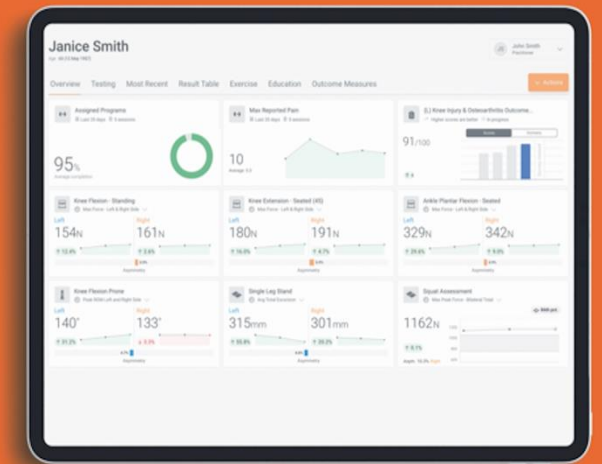


Return to Sport After Concussion - Physiotherapy Management

medbase

Swiss Olympic Medical Day

Manuel Hangarter (M.Sc. Sportphysiotherapie | Z-Health Neuroathletiktrainer | WIN4 Winterthur)



Goals of physiotherapy



**PROTECT THE
ATHLETE**



**TREAT
SYMPTOMS**



**ENSURE A
SAFE
RETURN TO
SPORT**



**AVOID
PERSISTING
SYMPTOMS**

Name:	Geburtsdatum:
Datum Hinterschütterung:	Anzahl Hinterschütterungen:

STAGE 1	REST, NO SPORTS, "BRAIN RESET" Until complete disappearance of all symptoms. Ideally rest and sleep, no mental work or strain whatsoever. 'Switch off and reset' the brain. No school attendance either, refrain from driving a vehicle. Consult a doctor if symptoms increase. Only once completely symptom-free, proceed to Stage 2 the following day!	Stufe bestanden am: _____ Visum: _____
STAGE 2	Light, short AEROBIC TRAINING Light cardiovascular exercise: e.g., 15 minutes on a stationary bike with a pulse up to 125 per minute. Preferably no jogging due to the shaking movement for the head. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated. Only once completely symptom-free, proceed to Stage 3 the following day!	Stufe bestanden am: _____ Visum: _____
STAGE 3	Sport-specific interval training Initial attempt at interval training for circulation and head. Warm up and, under supervision, complete a 'Hürtenlauf' (line sprint). In addition, technical training and strength training (strength endurance) are allowed. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated. Only once completely symptom-free, proceed to Stage 4 the following day!	Stufe bestanden am: _____ Visum: _____
STAGE 4	Team training WITHOUT physical contact Participation in regular team training, but without any physical contact! (Wearing a 'yellow' bib as a warning signal for teammates). If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated. Only once completely symptom-free, proceed to Stage 5 the following day!	Stufe bestanden am: _____ Visum: _____
STAGE 5	Regular team training Participation in regular team training, possibly with additional interval or skills sessions with the coach at the end. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated. Only once completely symptom-free, proceed to Stage 6 the following day!	Stufe bestanden am: _____ Visum: _____
STAGE 6	Match Match possible, but clearly declared as the final stage of the build-up program. In case of symptoms or overload, stop immediately. So, from the day of the accident, at least 6 days must pass before being match-fit! This is the minimum time required for the recovery of the nerve cells.	Stufe bestanden am: _____ Visum: _____

Geburtsdatum:

Anzahl Hirschschütterungen:

STAGE	REST, NO SPORTS, "BRAIN RESET"	Stufe bestanden am
1	Until complete disappearance of all symptoms. Ideally rest and sleep, no mental work or strain whatsoever. 'Switch off and reset' the brain. No school attendance either, refrain from driving a vehicle. Consult a doctor if symptoms increase. Only once completely symptom-free, proceed to Stage 2 the following day!	Visum:
STAGE	Light, short AEROBIC TRAINING	Stufe bestanden am
2	Light cardiovascular exercises: e.g., 15 minutes on a stationary bike with a pulse up to 125 per minute. Preferably no jogging due to the shaking movement for the head. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated. Only once completely symptom-free, proceed to Stage 3 the following day!	Visum:
STAGE	Sport-specific interval training	Stufe bestanden am
3	Initial attempt at interval training for 10 minutes and 1 set. With a coach or under supervision, complete a 'Hürleimann' (line sprint). In addition, short running sessions (e.g., 100m, 200m, 400m, 800m, 1600m, 3200m, 6400m, 12800m, 25600m, 51200m, 102400m, 204800m, 409600m, 819200m, 1638400m, 3276800m, 6553600m, 13107200m, 26214400m, 52428800m, 104857600m, 209715200m, 419430400m, 838860800m, 1677721600m, 3355443200m, 6710886400m, 13421772800m, 26843545600m, 53687091200m, 107374182400m, 214748364800m, 429496729600m, 858993459200m, 1717986918400m, 3435973836800m, 6871947673600m, 13743895347200m, 27487790694400m, 54975581388800m, 109951162777600m, 219902325555200m, 439804651110400m, 879609302220800m, 1759218604441600m, 3518437208883200m, 7036874417766400m, 14073748835532800m, 28147497671065600m, 56294995342131200m, 112589990684262400m, 225179981368524800m, 450359962737049600m, 900719925474099200m, 1801439850948198400m, 3602879701896396800m, 7205759403792793600m, 14411518807585587200m, 28823037615171174400m, 57646075230342348800m, 115292150460684697600m, 230584300921369395200m, 461168601842738790400m, 922337203685477580800m, 1844674407370955161600m, 3689348814741910323200m, 7378697629483820646400m, 14757395258967641292800m, 29514790517935282585600m, 59029581035870565171200m, 118059162071741130342400m, 236118324143482260684800m, 472236648286964521369600m, 944473296573929042739200m, 1888946593147858085478400m, 3777893186295716170956800m, 7555786372591432341913600m, 15111572745182864683827200m, 30223145490365729367654400m, 60446290980731458735308800m, 120892581961462917470617600m, 241785163922925834941235200m, 483570327845851669882470400m, 967140655691703339764940800m, 1934281311383406679529881600m, 3868562622766813359059763200m, 7737125245533626718119526400m, 15474250491067253436239052800m, 30948500982134506872478105600m, 61897001964269013744956211200m, 123794003928538027489912422400m, 247588007857076054979824844800m, 495176015714152109959649689600m, 990352031428304219919299379200m, 1980704062856608439838598758400m, 3961408125713216879677197516800m, 7922816251426433759354395033600m, 15845632502852867518708790067200m, 31691265005705735037417580134400m, 63382530011411470074835160268800m, 126765060022822940149670320537600m, 253530120045645880299340641075200m, 507060240091291760598681282150400m, 1014120480182583521197362564300800m, 2028240960365167042394725128601600m, 4056481920730334084789450257203200m, 8112963841460668169578900514406400m, 16225927682921336339157801028812800m, 32451855365842672678315602057625600m, 64903710731685345356631204115251200m, 129807421463370690713262408230502400m, 259614842926741381426524816461004800m, 519229685853482762853049632922009600m, 1038459371706965525706099265844019200m, 2076918743413931051412198531688038400m, 4153837486827862102824397063376076800m, 8307674973655724205648794126752153600m, 16615349947311448411297588253504307200m, 33230699894622896822595176507008614400m, 66461399789245793645190353014017228800m, 132922799578491587290380706028034457600m, 265845599156983174580761412056068915200m, 531691198313966349161522824112137830400m, 1063382396627932698323045648224275660800m, 2126764793255865396646091296448551321600m, 4253529586511730793292182592897102643200m, 8507059173023461586584365185794205286400m, 17014118346046923173168730371588410572800m, 34028236692093846346337460743176821145600m, 68056473384187692692674921486353642291200m, 136112946768375385385349842972707284582400m, 272225893536750770770699685945414569164800m, 544451787073501541541399371890829138329600m, 1088903574147003083082798743781658276659200m, 2177807148294006166165597487563316553318400m, 4355614296588012332331194975126633106636800m, 8711228593176024664662389950253266213273600m, 17422457186352049329324779900506532426547200m, 34844914372704098658649559801013064853094400m, 696898287454081973172991196020261297	

Complication



**6 DAYS IS NOT
(ENOUGH)
PROTECTION**



**ABSOLUTE REST
SLOWS
RECOVERY**



**ATHLETE
REPORTS
ALONE IS NOT
ENOUGH**



**WE DON'T
ASSESS
NERVOUS
SYSTEM
FUNCTION**

Relative Rest

Aerobic Training

Sport-Specific Training

Restricted Team Training

Team Training

Match

STAGE

1

REST, NO SPORTS, "BRAIN RESET"

Until complete disappearance of all symptoms. Ideally rest and sleep, no mental work or strain whatsoever. 'Switch off and reset' the brain. No school attendance either, refrain from driving a vehicle. Consult a doctor if symptoms increase.

Only once completely symptom-free, proceed to Stage 2 the following day!

STAGE

2

Light, short AEROBIC TRAINING

Light cardiovascular exercise: e.g., 15 minutes on a stationary bike with a pulse up to 125 per minute. Preferably no jogging due to the shaking movement for the head. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 3 the following day!

STAGE

3

Sport-specific interval training

Initial attempt at interval training for circulation and head. Warm up and, under supervision, complete a 'Hürtimann' (line sprint). In addition, technical training and strength training (strength endurance) are allowed. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 4 the following day!

STAGE

4

Team training WITHOUT physical contact

Participation in regular team training, but without any physical contact! (Wearing a 'yellow' bib as a warning signal for teammates). If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 5 the following day!

STAGE

5

Regular team training

Participation in regular team training, possibly with additional interval or skills sessions with the coach at the end. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 6 the following day!"

STAGE

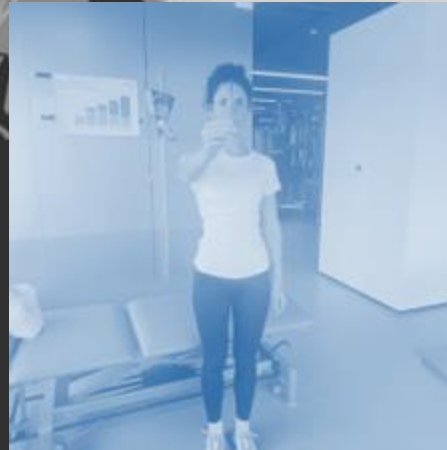
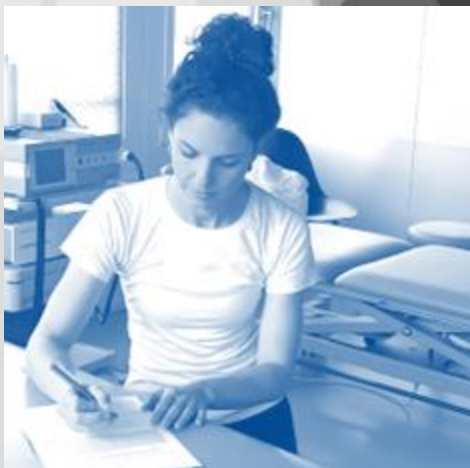
6

Match

Match possible, but clearly declared as the final stage of the build-up program. In case of symptoms or overload, stop immediately.

So, from the day of the accident, at least 6 days must pass before being match-fit! This is the minimum time required for the recovery of the nerve cells.

PHASE 1 - PHYSIOTHERAPY ASSESSMENT



Rehaphad Gehirnerschütterung: Befundbogen Physiotherapie

Name: _____

Ans. Name: _____

Geburtsdatum: _____

Geburtsort: _____

Adresse: _____

Assessment Symptomliste Concussion SCDaTz

Assessmentssituation: ☒ 1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐ 17. ☐ 18. ☐ 19. ☐ 20. ☐ 21. ☐ 22. ☐ 23. ☐ 24. ☐ 25. ☐ 26. ☐ 27. ☐ 28. ☐ 29. ☐ 30. ☐ 31. ☐ 32. ☐ 33. ☐ 34. ☐ 35. ☐ 36. ☐ 37. ☐ 38. ☐ 39. ☐ 40. ☐ 41. ☐ 42. ☐ 43. ☐ 44. ☐ 45. ☐ 46. ☐ 47. ☐ 48. ☐ 49. ☐ 50. ☐ 51. ☐ 52. ☐ 53. ☐ 54. ☐ 55. ☐ 56. ☐ 57. ☐ 58. ☐ 59. ☐ 60. ☐ 61. ☐ 62. ☐ 63. ☐ 64. ☐ 65. ☐ 66. ☐ 67. ☐ 68. ☐ 69. ☐ 70. ☐ 71. ☐ 72. ☐ 73. ☐ 74. ☐ 75. ☐ 76. ☐ 77. ☐ 78. ☐ 79. ☐ 80. ☐ 81. ☐ 82. ☐ 83. ☐ 84. ☐ 85. ☐ 86. ☐ 87. ☐ 88. ☐ 89. ☐ 90. ☐ 91. ☐ 92. ☐ 93. ☐ 94. ☐ 95. ☐ 96. ☐ 97. ☐ 98. ☐ 99. ☐ 100. ☐ 101. ☐ 102. ☐ 103. ☐ 104. ☐ 105. ☐ 106. ☐ 107. ☐ 108. ☐ 109. ☐ 110. ☐ 111. ☐ 112. ☐ 113. ☐ 114. ☐ 115. ☐ 116. ☐ 117. ☐ 118. ☐ 119. ☐ 120. ☐ 121. ☐ 122. ☐ 123. ☐ 124. ☐ 125. ☐ 126. ☐ 127. ☐ 128. ☐ 129. ☐ 130. ☐ 131. ☐ 132. ☐ 133. ☐ 134. ☐ 135. ☐ 136. ☐ 137. ☐ 138. ☐ 139. ☐ 140. ☐ 141. ☐ 142. ☐ 143. ☐ 144. ☐ 145. ☐ 146. ☐ 147. ☐ 148. ☐ 149. ☐ 150. ☐ 151. ☐ 152. ☐ 153. ☐ 154. ☐ 155. ☐ 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EVIDENCE: PATIENT EDUCATION & ASSESSMENT

Review

Western diet aggravates neuronal insult in post-traumatic brain injury: Proposed pathways for interplay

Abdullah Shaito^a, Hiba Hasan^{b,1}, Karl John Habashy^{c,1}, Walaa Fakh^{d,1}, Samar Abdelhady^e, Fatimah Ahmad^f, Kazem Zibara^g, Ali H. Eid^{d,h}, Ahmed F. El-Yazbi^{d,i,j,k}, Firas H. Kobeissy^{j,**}

^a Department of Biological and Chemical Sciences, Lebanese International University, Beirut, Lebanon and Faculty of Health Sciences, University of Balamand, Beirut, Lebanon

^b Institute of Anatomy and Cell Biology, Justus-Liebig-University Giessen, 35392 Giessen, Germany

^c Faculty of Medicine, American University of Beirut, Beirut, Lebanon

^d Department of Pharmacology and Toxicology, Faculty of Medicine, American University of Beirut, Beirut, Lebanon

^e Faculty of Medicine, Alexandria University, Alexandria, Egypt

^f Department of Biochemistry and Molecular Genetics, Faculty of Medicine, American University of Beirut, Beirut, Lebanon

^g Biology Department, Faculty of Sciences-I, Lebanese University, Beirut, Lebanon

^h Department of Biomedical Sciences, College of Health Sciences, Doha, Qatar

ⁱ Department of Pharmacology and Toxicology, Faculty of Pharmacy, Alexandria University, Egypt

Physical Therapy Evaluation and Treatment After Concussion/ Mild Traumatic Brain Injury

Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Academy of Orthopaedic Physical Therapy of the American Physical Therapy Association

J Orthop Sports Phys Ther. 2020;50(4):CPG1-CPG73. doi:10.2519/jospt.2020.0301

American Medical Society for Sports Medicine position statement on concussion in sport

Kimberly G Harmon,¹ James R Clugston,² Katherine Dec,³ Brian Hainline,⁴ Stanley Herring,⁵ Shawn F Kane,⁶ Anthony P Kontos,⁷ John J Leddy,⁸ Michael McCrea,⁹ Sourav K Poddar,¹⁰ Margot Putukian,^{11,12} Julie C Wilson,¹³ William O Roberts¹⁴

RESEARCH ARTICLE

Clinical examination factors that predict delayed recovery in individuals with concussion

Corina Martinez^{1*}, Zachary Christopherson¹, Ashley Lake¹, Heather Myers¹, Jeffrey R. Bytowski², Robert J. Butler^{3,4} and Chad E. Cook⁴

Systematic review

Rest and exercise early after sport-related concussion: a systematic review and meta-analysis

John J Leddy^a,¹ Joel S Burma^a,² Clodagh M Toomey,³ Alix Hayden,⁴ Gavin A Davis^a,⁵ Franz E Babl^a,⁶ Isabelle Gagnon,^{7,8} Christopher C Giza,^{9,10} Brad G Kurowski,¹¹ Noah D Silverberg^a,¹² Barry Willer,¹³ Paul E Ronksley,¹⁴ Kathryn J Schneider^a¹⁵

Sleep and the athlete: narrative review and 2021 expert consensus recommendations

Neil P Walsh^a,¹ Shona L Halson,² Charli Sargent,³ Gregory D Roach,³ Mathieu Nédélec,⁴ Luke Gupta,⁵ Jonathan Leeder,⁶ Hugh H Fullagar,⁷ Aaron J Coutts,⁷ Ben J Edwards,¹ Samuel A Pullinger^a,^{1,8} Colin M Robertson,⁹ Jatin G Burniston,¹ Michele Lastella,³ Yann Le Meur,⁴ Christophe Hausswirth,¹⁰ Amy M Bender,¹¹ Michael A Grandner,¹² Charles H Samuels¹³

Consensus statement

Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport– Amsterdam, October 2022

Jon S Patricios^a,¹ Kathryn J Schneider^a,² Jiri Dvorak^a,³ Osman Hassan Ahmed^a,^{4,5} Cheri Blauwet^a,^{6,7} Robert C Cantu,^{8,9} Gavin A Davis^a,^{10,11} Ruben J Echemendia^a,^{12,13} Michael Makdissi,^{14,15} Michael McNamee,^{16,17} Steven Broglio^a,¹⁸ Carolyn A Emery^a,² Nina Feddermann-Demont,^{19,20} Gordon Ward Fuller^a,²¹ Christopher C Giza,^{22,23} Kevin M Guskiewicz,²⁴ Brian Hainline^a,²⁵ Grant L Iverson^a,^{26,27} Jeffrey S Kutcher,²⁸ John J Leddy^a,²⁹ David Maddocks,³⁰ Geoff Manley^a,³¹ Michael McCrea^a,³² Laura K Purcell,³³ Margot Putukian^a,³⁴ Haruhiko Sato^a,³⁵ Markku P Tuominen,³⁶ Michael Turner^a,^{37,38} Keith Owen Yeates^a,³⁹ Stanley A Herring,^{40,41} Willem Meeuwisse⁴²

Rehapfad Gehirnerschütterung Verhaltensempfehlungen nach einer Gehirnerschütterung



Direkt nach einer Gehirnerschütterung

Bei Verschlechterung der Symptome wie Übelkeit, Erbrechen oder starke Zunahme von Kopfschmerzen umgehend die Notaufnahme aufsuchen!

- Ruhiger & dunkler Raum für die ersten 24-48 Stunden
- Kein Handy, Fernsehen oder Lesen für die ersten 24-48 Stunden
- Ausreichend schlafen
- Sonnenbrille bei Lichtempfindlichkeit & Ohrstöpsel bei Geräuschempfindlichkeit nutzen
- Ab 24 Stunden kurze Spaziergänge

Artz konsultation

Eine Arztkonsultation bei einem Facharzt sollte innerhalb von 72 Stunden nach einer Gehirnerschütterung stattfinden!



Nach 48 Stunden bis zur vollständigen Erholung

- Maximale Symptomverschlechterung von 2/10 Punkten bei allen Aktivitäten
- Langsame Rückkehr zur Alltagsaktivitäten & Arbeit / Schule
- Regelmässige Spaziergänge
- Regelmässiges Ausdauertraining in Absprache mit einem Therapeuten
- Bildschirmzeit und Lesen langsam steigern
- Schlafhygiene (mindestens 7-9 Stunden, regelmäßiger Schlafrhythmus)
- Geregelter Tagesablauf
- Gesunde Ernährung, Verzicht von Alkohol und Drogen
- **Rückkehr in die Schule / Arbeit**
 - Erfolgt meist innerhalb von zehn Tagen nach einer Gehirnerschütterung
 - Eventuell Belastung anpassen durch teilweise Reintegration, mehr Pausen und mehr Einzelarbeit
 - Rückkehr in die Schule / Arbeit hat Priorität und erfolgt vor der Rückkehr in den Sport
- **Rückkehr in den Sport**
 - Rückkehr in den Sport meist nach zwei bis vier Wochen
 - Eine frühere Rückkehr in den Sport ist oft unrealistisch und potenziell gefährlich
 - Kinder und Jugendliche sollten mindestens 28 Tagen warten
 - Die Freigabe erfolgt in Absprache mit dem behandelnden Arzt oder Therapeuten

Relative Rest

- Mild symptoms are okay.
- Early walking and light daily activities are encouraged.
- Good education is key

Stage 2 after 48 hours.

Aerobic Training

Sport-Specific Training

Restricted Team Training

Team Training

Match

STAGE

1

REST, NO SPORTS, "BRAIN RESET"

Until complete disappearance of all symptoms. Ideally rest and sleep, no mental work or strain whatsoever. 'Switch off and reset' the brain. No school attendance either, refrain from driving a vehicle. Consult a doctor if symptoms increase.

Only once completely symptom-free, proceed to Stage 2 the following day!

STAGE

2

Light, short AEROBIC TRAINING

Light cardiovascular exercise: e.g., 15 minutes on a stationary bike with a pulse up to 125 per minute. Preferably no jogging due to the shaking movement for the head. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 3 the following day!

STAGE

3

Sport-specific interval training

Initial attempt at interval training for circulation and head. Warm up and, under supervision, complete a 'Hürimann' (line sprint). In addition, technical training and strength training (strength endurance) are allowed. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 4 the following day!

STAGE

4

Team training WITHOUT physical contact

Participation in regular team training, but without any physical contact! (Wearing a 'yellow' bib as a warning signal for teammates). If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 5 the following day!

STAGE

5

Regular team training

Participation in regular team training, possibly with additional interval or skills sessions with the coach at the end. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

Only once completely symptom-free, proceed to Stage 6 the following day!

STAGE

6

Match

Match possible, but clearly declared as the final stage of the build-up program. In case of symptoms or overload, stop immediately.

So, from the day of the accident, at least 6 days must pass before being match-fit! This is the minimum time required for the recovery of the nerve cells.

Relative Rest

- Mild symptoms are okay.
- Early walking and light daily activities are encouraged.

Stage 2 after 48 hours.

Aerobic Training

Sport-Specific Training

Restricted Team Training

Team Training

Match

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Match possible, but clearly declared as the final stage of the build-up program. In case of symptoms or overload, stop immediately.

So, from the day of the accident, at least 6 days must pass before being match-fit! This is the minimum time required for the recovery of the nerve cells.

PHASE 2 – BUFFALO CONCUSSION TREADMILL TEST



Rehaphad Gehirnerschütterung - Belastungsprotokoll © 2015 medbase

Teilnehmer:

Name: _____ Alter: _____ Geschlecht: _____

Erkrankung:

Erkrankung: _____

Belastungsprotokoll:

Belastungsprotokoll: _____

Ergebnisse:

Phase	Belastung	Erkrankung	Erkrankung	Erkrankung	Erkrankung
1	10%	10%	10%	10%	10%
2	20%	20%	20%	20%	20%
3	30%	30%	30%	30%	30%
4	40%	40%	40%	40%	40%
5	50%	50%	50%	50%	50%
6	60%	60%	60%	60%	60%
7	70%	70%	70%	70%	70%
8	80%	80%	80%	80%	80%
9	90%	90%	90%	90%	90%
10	100%	100%	100%	100%	100%

Trainerkompetenz:

Trainerkompetenz: _____

Trainerkompetenz:

Trainerkompetenz: _____

PHASE 2 – EARLY INITIATION OF VESTIBULAR, CERVICOGENIC, AND VISUAL REHABILITATION



EVIDENCE - CARDIOVASCULAR TRAINING & VESTIBULAR, CERVICOGENIC, AND VISUAL REHABILITATION

Vision and Concussion: Symptoms, Signs, Evaluation, and Treatment

Christina L. Master, MD, FRCPC¹, Darin Rouse, MD, FRCPC², Matthew F. Green, MD, FRCPC³, Richard Harris, MD, FRCPC⁴, Andrew J. Shaw, MD, FRCPC⁵, Michael Strassburg, MD, FRCPC⁶, Isaac Wilkins, MD, FRCPC⁷, Geoffrey E. Brashers, MD, FRCPC⁸, Frank Lutz, MD, FRCPC⁹, David F. Dunlop, MD, FRCPC¹⁰, and Section on Ophthalmology, American Academy of Ophthalmology, American Association for Pediatric Ophthalmology and Strabismus, and American Association of Certified Orthoptists

Effect of Aerobic Exercise on Symptom Burden and Quality of Life in Adults With Persisting Post-concussive Symptoms: The ACTBI Randomized Controlled Trial

Leah J. Mercier, PhD^{a,b} ✉ · Samantha J. McIntosh, BHSc^{a,b} · Chloe Boucher, BSc^{a,b} · ... · Sean P. Dukelow, MD, PhD^{a,b} · Ashley D. Harris, PhD^{b,c,f} · Chantel T. Debert, MD, MSc^{a,b,f} ... Show more

Affiliations & Notes ▾ Article Info ▾

A Physiological Approach to Prolonged Recovery From Sport-Related Concussion

John Leddy, MD, FACS, FACP[†]; John G. Baker, PhD[†]; Mohammad Nadir Haider, MBBS[§]; Andrea Hinds, PhD[†]; Barry Willer, PhD[‡]

[†]UBMD Department of Orthopaedics and Sports Medicine, [‡]Department of Nuclear Medicine, and [§]Department of Psychiatry, [§]Jacobs School of Medicine and Biomedical Sciences, The State University of New York at Buffalo

Early Subthreshold Aerobic Exercise for Sport-Related Concussion

A Randomized Clinical Trial

John J Leddy^{1,8}, Mohammad N Haider^{1,2}, Michael J Ellis^{3,4,5}, Rebekah Mannix⁶, Scott R Darling¹, Michael S Freitas¹, Heidi N Suffoletto¹, Jeff Leiter⁷, Dean M Cordingley⁷, Barry Willer⁸

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REVIEW ARTICLE

Cerebrovascular pathophysiology following mild traumatic brain injury

T. K. Len and J. P. Neary

Exercise Physiology Laboratory, Faculty of Kinesiology and Health Studies, University of Regina, Regina, SK, Canada

Summary

Mild traumatic brain injury (mTBI) or sport-induced concussion has recently become a prominent concern not only in the athletic setting (i.e. sports venue) but also in the general population. The majority of research to date has aimed at understanding the neurological and neuropsychological outcomes of injury as well as return-to-play guidelines. Remaining relatively unexamined has been the pathophysiological aspect of mTBI. Recent technological advances including

Correspondence

Dr J. Patrick Neary, Faculty of Kinesiology and Health Studies, University of Regina, 3737 Wascana Parkway, Regina, SK, Canada, S4S 0A2
E-mail: patrick.neary@uregina.ca

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[CLINICAL COMMENTARY]

JULIA TRELEAVEN, PhD, PhDy¹

Dizziness, Unsteadiness, Visual Disturbances, and Sensorimotor Control in Traumatic Neck Pain

Cerebrovascular Neuroprotection after Acute Concussion in Adolescents

Stacey E. Aaron PhD, Jason W. Hamner BS, Erin D. Ozturk BS, Danielle L. Hunt MS, Mary Alexis Iaccarino MD, William P. Meehan III MD, David R. Howell PhD, Can Ozan Tan PhD ✉

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Review of Vestibular and Oculomotor Screening and Concussion Rehabilitation

Anthony P. Kontos, PhD[†]; Jamie McAllister Deltrick, PhD[†]; Michael W. Collins, PhD[†]; Anne Mucha, DPT[†]

[†]UPMC Sports Medicine Concussion Program/Department of Orthopaedic Surgery and [†]UPMC Centers for Rehabilitation Services, University of Pittsburgh, PA

Current and Emerging Rehabilitation for Concussion: A Review of the Evidence

Steven P. Broglio, MD, ATC^{a,b,c}, Michael W. Collins, PhD^d, Michelle M. Williams, MS, ATC^e, Anne Mucha, DPT^{f,g}, Anthony P. Kontos, MD^h

Physical examination of dizziness in athletes after a concussion: A descriptive study

Jennifer C. Reneker^{a,b,c,d}, Vinay K. Cheruvu^a, Jingzhen Yang^d, Mark A. James^b, Chad E. Cook^e

^aDepartment of Biostatistics, Environmental Health Sciences, and Epidemiology, College of Public Health, Kent State University, Kent, OH, United States

^bDepartment of Physical Therapy, School of Health Related Professions, University of Mississippi Medical Center, Jackson, MS, United States

^cDepartment of Neurosurgery, School of Medicine, University of Mississippi Medical Center, Jackson, MS, United States

^dCenter for Injury Research and Policy, The Research Institute on Nationwide Children's Hospital, Dept. of Pediatrics, College of Medicine, The Ohio State University, Columbus, OH, United States

^eDivision of Physical Therapy, Department of Orthopaedics, Duke University, Durham, NC, United States

Cerebral Blood Flow During Treadmill Exercise Is a Marker of Physiological Postconcussion Syndrome in Female Athletes

Mary Clausen, MS; David R. Pendergast, EdD; Barry Willer, PhD; John Leddy, MD

Exercise is Medicine for Concussion

John J. Leddy, M.D. FACS, FACP,
UBMD Orthopaedics and Sports Medicine, State University of New York at Buffalo, Buffalo, NY

Mohammad N. Haider, M.D.,
UBMD Department of Orthopedics and Sports Medicine, State University of New York at Buffalo, Buffalo, NY

Michael Ellis, M.D. FRCSC, and
University of Manitoba, Department of Surgery and Pediatrics, Section of Neurosurgery, Pan Am Concussion Program, Winnipeg, Manitoba, Canada

Barry S. Willer, Ph.D.
University at Buffalo Department of Psychiatry, State University of New York at Buffalo, Buffalo, NY –

Systematic review

Rest and exercise early after sport-related concussion: a systematic review and meta-analysis

John J Leddy¹, Joel S Burma², Clodagh M Toomey³, Alix Hayden⁴, Gavin A Davis⁵, Franz E Babl⁶, Isabelle Gagnon^{7,8}, Christopher C Giza^{9,10}, Brad G Kurowski¹¹, Noah D Silverberg¹², Barry Willer¹³, Paul E Ronksley¹⁴, Kathryn J Schneider¹⁵

Use of Graded Exercise Testing in Concussion and Return-to-Activity Management

John J. Leddy, MD, FACS, FACP¹ and Barry Willer, PhD²

Relative Rest

- Mild symptoms are okay.
- Early walking and light daily activities are encouraged.

Stage 2 after 48 hours.

Aerobic Training

- Regular endurance training 5–7 times per week
- Ensure maximum cardiovascular capacity
- Early initiation of vestibular, cervicogenic, and visual rehabilitation

Stage 3 when full cardiovascular capacity is ensured.

Sport-Specific Training

Restricted Team Training

Team Training

Match

STAGE

1

REST, NO SPORTS, "BRAIN RESET"

Until complete disappearance of all symptoms. Ideally rest and sleep, no mental work or strain whatsoever. 'Switch off and reset' the brain. No school attendance either, refrain from driving a vehicle. Consult a doctor if symptoms increase.

Only once completely symptom-free, proceed to Stage 2 the following day!

STAGE

2

Light, short AEROBIC TRAINING

Light cardiovascular exercise e.g., 15 minutes on a stationary bike with a pulse up to 125 per minute. Preferably no jogging due to the shaking movement for the head. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

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4

Team training WITHOUT physical contact

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Regular team training

Participation in regular team training, possibly with additional interval or skills sessions with the coach at the end. If symptoms reoccur, remain at this stage also on the following day. Try again until the stage is well tolerated.

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STAGE

6

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So, from the day of the accident, at least 6 days must pass before being match-fit! This is the minimum time required for the recovery of the nerve cells.

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PHASE 3 – RETURN TO SPORT TESTING



Rehaphad Gehirnerschütterung - Return to Sport Test
Dynamic Evention Protocol

Personenbezogene Daten

Rehaphad Gehirnerschütterung - Return to Sport Test

1. Anamnese Komponente

2. Dynamische Komponente

Symptome	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung
...	...	...	...	...

Symptome	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung
...	...	...	...	...

Symptome	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung
...	...	...	...	...

Symptome	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung	Rehaphad Gehirnerschütterung
...	...	...	...	...

EVIDENCE - RETURN TO SPORT TESTING

BJSM Online First, published on July 22, 2017 as 10.1136/bjsports-2016-096551

Review

A systematic review of criteria used to define recovery from sport-related concussion in youth athletes

Mohammad Nadir Haider,¹ John J Leddy,² Sonja Pavlesen,² Melissa Kluczynski,² John G Baker,^{2,3} Jeffrey C Miecznikowski,⁴ Barry S Willer¹

The use of an intensive physical exertion test as a final return to play measure in concussed athletes: a prospective cohort

Cameron M. Marshall, Nicole Chan, Pauline Tran & Carol DeMatteo

Neurocognitive Performance of Concussed Athletes When Symptom Free

Steven P. Broglio, PhD, ATC*; Stephen N. Macciocchi, PhD, ABPP†‡; Michael S. Ferrara, PhD, ATC‡

*University of Illinois at Urbana-Champaign, Urbana, IL; †Shepherd Center, Atlanta, GA; ‡University of Georgia, Athens, GA

Examining Recovery Trajectories After Sport-Related Concussion With a Multimodal Clinical Assessment Approach

Consensus statement

Consensus statement on concussion in sport: the 6th International Conference on Concussion in Sport—Amsterdam, October 2022

Jon S Patricios ,¹ Kathryn J Schneider ,² Jiri Dvorak ,³ Osman Hassan Ahmed ,^{4,5} Cheri Blauwet ,^{6,7} Robert C Cantu^{8,9}

RESEARCH ARTICLES

Does Exercise Increase Vestibular and Ocular Motor Symptom Detection After Sport-Related Concussion?

Michael Popovich, MD, MPH, Andrea Almeida, MD, Matthew Lorincz, MD, PhD, James T. Eckner, MD, MS, Jeremiah Freeman, ATC, Nicholas Streicher, MD, and Bara Alsalaheen, PhD

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Stage 3 when full cardiovascular capacity is ensured.

Sport-Specific Training

- Strength training allowed
- Training away from the team allowed (psychologically important).

Stage 4 upon passing the return-to-sport test and no symptom provocation during 24 hours.

Restricted Team Training

Team Training

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**CLEAR CRITERIA
TO BE MET**



**PROTECT THE
ATHLETE**

**EARLY
VESTIBULAR,
VISUAL, AND
CERVICOGENIC
REHABILITATION**



**TREAT
SYMPTOMS**

**RETURN TO
SPORT
TEST**



**SAFE
RETURN TO
SPORT**

**RELATIVE REST
INSTEAD OF
ABSOLUTE REST**



**AVOID
PERSISTING
SYMPTOMS**

Merci beaucoup, vielen Dank!

Vielen Dank fürs
Zuhören

Bei Fragen und Anregungen freuen
wir uns über eure Rückmeldung.

 medbasesport

 medbasegruppe

oder tagge uns unter #myrehabstory

Manuel Hangarter & Philipp Purkert