdam.	Lead author of injury surveillance research in circus arts and co-author of several injury/illness studies in sport and performing arts Member Editorial Board Journal of Dance Medicine and Science
MS	Canada	PhD Research associate in human performance and social innovation at Centre for Circus Arts Research, Innovation and Knowledge Transfer (CRITAC)	Lead author of injury burden in circus arts study Co-editor-in-chief, Journal of Circus Arts, Life and Science Co-chair, American Circus Educators Health & Wellness committee Pole/circus artist and coach
RvR	The Netherlands	PhD Medicine Associate professor of Performing Arts Medicine Codarts University of the Arts, Rotterdam.	Co-author of several injury/illness studies in sport and performing arts Board member of the Dutch Performing artist and Athlete Research Lab (PEARL) Member Editorial Board Journal of Dance Medicine and Science
External Reviewers			
MB	Brazil	PhD Anthropology/Sport Science Associate Professor Director/Senior Researcher at Circus Research Lab	Former professional circus artist Former acrobatics teacher at Barcelona Circus School

		University of Campinas (UNICAMP)	Resident Researcher at CRITAC Board Member of Circus Arts Research Platform (CARP) Member of International Circus Studies PhD Directors Network Consultor for Brazilian Arts Foundation (FUNARTE) Honorary Member Brazilian Social Circus Network
AD	France	PhD Performing Arts, Msc Sport Sciences Professor and Researcher Ecole supérieure d'art de design Centre national des arts du cirque (CNAC) circusnext	Associated Researcher, circusnext Former Associated Researcher and Author, European Federation of Professional Circus Schools (FEDEC) Former teacher, Centre national des arts du cirque
CG	United States	BSE Mechanical Engineering, MSE Biomedical Engineering, PhD Decision Sciences and Engineering Systems Data scientist for CRITAC Circus coach/consultant/ researcher New England Center for Circus Arts	Former artist, head coach, and consultant for Cirque du Soleil Independent/freelance coach and ProTrack coach at New England Center for Circus Arts
EV	The Netherlands	PhD Epidemiology Professor Dept of Public and Occupational Health, Amsterdam UMC	Former research consultant at Cirque du Soleil Co-author of IOC injury/illness consensus Co-author of tennis and cycling-specific extensions of IOC consensus Highly published sports epidemiologist
KY	Australia	MBBS, Master Public Health (occupational), Grad Dip Sports Medicine, Fellow of the Royal Australian College of General Practitioners Sports Doctor NICA Chief Medical Officer Australian Sailing	Physician working with elite gymnasts, circus and performing artists Consulting physician for NICA Participation in injury consensus guidelines for The International Federation of Gymnastics (FIG) Former Chief Medical Officer Gymnastics Australia

Appendix 2. Healthcare practitioner report form for circus injuries

Date of report: __/__/____ (dd/mm/yy)

Organisation/Company/Group affiliation: _____

Artist identification: _____ Date of onset __/__/____

Report completed by:

Name: _____ Qualifications: _____

Email: _____ Phone: _____

*One report should be completed for each injury even if related to same incident.**Please select the appropriate option(s) for each bolded category based on your assessment.***Activity associated with the injury onset** (select all that apply) Circus arts training (specify specific circus arts discipline, equipment/apparatus & skill/movement involved) Performance (specify specific circus arts discipline, equipment/apparatus & skill/movement involved) Rehearsal (specify specific circus arts discipline, equipment/apparatus & skill/movement involved) Warm-up Conditioning training (Physical training to improve muscle activation, endurance, strength, power, flexibility and/or coordination separate from training of specific circus skills and not on a circus apparatus) Strength Aerobic Flexibility (contortion skills training should be reported as circus arts training) Circus-related but not discipline specific (specify eg, spotting, pulling lines, walking over mats) _____ Non-circus (eg, participation in other sports or life activities where injury occurs) Unknown, or not specified**Type of Injury** (select the single best option) New injury Exacerbation of existing injury Subsequent recurrent injury (same site, same type) Subsequent local injury (same site, different type) Unknown, or not specified**Mode of Onset** (select the single best option) Acute- Sudden onset Repetitive – Sudden onset Repetitive- Gradual onset**Mechanism of Injury** (select the single best option) No identifiable single event (eg, acrobat that trains in hand balancing and Chinese pole has gradual onset of wrist pain, or juggler has the gradual onset of neck pain radiating into the arm) Noncontact (single event) (eg, a banquine base feels the sudden elbow pain after tossing their flyer into the air.) Indirect contact with an object (eg, trapeze artist overturns in release manoeuvre catching the trapeze with hands late in the turn, or musician rolls their ankle after being thrown off balance by a stage prop bumping into them) Indirect contact with ground (eg, a stilt walker steps into a hole while doing an outdoor roaming act and has acute knee joint pain, or a Chinese pole artist falls on outstretched arm resulting in fractured clavicle) Indirect contact with another artist (eg while performing ensemble dance choreography, one acrobat contacts another's shoulder, resulting in the second acrobat losing their balance and twisting their knee).

- Direct contact with an object (eg, fracture of their radius due to direct contact from a wheel or skin abrasion following training on rope, or an aerial acrobat loses hand grip on a trapeze and falls hitting their head on a crash mat)
- Direct contact with the ground (eg, fall from tightwire results in acrobat's knee hitting the ground, or aerial acrobat misjudges height with drop hitting head on the ground)
- Direct contact with another artist (eg, hoop diver kicks another diver in the thigh while passing through same hoop in opposite directions, or during a doubles trapeze act, the base's wrist is forced into hyperextension when catching the flyer from a dynamic release move)

Injured body region (*select the single best option*)

- Head and neck*
 - head/face
 - neck/cervical spine
- Trunk*
 - chest
 - thoracic spine/upper back
 - abdomen (incl. organs)
 - lumbosacral
- Upper limb*
 - shoulder
 - upper arm
 - elbow
 - forearm
 - wrist
 - hand
- Lower limb*
 - hip/groin
 - thigh
 - knee
 - lower leg/Achilles tendon
 - ankle
 - foot
- Other (please specify)* _____

Body Side (*Select one option*)

- Left
- Right
- Both
- Not applicable

Tissue & pathology type (*Select the single best option*)

Nervous

- Concussion/brain injury
- Spinal cord injury
- Radiculopathy
- Peripheral nerve injury

Bone

- Fracture
- Bone stress injury
- Bone contusion
- Physis injury

Muscle/tendon

- Muscle strain/tear
- Muscle contusion
- Tendinopathy
- Tendon rupture

Cartilage/synovium/bursa

- Cartilage injury
- Arthritis
- Synovitis
- Bursitis
- Chondral pain (eg, patellofemoral pain)

Ligament/joint capsule

- Joint sprain/ligament tear
- Acute subluxation/dislocation
- Chronic instability

- Contracture Capsulitis

Superficial tissues/skin

- Contusion/bruise (superficial) Laceration Abrasion Burn
 Internal organ trauma (please specify) _____
 Vascular trauma (please specify) _____
 Other not specified above (please specify) _____

[Enter the appropriate diagnostic code(s)]

Diagnosis and diagnosis code: _____ **OSIICS** _____ **SMDSC**

Provide diagnosis and diagnosis code from the Orchard Sports Injury and Illness Classification System (OSIICS), the Sports Medicine Diagnostic Coding System (SMDSC)

Time loss in circus due to injury: Yes No

Date of full return to circus training and performance: __/__/____ (dd/mm/yy)

- No return to circus possible (specify reason below)*
 permanent disability
 fatality
 other reason (please specify): _____

The following fields are optional, depending on the research question

Use of safety equipment (*Select all that apply*)

- Mat (specify type) _____
 Lines
 Nets
 Spotter(s)
 Foam pit
 Helmet
 Pads
 Other (Please specify) _____

Role:

- Solo Base Flyer

Appendix 3. Weekly self-report of health complaints and exposure to circus arts training and performance (adapted from Murray et al., 2020 and Clarsen et al., 2021)

Note: Users can change the questionnaire title to suit the aims and context of the study. Epidemiological studies that collect information directly from artists are likely to use electronic questionnaires. This document can be used to creating an electronic questionnaire with logic (i.e. artists' path through the questionnaire is determined by their answers). All questions should have single select answer except where otherwise noted. Questionnaire logic and other notes are written in red and blue. Electronic questionnaires with logic should not present red and blue text to artists. For paper-based questionnaires red notes should be deleted but blue notes kept to guide the athlete through the questionnaire.

Researchers are encouraged to use responses to the following questions to classify mechanism of injury: Q8 body part, Q10 suddenly or gradually, Q12 single event, Q14 contact source, Q15 contact bodily area, Q16 direct contact. The following questions may provide insight into factors contributing to the injury: Q11 activity, Q13 event details, Q17 safety equipment.

Circus artist identification:

Week of report:

Please answer all questions regardless of whether you have experienced health problems in the past 7 days. Select the option that is most appropriate for you, and in the case that you are unsure, try to answer as best you can anyway.

A health problem is any condition that you consider to be a reduction in your normal state of full health, irrespective of its consequences on your circus participation or performance, or whether you have sought medical attention. This may include, but is not limited to, injury, illness, pain or mental health conditions.

If you have several health problems, please begin with your worst problem in the past 7 days, and then fill in another questionnaire for each problem.

1. Have you had any difficulties **participating in training, rehearsal or performance** due to injury, illness or other health problems during the past 7 days?

- full participation without health problems (if this answer is selected skip to #23)
- full participation, but with a health problem
- reduced participation due to a health problem
- could not participate due to a health problem
- did not participate due to a vacation or other personal reasons (if this answer is selected, end survey)
- did not participate due to scheduled rest week (if this answer is selected, end survey)

2. To what extent have you **modified your training, rehearsal or performance** due to injury, illness or other health problems during the past 7 days?

- no modification
- to a minor extent
- to a moderate extent
- to a major extent

3. To what extent has injury, illness or other health problems **affected your training, rehearsal or performance** during the past 7 days?

- no effect
- to a minor extent
- to a moderate extent
- to a major extent

4. To what extent have you **experienced symptoms/health complaints** during the past 7 days?

- no symptoms/health complaints

- to a minor extent
- to a moderate extent
- to a severe extent

5. **When** did this health problem occur or when did you **first** notice **symptoms**? *If this is a recurrent problem, please refer to the most recent episode. If you have multiple injuries or health problems there will be an opportunity to enter each.*

__/__/____ (dd/mm/yy) (Enter date or select from calendar)

6. Have you reported this health problem previously?

- Yes (Artist chooses from list of previously reported problems and continues with question 17.)
- No

7. Which type of health problem are you reporting?

- injury** defined as damage to a body part resulting in pain, numbness, weakness or other symptoms with or without other reduction of normal physical function
- physical illness** defined as physical complaint or disorder not related to injury. Illnesses include health-related problems (e.g. influenza). (if this answer is selected skip to #19)

mental health problem (e.g. depression, anxiety) or social well-being (if this answer is selected, end survey)

8. What **body part** was/is injured? If more than one injury please complete the following questions for one body part and you will be asked to complete questions again for other injured body parts. (Body part can be recorded using either the list below or a body chart)

- head/face
- neck/cervical spine
- chest/ribs (incl. chest organs)
- thoracic spine/upper back
- abdomen (incl. abdominal organs)
- low back/lumbosacral spine
- buttock

- shoulder
- upper arm
- elbow
- forearm
- wrist
- hand/finger/thumb

- hip/groin
- thigh
- knee
- lower leg/Achilles tendon
- ankle
- foot
- others, please specify (free text entry can be added here)

9. Which body side of your body was injured?

- right
- left
- both
- not applicable

10. Did your injury come on **suddenly** or **gradually**?

- Suddenly (ie, from a single incident)
- Gradually (please continue with question 13)

11. **What were you doing when the injury occurred?**

- Circus arts training (specify specific circus arts discipline & skill/movement involved) _____ (Free text entry can be added here.)
- Performance (specify specific circus arts discipline & skill/movement involved) _____ (Free text entry can be added here.)
- Warm-up
- Strength training
- Flexibility training (please note contortion skills training should be reported as circus arts training)
- Circus-related but not discipline specific (specify eg, spotting, pulling lines, walking over mats) _____ (Free text entry can be added here.)
- Non-circus
- Unknown, or not specified

12. Was the **injury caused by a clearly identifiable, single event** (eg, a fall or rolling your ankle on a mat)?

- Yes
- No (Please continue with question 13)

13. **How did the injury happen?** Please provide a detailed account of how the injury occurred including series of events leading up to the injury (specify specific discipline, skill/movement involved, whether other people were involved (eg, base or flyer), whether apparatus was stationary or moving):
_____ (Free text entry can be added here.)

14. When your injury occurred did your body **contact** something external (eg, another person, apparatus, mat or the ground)?

- Yes (please specify): _____ (Free text entry can be added here.)
- No (Please continue with question 17)

15. Where on your body did contact occur (specify body part)? _____ (Free text entry can be added here.)

16. Was this contact point the same as where your injury occurred e.g., landed on head and injury occurred at head?

- Yes
- No
- Unsure

17. Were there any **safety measures** or **equipment** in use?

- Yes
- Mat (specify type) _____ Lines Nets Spotter
- No

18. Did you have any of the following **roles** at the time of injury?

- Base
- Flyer
- Spotter
- Other (specify) (Free text entry can be added here.)
- No

19. What **kind of illness complaints** or symptoms do/did you have?
(multiple selections possible)

- fever diarrhea numbness/pins and needles
- fatigue/malaise constipation anxiety

- swollen glands
- symptoms of hay fever
- depression/sadness
- sore throat
- muscle cramps
- irritability
- blocked /running nose/sneezing
- fainting
- sleep problems
- cough
- rash/itchiness
- eye symptoms
- breathing difficulty/tightness
- irregular pulse/arrhythmia
- ear symptoms
- headache
- chest pain/angina
- urinary tract/genitalia symptoms
- nausea
- abdominal/menstrual pain
- vomiting
- Other pain
- others, please specify _____ *(Free text entry can be added here.)*

20. Have you seen a **physician, physiotherapist/physical therapist, psychologist or another qualified healthcare**

practitioner because of this health problem in the past 7 days?

- No, what is the reason for not seeing a practitioner?
 - Not needed
 - Not possible/accessible
 - I prefer to treat myself
 - Prefer not to say
 - Other, please specify _____
- Yes, physician __ visits in the past 7 days *(A number between 0 and 7 should be entered here.)*
- Yes, physical therapist __ visits in the past 7 days *(A number between 0 and 7 should be entered here.)*
- Yes, psychologist or psychiatrist __ visits in the past 7 days *(A number between 0 and 7 should be entered here.)*
- Yes, other qualified healthcare practitioner, please specify: __ visits in the past 7 days *(A number between 0 and 7 should be entered here.) (multiple selections possible)*

21. On **how many** of the past 7 days, would you have been **completely unable to train, practice or perform in all circus disciplines** due to this health problem?

Please consider all 7 days, even if no training, practice or competition was planned.

___ days of the past 7 days *(A number between 0 and 7 should be entered here.)*

22. On **how many** of the past 7 days, would you have been **completely unable to train, practice or perform in at least 1 circus discipline but not all usual circus disciplines** due to this health problem?

Please consider all 7 days, even if no training, practice or competition was planned.

___ days of the past 7 days *(A number between 0 and 7 should be entered here.) (specify specific circus arts discipline(s) _____ (Dropdown list with multiple selections possible or free text entry can be added here.)*

23. On **how many** of the past 7 days, did you have to **modify or reduce your normal training, practice or performances** due to this health problem?

Please consider all 7 days, even if no training, practice or competition was planned.

___ days of the past 7 days *(A number between 0 and 7 should be entered here.)*

24. Would you like to add any **additional information** about this problem that you think may be important?

(Free text entry can be added here.)

25. Have you had any **other health problems** during the past 7 days?

No

Yes *(please describe your other health problems using another questionnaire)*

(The questionnaire loops back to question 5 as many times as is necessary to record all the athlete's health problems. In subsequent rounds, question 1 should begin with "Please refer your second-worst health problem" or third worst etc. depending on the loop.)

For optimal internal consistency, questions 23 and 24 should not be presented to athletes who reported complete inability to participate in question 1 and 7 days of time loss in question 18.

26. How many hours did you train or perform circus arts in the past 7 days?

___ *(A number should be entered here)* Enter hours of training (includes classes, independent training, and rehearsal)

___ *(A number should be entered here)* Enters hours of performing (associated warm-up/cool-down should be counted under training)

27. How many sessions of training or performances did you participate in during the past 7 days?

Select a circus discipline and then enter the sessions for each category of training and performances. Repeat for all disciplines participated in this week.

(Free text for each circus discipline or drop down list of circus disciplines. Can also choose to add a category for other sports/fitness training.)

___ Classes taken

___ Classes taught (where demonstrated exercise or skills)

___ Independent training

___ Rehearsals

___ Performances *(A number should be entered for each)*

Thank you for taking the time to fill in the questionnaire!

Appendix 4. Example of recording training and performance exposure

Below are examples of how to measure training and performance in circus.

- Part A represents circus artist's weekly training summary and corresponding hours of circus training and performance hours
- Part B represents a reporting of weekly training and performance sessions by discipline for the same training week

Weekday	Summary of training	Training Exposure* (hours)	Performance Exposure (hours)
Monday	Rest day – no training	0	0
Tuesday	Independent training including warm-up, handbalancing, rope and trampoline x 3 hours total	3	0
Wednesday	Took two 1-hour classes back-to-back, one in handbalancing and one in rope	2	0
Thursday	Taught a 1-hour handbalancing class (demonstrating warm-up and skills), independent training including warm-up, handbalancing, rope, and trampoline x 3 hours total	4	0
Friday	Rehearsal of rope, handbalancing and dance acts x 2 hours	2	0
Saturday	Performed rope, handbalancing and dance acts in a show; 30 minutes warm-up 30 minutes performance time	0.5	0.5
Sunday	Took a 90-minute restorative yoga class	0	0
Total hours/week		11.5	0.5

*This includes all time for training (classes taken and taught, additional training, rehearsal and warm-up for performance)

Circus disciplines	Total classes taken	Total classes taught	Total rehearsals	Additional training sessions	Total performances	Training exposure (sessions)	Performance exposure (sessions)
Dance			1		1	1	1
Handbalancing	1	1	1	2	1	5	1
Rope	1		1	2	1	4	1
Trampoline				2		2	0
Other Sports/Fitness	1						

Appendix 5. Demographic, health and circus experience intake questionnaire

Demographics**Current Age:** ___ years**Gender Identity:** Male Female Nonbinary/other/self-identify (*free text entry*)Assigned Sex at Birth: Male Female**Country(ies) where you lived and trained for last year:** -
_____**Hand dominance:** Right Left Ambidextrous**Circus arts experience prior to start of study participation**

Activity	Age at start	Current Participation	If no, age when stopped training
Circus (self-taught or formal training)		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Gymnastics		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Dance		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Parkour		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Other		<input type="checkbox"/> Yes <input type="checkbox"/> No	

What is/are your primary circus discipline(s)? _____**Over the last 6 months:**

On average, how many hours have you trained circus arts per week? (including classes, independent training and rehearsals)	
On average, how many hours of have you spent in circus arts coaching/teaching per week?	
On average, how many circus arts classes have you taken per week? (including private or group classes)	
How many total performances have you performed at least one circus act in? (including student shows, competitions, community events, freelance or professional company shows)	
Have you been part of a pre-professional or professional circus training program?	
Have you been part of a performing arts university degree program? Please specify degree (eg, dance, circus arts, theatre)	
On average, how many hours have you participated in other fitness activities per week? (conditioning activities for strength flexibility, or cardiovascular endurance, sports, etc.)	

Additional Screening**Do you identify as a person with disability?** No Yes, please describe:

Over the last 4 weeks, on average, how many hours of sleep do you get each night? _____ hours

How often do you use?

	Never		<1/mo	1/mo	2-3x/mo	1/wk	2-3x/wk	4-6x/wk	Daily
Alcohol									
Cannabis/marijuana									
Other drugs									

Have you ever been diagnosed with a mental illness or eating/exercise disorder? Yes No

If yes:

Have you ever been diagnosed with an eating disorder? Yes No

Have you ever been diagnosed with a depressive disorder? Yes No

Have you ever been diagnosed with an anxiety disorder? Yes No

Have you ever been diagnosed with a different mental health disorder? Yes No

Have you had any major life events last 12 months?

relocation loss/change of job change of relationship status

death/serious illness of close family or friend other _____