Mandatory Helmet Laws

Unsafe At Any Speed

Acknowledgments

- This paper is a community effort with contributions from people throughout the world.
- The creation of this paper was made exclusively with free software.

Physical Law

- Gravity, inertia, acceleration, deceleration and reaction are immutable(1 & 2):
- Yet:
  - All pro-helmet studies willfully ignore physical law.
  - All pro-helmet testimony willfully ignore physical law.

Physical Law (II)

- As gravity is unimpeachable:
  - No helmet can prevent(3):
    - Brain injuries.
      - Shaken baby syndrome is a perfect example of inertia.
    - Neck injuries.
  - Helmet weight, placement, fit and chinstrap increase the (3 & 4):
    - Weight the neck must support.
    - Total mass of the head/skull

Physical Law (III)

- Additionally, helmets:
  - Exacerbate injuries(3 ~ 5).
    - Due to weight, placement, fit and chinstrap.
    - Cause brain injuries.
      - Craniofacial among others.
    - Catch or hang up on objects(5).
      - Causing neck injuries including fatal injuries.
    - Separate from the operator/passenger(6 & 7).
      - Chinstrap breakage.

Physical Law (IV)

- Above a mere 13 MPH helmets(3, 4 & 8):
  - Lose effectiveness.
  - Increase the risk of:
    - Brain injury.
    - Neck injury.
- Helmets also:
  - Instill a false sense of security in the operator and passenger(3).

Physical Law (V)

- No human act can overcome(1 ~ 4, 8 ~ 10):
  - Gravity.
  - Its effects.
  - Its products.
  - And most importantly the:
- Consequences of ignoring gravity.

Gravity

- Law of gravity(2, 9 & 10):
  - Every planetary body is:
    - Surrounded by its own gravitational field.
    - Exerts an attractive force on any object.
    - Gravity's effect is unavoidable.

Newton's Laws of Motion

- First law of motion(2, 3, 9 & 10):
  - Objects:
    - At rest tend to stay at rest.
    - In motion tends to stay in motion unless acted upon by an external force.
- Second law of motion(2, 3, 9 & 10):
  - Acceleration:
    - A falling object increases in speed by 32 ft/s (22 mph) for each second of fall.

Newton's Laws of Motion (II)

- Third law of motion(2, 3, 9 & 10):
  - Action/Reaction:
    - For every action there is an equal and opposite reaction.
- The laws of motion(1, 2, 9 & 10):
  - A product of gravity.
  - Completely and utterly unavoidable.

Effect of Newton's Laws

- Helmet effectiveness(3):
  - Impact velocity(mph) Helmet thickness(inches)

4	1
10	1.8
20	6.5
30	15
40	29

    - Brain deceleration is the controlling factor.
    - Operator weight is 170 pounds.

Goldstein Study

- Motorcycle helmets(4):
  - Have no statistically significant effect on the probability of fatality.
  - Above 13 MPH (3 & 4):
    - Helmets increase the severity of neck injuries.

Cooter Study

- Motorcycle full face helmets(8):
  - Kill operators and passengers.
  - Impact to head and face by chin guard.
    - Result is skull based fracturing.

Stutts Study

- Motorcyclists (11):
  - As likely as any other road trauma case to be medically insured.
  - Highest insurance payment rate of all groups.
  - Higher rate of self pay than any other group.
  - Average medical cost was less than other road trauma cases.
  - Relied on Medicare and Medicaid less than any other group.

Brain and Skull

- Brain versus skull (12):
  - Brain:
    - Soft with the consistency of gelatin.
    - Floats within the skull (cerebro-spinal fluid).
  - Skull:
    - Hard and inflexible.
      - Inner skull is jagged.
- Brain and skull contact:
  - Result is a brain injury.

Brain Deceleration

- Motion(2, 3, 9 & 10):
  - Skull and brain through space (acceleration).
- Rapid deceleration(12):
  - Skull meeting a stationary object causes brain to move inside the skull.
    - Brain contacts jagged inner skull.
    - Brain injury or death is the result.

Brain shearing

- Brain is slammed against inner skull(12):
  - Strong impact:
    - Tears brain cells.
    - Swelling.
    - Brain injury.
  - Severe impact causes massive:
    - Brain shearing.
    - Bleeding, swelling.
    - Severe brain injury or death.

Cause of Brain Injury

- Motion is required(2, 3. 9 & 10) and:
  - Opposing force:
    - Another vehicle, tree, ground, etc.
  - Examples:
    - Vehicular accidents.
    - Contact sports.
    - Falls from a horse.
    - Falls down stairs.
- Root cause is the law(s) of motion.

Neck Injuries

- The neck bones (cervical vertebrae)(12):
  - Most important bone structure in the body.
  - All nerves pass through the neck.
  - Weakest part of the body.
  - Neck injury affects other parts of the body.

Cause of Neck Injuries

- Motion is required(2, 3. 9 & 10) and:
  - Opposing force:
    - Another vehicle, tree, ground, etc.
  - Examples:
    - Vehicular accidents.
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    - Falls from a horse.
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- Root cause is the law(s) of motion.

Are Helmets Safe?

- A small sampling of deaths and injuries(13):
  - Dale Earnhardt, nascar driver, deceased.
    - Neck injury. Helmet worn.
  - Christopher Reeves, actor, deceased.
    - Neck injury. Helmet worn.
  - Curtis Williams, football player, deceased.
    - Neck injury. Helmet worn.
  - Shannon Dougherty, motorcyclist, paraplegic.
    - Neck injury. Helmet worn.

Are Helmets Safe? (II)

- Ayrton S. da Silva, formula 1 driver, deceased.
  - Traumatic brain injury. Helmet worn.
- Mr. Carlson, motorcyclist, deceased.
  - Traumatic brain injury. Helmet worn.
- Ms. Cornier, motorcyclist, vegetable.
  - Traumatic brain injury. Helmet worn.
- Mr. Green, motorcyclist, vegetable.
  - Traumatic brain injury. Helmet worn.

Sport Brain and Neck Injuries

- Football(14):
  - 497 players have died since 1945.
    - 69% from brain injuries.
    - 16% from neck injuries.
    - 15% from other causes.

State liability

- Liability extends to state:
  - Held to same legal standard as citizens.
    - Liability/negligence claims.
  - Helmet use laws constitute a duty to warn:
    - Danger(s) of inherent use.
    - Risk of injury from mandated use.
  - Mandatory use of a device causing or exacerbating an injury:
    - Grounds for a tort claim against state.

Legislation

- Simply cannot overcome:
  - Gravity.
    - Its effects.
    - Its products.
  - Its consequences.
    - Including increasing state liability.

Notes

- Footnotes:
  - (1) McGraw/Hill Professional Dictionary
  - (2) Gravity
    - G. Gamow, Professor of physics
  - (3) Ineffectiveness of Helmets and Detrimental Effects of Helmet Use
    - Michael E. Holt, P.E., President, American Eagle Engineering, Ltd., Registered engineer in California, Colorado, Nebraska, New Mexico and Wyoming

Notes (II)

- (4) The Effect of Motorcycle Helmet use on the Probability of Fatality and the Severity of Head and Neck Injuries
  - Jonathon P. Goldstein, Ph.D., Department of Economics, Bowdoin College, Brunswick, Maine
- (5) Testimony Before the California Senate Transportation Committee on Assembly Bill AB-244 of 7 May, 1996
  - Shannon Dougherty, former motorcyclist, now paraplegic

Notes (III)

- (6) Self et al. v. Fruhling Products, Inc.,
  - No. 141-20651-73 (141st Judicial Dist., Ct., Texas)
- (7) Carlson v. American Safety Equipment Co.
  - 28 F. 2d 384 (1st Cir.)
- (8) Motorcyclist Craniofacial Injury Pattern
  - Rodney D. Cooter, MB, BS, (Adel) Registrar, The Australian Craniofacial Unit, Adelaide Children's Hospital and Royal Adelaide Hospital, Australia

Notes (IV)

- (Cooter Contd) David J. David, JC, MBBS (Adel), FRCS, FRCSE, FRACS, Head of Unit, The Australian Craniofacial Unit, Adelaide Children's Hospital and Royal Adelaide Hospital, Australia

- (9) Essential Physics
  - Frank W. K. Kirk, Professor Emeritus of Physics, Yale University
- (10) The Age of Einstein
  - Frank W. K. Kirk, Professor Emeritus of Physics, Yale University

Notes (V)

- (11) An Examination of Motorcyclists Injuries and Costs Using North Carolina Motor Vehicle Crash and Trauma Registry Data
  - Jane C. Stutts Ph.D., and Carol Martell, University of North Carolina (System), Highway Safety Research Center
- (12) The Human Brain and Spinal Cord
  - L. Heimer, M.D.
- (13) Public Records Search

Notes (VI)

- (14) Catastrophic Head Injuries in High School and Collegiate Sports
  - Fredrick O. Mueller, University of North Carolina
- (15) Individual State Boards of Claim and Administrative/Government Codes