



<http://www.diva-portal.org>

This is the published version of a paper presented at *Brain Disorders Conference*.

Citation for the original published paper:

Alfvén, G., Andersson, E. (2020)

Increased muscle activity response during startle in children and adolescents with pain in the head, neck and abdomen due to stress

In:

N.B. When citing this work, cite the original published paper.

Permanent link to this version:

<http://urn.kb.se/resolve?urn=urn:nbn:se:gih:diva-6493>

Increased muscle activity response during startle in children and adolescents with pain in the head, neck and abdomen due to stress

G. Alfvén¹, E. Andersson^{2, 3}

1. Clintec, Karolinska Institute, Stockholm, Sweden. 2. The Department of Neuroscience, Karolinska institute, Stockholm, Sweden. 3. The Swedish School of Sport and Health Sciences, Stockholm, Sweden.

Corresponding author: G Alfvén (gosta.alfven@slmk.org) Karolinska Institute, Sweden

Background: Headache of stress etiology is a common, worldwide medical problem with high sick leave and large economic consequences. There is a need to improve the understanding of underlying neurobiological processes. Research show that headache of stress etiology often is one symptom in a complex of multiple pains and augmented widespread muscular tension with a specific pattern of tender points (1).

Objective and Method: We will present in children with recurrent stress related pain, some hormonal changes and electromyography (EMG) data, showing a novel and a missing link, regarding central and peripheral neurophysiological changes of significant importance for better understanding recurrent multiple pain including headache.

Results: During high acoustic signals, the startle reaction was shown, via EMG, to be potentiated, more easily and more often elicited in several muscles related to the pain, in 19 children with recurrent stress related pain in the head, neck and abdomen, diagnosed according to strict defined criteria (2), and compared to 21 matched controls. Also, higher resting muscle activity was found in these children as well as increased cortisol and decreased oxytocin.

Conclusion. Stressors evoke stress response for example in the amygdala, which can trigger and potentiate the startle reaction with amplified muscle excitability and tonus. These reactions and the increased cortisol and decreased oxytocin in those children are in accordance with findings of the right dominance of stress in the bi-cameral brain (3). These neurophysiological facts can be of importance for the understanding of clinical manifestation of headache and other pain and must be heeded in the treatment of patients with pain related to stress.

1. Alfvén G, Grillner S, Andersson E. Review of childhood pain highlights the role of negative stress. *Acta Paediatr.* 2019;Jun4.doi:10.1111/apa.14884.
2. Alfvén G, Grillner S, Andersson E. Children with chronic stress-induced recurrent muscle pain have enhanced startle reaction. *Eur J Pain.* 2017;21:1561-1570.
3. Strigo IA, Craig AD. Interoception, homeostatic emotions and sympathovagal balance. *Philos Trans R Soc Lond B Biol Sci.* 2016;Nov19;371(1708).