Head Trauma
The Untold Story of Common Recreational Injuries

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• TRAUMA – GENERAL

• RECREATIONAL vs. ACCIDENTAL TRAUMA

• HIGH RISK OF RECREATIONAL TRAUMA

• TRAUMATIC BRAIN (Head) INJURY (“TBI”)
TRAUMA - GENERAL

- Assault
- Motor Vehicle
- Natural Disaster
- Social Upheaval
- War
- Home or Work Accident
- Machinery or Structural Failure
- OCCUPATIONAL Impacts or Strains
- RECREATIONAL Impacts or Strains
RECREATIONAL TRAUMA

• SPORTS - team/individual, competitive or performance
• EXERCISE - jogging, gym, yoga, pilates, horseriding
• AMUSEMENT - parks/rides, music/dancing, substances
• SIGHT-SEEING - touring, bike, hike/climb, dive, ski, boat
• THRILL-SEEKING - sky-dive, surf, bungee, cliff-dive
Most RECREATIONAL TRAUMA is Accepted/Allowed because it is INFREQUENT or BENIGN
INFREQUENT

• Severe Trauma is INFREQUENT

• Accidental Mishap is INFREQUENT

• Few Participants in Very Few Encounters

• Socially Accepted Habits = Difficult to Change
BENIGN

- Benign Musculo-Skeletal Strains or Impacts
- Benign Long-Term Sequelae: Osteoarthritis, etc.
- Benign Consequences = Unmotivated to Change
Splitting the Falx Cerebri
RECREATIONAL TRAUMA

- SPORTS - team/individual, competitive or performance
- EXERCISE -
- AMUSEMENT - parks/rides, music/dancing, substances
- SIGHT-SEEING -
- THRILL-SEEKING -
RECREATIONAL TRAUMA

- SPORTS ---------- SOCCER
- EXERCISE -
- AMUSEMENT ---- ROLLER COASTER RIDES
- SIGHT-SEEING -
- THRILL-SEEKING -
The Untold Story of Traumatic Brain Injury in Soccer and Amusement Rides
Is heading a soccer ball injurious to brain function?  

A dose-response relation of headers and concussions with cognitive impairment in professional soccer players.  

Heading and head injuries in soccer.  

Effects of heading exposure and previous concussions on neuropsychological performance among Norwegian elite footballers.  

Prolonged neuropsychological impairments following a first concussion in female university soccer athletes.  
Amusement park injuries and deaths.

Roller coaster headaches revisited.

Waiver of Consent in Studies of Acute Brain Injury
Guy L. Clifton, Paula Knudson, Marilyn McDonald

Head Accelerations Experienced during Everyday Activities and While Riding Roller Coasters
Steven R. Arndt, Robert S. Cargill, P. E. Selim Hammoud

Deformation of the Human Brain Induced by Mild Acceleration

SOCCEER
SOCCER

- 265 MM Soccer Players Worldwide
- 3 MM Youth Soccer Players in U.S. is #1 Sport
- HEADING the Ball as Regular Part of Game
- No Protection
- Medical Literature Dates Back >30 Years
- Documented Adverse Effects, CTE, Etc.
SOCCER

• BALL Travels at High Speed & Long Distance in Air

• “Heading the Ball” RARELY Occurs Smoothly

• Force of Ball Impact ENTERS the Head

• INJURY Results to Brain, Meninges, & Cranium
AMUSEMENT RIDES
ROLLER COASTER

• 300 MM Riders Annually
  4 deaths/yr. averaged ‘94-’04
  9,200 children in ER’s/yr. in ‘08 diag. code Amus. Pk.

• Mishaps & Accidents are Rare – Misleading

• Regular Mild Concussions for the Vulnerable
  (consider football player vs. young child)

• Measurable Decreases in GH Levels
ROLLER COASTER Etc.

- Amusement Park Rider in Any THRILL Ride
- SUDDEN Change in Direction Delivers “Shear Force”
- Whiplash injury to BRAIN is “Coup-Contracoup”
- BIG Acceleration/Deceleration Delivers “G Forces”
NFL Now Allows NO IMPACTS TO HEAD

- 2017 had 281 reported incidents of CONCUSSION in preseason & reg. season
- Most since NFL began releasing those statistics in 2012
- Often went undetected or unreported, previously no protocols, and impacts to head were allowed in rules...
- PRESENTLY NOT ALLOWED to hit to the head or to hit WITH the head!!
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**Deformation of the Human Brain Induced by Mild Acceleration**

Emergency department visits secondary to amusement ride injuries in children.


**Measurements of Non-Injurious Head Accelerations of a Pediatric Population**

William R. Bussone, Tara L. A. Moore, Darrin Richards, Robert T. Bove, Irving Scher, Michael T. Prange


**Biomechanical Analysis of Experimental Diffuse Axonal Injury**

DAVID F. MEANEY, DOUGLAS H. SMITH, DAVID I. SHREIBER, ALLISON C. BAIN, REID T. MILLER, DOUG T. ROSS, THOMAS A. GENNARELLI


**Subacute subdural hematoma in a 45-year-old woman with no significant past medical history after a roller coaster ride**

Kim A. Williams Jr, Pelagia Kouloumeris, Herbert H. Engelhard


**Human factors on the midway knowledge transfer and research opportunities for safety in the carnival and theme park domains.**

Kathryn Woodcock

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**Head Motions While Riding Roller Coasters**

Bryan J. Pfister, Larry Chickola, Douglas H. Smith

Bilateral internal carotid artery and vertebral artery dissections with retinal artery occlusion after a roller coaster ride - case report and a review.


ROLLER COASTER-ASSOCIATED RETINAL DETACHMENTS
Saad Shaikh

Roller coaster-associated subarachnoid hemorrhage—report of 2 cases
Sebastian Rutsch, Wolf-Dirk Niesen, Stephan Meckel, Matthias Reinhard

Neurologic complication after a roller coaster ride.

Three cases of cervicocephalic artery dissection in an amusement park.

Internal carotid artery dissection after a roller coaster ride in a 4-year-old: case report and review of the literature.
Nouh A¹, Vela-Duarte D², Grobelny T², Hoganson G³, Pasquale D⁴, Biller J⁵.
Effects of Horizontal Acceleration on Human Visual Acuity and Stereopsis
Chi-Ting Horng, Yih-Shou Hsieh, Ming-Ling Tsai, Wei-Kang Chang, Tzu-Hung Yang, Chien-Han Yauan, Chih-Hung Wang, Wu-Hsien Kuo, Yi-Chang Wu

A Motion Simulator Ride Associated With Headache and Subdural Hematoma: First Case Report
Robert A. Scranton, Randolph W. Evans, David S. Baskin

Pilot Findings of Brain Displacements and Deformations during Roller Coaster Rides
Calvin Kuo, Lyndia C. Wu, Patrick P. Ye, Kaveh Laksari, David B. Camarillo, Ellen Kuhl

Middle Cerebral Artery Stroke as Amusement Park Injury: Case Report and Review of the Literature
Abby Baumgartle, Laura Wolfe, Vinay Puri, Karen Moeller, Salvatore Bertolone, Ashok Raj
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Literature of References - Soccer

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Effects of heading exposure and previous concussions on neuropsychological performance among Norwegian elite footballers.

Prolonged neuropsychological impairments following a first concussion in female university soccer athletes.
Chronic traumatic encephalopathy in contact sports: a systematic review of all reported pathological cases.

Effects of Soccer Heading on Brain Structure and Function.

Soccer (Football Association) and chronic traumatic encephalopathy: A short review and recommendation.