The TBSS hypothesis

Introduction

Anticipation of a potential danger e.g. pain, a potentially aversive event or perceived threat activates central autonomic networks where left amygdala and medial wall M1 Cingulate Cor ticels (MCC) are core areas. The amygdala acts as our threat radar and sounds the alarm for flight or fight. Cingulate pre-Motor Areas (CMA) in the MCC project mainly to the left and right pre-Motor Areas (SMA) where plans for appropriate motor actions are set up. A left lateralized pre-movement EEG-pattern has been shown earlier. Clinically, a generalized non-conscious increase in pre-movement muscle tone on the right side of the body can be seen. If sustained, fascia and connective tissue changes will form, mainly on the right side of the body.

1. The amygdala act on our threat “radar”. Left amygdala is part of an autonomous core area, and is a hub in the fear network. The amygdala sound the alarm for appropriate motor response.

2. Preparation for action! The pre-motor EEG-pattern has been shown to be left lateralized. Katherine S. Baker et al 2011! (adapted picture, from above).

3. Blue arrows: Right hand is promoted.

4. Orange arrows: Right shoulder is lowered and protracted. Right arm is internally rotated.

5. Green arrows: Right hip is internally rotated and adducted.

6. Black arrows: The generalized increase in pre-movement (body motor preparation) tone on the right side of the body pulls the right innominate bone forward. The result is an anterior tilt of the right ilio-pectineal bone with right-side sacral counternutation.

7. The right Saccroiliac Long Dorsal Ligament (LDL), a ligament restricting counternutation, is stretched and becomes painful. Sacroiliac Joint Dysfunction and Low Back Pain may result.

8. Yellow arrows: A left axial trunk and spine rotation. The body twists, Intervertebral discs, facet joints and foraminal spaces are affected.

9. Red arrows: Clinical “tailgate signs” of the TBSS syndrome. Right-sided foot inversion and/or right foot drop. It is proposed that these patterns are the signs of increased excitability of left pre-motor areas.

10. Another tailgate sign is impaired strength of the left ext. Hallucis longus muscle. It proposes that this sign, except when indicating a distal LS lesion also could and often is, at least in part, be caused by Inter-Hemispheric inhibition (IHI) from facilitated left pre-motor areas to the right motor cortex M1.

11. Left amygdala projects to left CMA, and on to the left SMA. These are pre-motor areas on the medial wall that prepares the body for appropriate flight or fight motor responses. When left SMA is activated, left motor cortex (M1) excitability increases. Left SMA + left M1 activity in turn results in interhemispheric-inhibition (IHI) of right M1, (Sarfeli et al 2012 below).

12. It has been shown, that when the left SMA, a key motor sequence and coordination planning area on the medial aspect of the left hemisphere, was electrically stimulated, signs of body motor preparation were seen. The right-side muscle tone and a feeling of intention to move. The affected muscles exactly correspond to the muscle imbalances we identify in the TBSS syndrome.

13. Complex pre-motor and motor, intra/inter-hemispheric reciprocal networks, and Inter-Hemispheric Inhibition (IHI) between left and right hemispheres Motor and pre-motor areas

14. Pre-motor and motor areas and their functional cortico-spinal connectivity: Amygdala fear detection is non-conscious and controls our responses to a threat e.g. the pre-movement motor sequence/coordination preparation. Activated pre-motor areas are lateralized mainly to the left hemisphere.

15. Aim of treatment

The aim of the cognitive three-step treatment procedure described below, is to reduce left-lateralized SMA/M1 pre-motor activity in order to release the inter-hemispheric inhibitions of the right motor cortex M1. As cortico-spinal excitability balance improves the pre-movement right-lateralized “muscle preparation” tone is reduced. Simultaneously left-side muscle strength instantly improves. The resulting improved muscle strength balance gives us better conditions for all other subsequent treatments. The treatment phases are as follows:

Step 1: reduce CMA/SMA activity by instead activating the pre-SMA, our centre for inhibitory control and visuospatial processing. Steps 1.2 also reduce amygdala activity by activating the Anterior Cingulate Cortex (ACC) an emotion regulating and autonomic control area.

Step 2: reduce IHI activity as visuospatial working memory tasks activate SMA pre-DMN area while SMA and CMA activity is reduced. Left M1 excitability decreases and the interhemispheric inhibition from left SMA and left M1 of the right M1 is reduced.

Visuospatial working memory tasks also actives the Anterior Cingulate Cortex (ACC) (1). The ACC has dense connections with amygdala. Thus activating the ACC is important for emotion regulation and autonomic control. The fear response, the startle reflex and the sympathetic arousal all decrease.

Step 3: Cognitive reappraisal: Downregulates amygdala activity. When the therapist presents the opportunity to control the therapies palpation or the fear is reduced or absent.

Step 4: Three-step treatment sequence: The pre-motor area is at the focal point of the treatment. The therapist performs a sequence of three steps that are repeated in alternating order.

Step 1: Recognition inhibition: Frontal executive areas are needed to inhibit automatic responses. Use the reflex test! Generate a muscle contraction when a right hand movement is indicated.

Step 2: Preventing inhibition: Use the 3-dice method! Make a muscle contraction when a left hand movement is indicated.

Step 3: Cognitive reappraisal: Downregulates amygdala activity. When the therapist presents the opportunity to control the therapies palpation or the fear is reduced or absent.

The emotional valence changes as the pro-frontal cortex cognitively re-interprets and re-appraises the action. Self-control improves. Tender/painful points disappear instantly!

Results

Improved left-sided neuremuscular function in seconds! The increased right-sided muscle tone is instantly reduced and instead left side muscle strength increases. Muscular balance is improved.

Scan the QR-code on the dice to read & learn more!

Conclusions:

Starting treatment with a purely cognitive approach, that is without even touching the patient, most often instantly and significantly improves the common clinical finding of impaired left e.g. extensor hallucis longus strength. This indicates that the cause involves, at least in part, central brain pre-motor/motor areas functions. Except from the current cognitive approach, depression, that a weak left extensor hallucis longus muscle correlates a distal LS lesion, I propose that this finding could and instead often is the result of a central stress-induced sympathoadrenotropic (somatomotor and/or motoric preparation) response with lateralized activated pre-motor areas resulting in motor cortex excitability imbalance.

Significance for diagnostics:

I further propose that the impaired left ext. hallucis longus strength should be initially performed on all patients as an indicator for the level of sympathoadrenal arousal, the degree of motor cortex excitability imbalance and the resulting left-right muscle imbalance.

Significance for pain therapies:

The described cognitive three-step treatment procedure reduces the activity in the left SMA and instead activates the pre-SMA and the ACC, that is more profusor, emotion regulating and autonomic controlling areas. Stress-induced muscular imbalance instantly improves. This gives us better conditions for all other subsequent treatments. Diagnoses positively affected are: Low back and pelvic pain caused by disk protrusions, facet joints, fibromyalgia, swollen, fascia, sacroiliac joint dysfunction but also lumbosacral myalgia of the hip and finally neck-shoulder thoracic, Thoracic Outlet Syndromes and Fibromyalgia.

References:


