

## JULY 26-28 | INDIANAPOLIS, IN 2019 SPORTS CONCUSSION CONFERENCE

**Title:** Nonverbal hand movement durations indicate post-concussion symptoms of athletes

**Authors:**

Ingo Helmich, *Department of Neurology, Psychosomatic Medicine and Psychiatry, Institute of Health Promotion and Clinical Movement Science, German Sport University (GSU) Cologne, Germany*

Hedda Lausberg, *Department of Neurology, Psychosomatic Medicine and Psychiatry, Institute of Health Promotion and Clinical Movement Science, German Sport University (GSU) Cologne, Germany*

**Funding:**

The study was funded by the University research funding of the German Sports University, Cologne (L-11-10011-175-122000).

**Abstract:**

*Introduction:* Concussions are common in sports<sup>1</sup> and appear to be a risk factor for cognitive impairment and mental health problems<sup>2</sup>. Methods of post-concussion diagnosis are still of debate, regarding sensitivity, objectivity, reliability, and costs<sup>1</sup>. Spontaneous displays of nonverbal hand movement behavior during interaction are indicative of psychopathology<sup>3</sup> and relatively simple to record and analyze. Increased durations of continuous (/irregular) body-focused hand movement activity in particular indicates psychopathology<sup>3</sup> that overlaps in symptomatology with that of sport related concussions (SRC). We therefore hypothesized that the duration of irregular, on body, and act on each other hand movements is increased in athletes with SRC who suffer from post-concussion symptoms. *Methods:* Three matched groups were investigated: 14 symptomatic athletes with a concussion, 14 asymptomatic athletes with a concussion, and 12 non-concussed athletes. Four certified raters analyzed with the NEUROGES analysis system<sup>3,4</sup> all nonverbal hand movements that were displayed during a videotaped standardized anamnesis about concussion history, incidence, course of action, and post-concussion symptoms. *Results:* Irregular Structure units of symptomatic athletes are significantly longer when compared to asymptomatic athletes. Hand movement durations of irregular, on body, and act on each other correlate positively with post-concussion symptoms. The duration of irregular units significantly predicts the PCS score. *Discussion:* Increased durations of irregular hand movement units indicate post-concussion symptoms in athletes with sport-related concussions. Because the recording of spontaneous displays of nonverbal hand movement behavior is relatively simple and cost-efficient, we suggest using the neuropsychological analysis of hand movement behavior as a future diagnostic parameter of concussion management protocols.

**References:**

- (1) McCrory Pet al. (2017), What is the definition of sports-related concussion: a systematic review. *Br J Sports Med.* 2017 Jun;51(11):877-887.
- (2) Manley G et al. (2017) A systematic review of potential long-term effects of sport-related concussion. *Br J Sports Med.* 2017 Jun;51(12):969-977.

- (3) Lausberg H. (Ed.) (2013). *Understanding Body Movement. A Guide to Empirical Research on Nonverbal Behaviour. With an Introduction to the NEUROGES Coding System.* Frankfurt/Main: Peter Lang, Berlin.
- (4) Lausberg H., & Sloetjes H. (2016). The revised NEUROGES-ELAN system. An objective and reliable interdisciplinary analysis tool for nonverbal behavior and gesture. *Behavior Research Methods.* 2016 Sep;48(3):973-93.