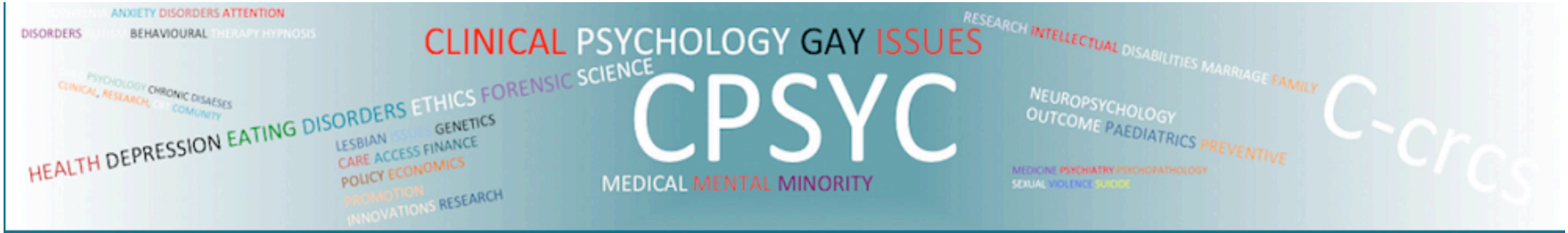

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Unexplained anticipatory activity in patients with traumatic brain injury

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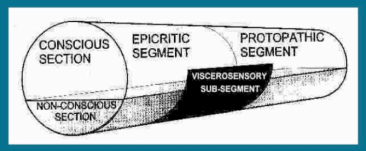
INTRODUCTION

- Traumatic brain injuries /*TBIs*/ usually lead to considerable damage in cognitive, as well as in other brain functions
  - depending on the etiology, location and extent of the lesion(s)
- Visceral cognition: * somatic markers (with a "hunch") [Damasio et al., 1991; Bechara et al., 2005]
  * presentiment [Ádám, 1998]
  * embodiment [Wilson, 2002 and others]



- Visceral cognition, being a part of human ontogeny, "subconsciously" influenced people's actions and has later been transformed into the ability to speak; but it has not perished [Ádám, 1998]
- Visceral messages are processed in interconnected cognitive and emotional brain structures; as shown in the model of visceral cognition [ibid.]
- The so-called core SELF is localized in primordial medial areas of the brain, which include somato- & viscero-motor coordinates forming the primary basis for emotional behaviour and feelings (and thus for all mental life) [Panksepp, 1998]
- As already suggested by MacLean (1970) in his theory of the "triune brain", visceral cognition is controlled mainly by subcortical structures of the forebrain, lead by amygdala, which modulates sensory processing [Pessoa, 2013] - in accordance with the idea of somatic markers [Damasio et al., 1991]
- Metanalyses:
  - ambiguity in showing existence, and possibly intensity of the relation between conceptualizing neuropsychological functions and performance in an "intuitive" decision-making task [Toplak et al., 2010]
  - physiological measures (e.g., electrodermal activity) anticipate seemingly unpredictable future events by deviating from a baseline [Mossbridge et al., 2012]
- Question of the relation between rationality vs. intuitiveness as personality characteristics and somatic markers [Kulišťák, 2009]
- **Aim:** examination of the state of visceral cognition in people after TBI
  - comparison of performance in a conceptualizing ("rational") and a visceral ("intuitive") task

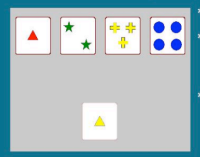
METHODS

- Participants:
  * Patients after TBI, hospitalized in the Military Rehabilitation Facility Slapy: N = 45 / 34 M & 11 F / average age 36.8 yrs (SD=13.9)
  * Healthy controls - neurologically and psychiatrically intact: N = 22 / 8 M & 14 F / average age 25.4 yrs (SD=5.8)

  → the higher number of males is due to general prevalence of TBI in the male population

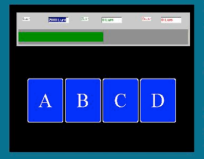
- Materials & procedure:

* Wisconsin Card Sorting Test (WCST) [Heaton et al., 1993]:



* within the NEUROP-2 PC program [Gaál, 2002]
* measures conceptualizing abilities, rational decision-making, deduction, and strategy forming
* participants are supposed to match cards from a pack to one of four stimulus cards, based on an unknown rule, which changes from time to time

* Iowa Gambling Task (IGT) [Bechara et al., 1996]:

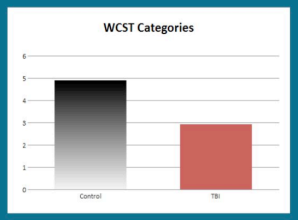


* within the NEUROP-2 PC program [Gaál, 2002]
* test of tendency to risky decision-making and of sensitivity to reward & punishment
* participants choose from 4 packs of cards with various possibility of winning or losing money
* goal: win as much money as possible
* individual exploration of the participants' steps, i.e., their "tactics" or "strategy", was performed

RESULTS

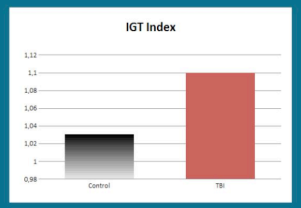
Independent Samples Median Test used:

- Wisconsin Card Sorting Test - controls vs TBI:
  * the *Categories* index:



z = 3,166; p < 0.001**

- Iowa Gambling Task - controls vs TBI:
  * the *Index* index:



z = -2.083; p = 0.389[n.s.]

CONCLUSIONS

- In the conceptualizing /"rational"/ task (WCST), the performance of persons after TBI as statistically significantly different from that of healthy control subjects: patients after TBI showed significant decrease in the main task parameters
- Results of the "intuitive" task (IGT), testing visceral cognition and presentiment, were not statistically different in the two groups: persons after TBI performed even extremelly well in several tasks parameters
- **Limitations:** unavailability of precise descriptions of imaging results (mostly CT and MRI) - lesions are sometimes relatively vaguely localized (mainly F, FT or even FTPO)

FUTURE DIRECTIONS

In case our results are confirmed on a larger group of people after TBI (and especially when having more precise descriptions of imaging results), it would be benificial to implement the findings into neuropsychological rehabilitation procedures based on the visceral cognition and embodiment

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