

Boxer's knockdown: the labyrinth plays a role

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Opinion

In boxing, a knockdown is defined by a situation in which the fighter touches the floor of the ring with any part of the body other than the feet following a hit. The term is also used if the fighter lies against the ropes, is caught between the ropes or hanging over them, unable to protect himself. In contrast to a full knockout, which incapacitates the fighter to pursue the combat and is often associated with a sudden traumatic loss of consciousness, a knockdown is generally not related to a loss of consciousness and is followed by a relatively short recovery phase.¹ The exact mechanism of the dizziness following a blow on the jaw or on the temporal region is unclear. Cerebral concussion, elongation of cerebellar peduncles or the cranial vessels, sympathetic, and muscular knockouts with a participation of pain and exhaustion have been advocated, but to our knowledge, the possible participation of the inner ear in this situation has been never proposed.² Studies on this phenomenon are rare, hampered by the fact that it is brief, and the recovery is apparently complete. However, the participation of the inner ear is suggested by the observation that dizziness and cochlear symptoms (tinnitus, hearing loss) are frequently reported during the days following a fight.³ The role of the vestibule and especially the vestibulospinal system in postural regulation has been studied for decades.⁴ Certain forms of vestibular disease are associated with a vertical collapse and the loss of muscle tone in the lower limbs. Indeed, a condition known as vestibular drop attack and related to the disturbance of otolithic organs located in the labyrinth was first described by Tumarkin.⁵ This condition is classically related to a labyrinthine hydrops (Ménière's disease) and can be permanently cured by a labyrinthectomy or a vestibular neurectomy on the side of the involved labyrinth. Apart from hydrops, a spontaneous collapse without prodrome or other neurologic or cardiovascular symptoms not rare in patients complaining from vertigo.⁴ On a boxing ring, a blow on the chin leads to a neck rotation with a tremendous angular and/or linear head acceleration. This acceleration, which can reach 50g,^{2,6} is consistent with a vestibular trauma as observed in a whiplash,⁷ and can potentially lead to a drop attack. In this type of trauma, otolithic organs seem to be the most vulnerable in the vestibule.⁷ We aimed at verifying the hypothesis of the labyrinthine participation in boxer's knockdown by visualizing a collection of 100 historic boxing combats from 1927 to 1990 on you tube (www.youtube.com, last access December 23, 2014), by selecting knockdowns without loss of consciousness and by systematically investigating the direction of the fall, the fighter's postural attitude during the recovery. Fifteen knockdowns (15%) could be clearly be identified with these criteria: 1- Max Baer against Max Schemling (New York, NY, June 6th 1933 New-York, Figure 1), 2- Max Baer against Primo Carnera (New York, NY, June 13th 1934), 3- Joe Louis against Max Schemling (New York, June 19th 1936), 4- Joe Louis against Max Schemling (New York, June 22th 1938), 5- Jersey Jo Walcott against Joe Louis (New York NY, June 25th 1948), 6- Rocky Marciano against Joe Louis (26 10 1951 à New-York), 7- Jersey Jo Walcott against Rocky Marciano (Philadelphia, PA, 22th September 1955), 8- Floyd Patterson against Sonny Liston (Chicago IL, September 22th 1962), 9- Muhammad Ali against Sonny Liston (Lewiston, MN, May 25th 1965), 10- Muhammad Ali against

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Joe Frazier (New York NY, le March 8th 1971), 11- Muhammed Ali against George Foreman (Kinshasa, Zaire, October 30th 1974), 12- Mike Tyson against Trevor Berbick (Las Vegas, NV, November 22th 1986), 13- Mike Tyson against Larry Holmes (Atlantic City, NJ, January 21th 1988), 14- Mike Tyson against Michael Spinks (Atlantic City, NJ, June 27th 1988), 15- Mike Tyson against James Buster Douglas (Tokyo, Japan, February 11th 1990). In all these cases, the attitude of knocked down boxer was similar to a patient with an acute otolithic dysfunction: A vertical collapse (Figure 1) or a paradoxical fall towards the opponent in spite of a lateral impact, a preserved consciousness (protection reflex during the fall, open eyes, adapted upper limb movements, attempts to stand up), unsteadiness in crawling or standing position during the recovery phase, and finally, an abnormal axial muscle tone (oscillation of the head and torso, paroxysmal and rapid knee flexion).

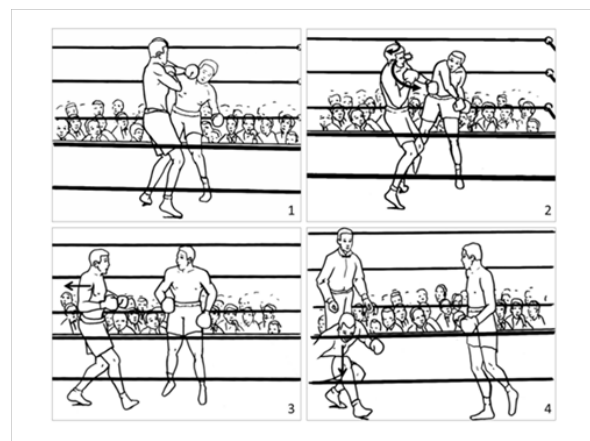


Figure 1 Baer versus Schemling (1933): Schemling steps back and collapses into a sitting position.

The participation of the labyrinth in a knockdown is indeed difficult to investigate. However, measurements of head acceleration,

boxers' behavior during the knockdown and the recovery, and finally, the reported vestibular abnormalities in boxers after a match support the idea that the labyrinthine insult significantly participates in the knockdown phenomenon.

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Conflicts of interest

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