Revolutionizing Chiropractic Care: Implementing the Contemporary Brain Model in Practice

Heidi Haavik BSc (chiropractic), PhD
VP Research, Dean Research
New Zealand College of Chiropractic

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Thank you!

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Gifts

Gifts

The HANDOUT for today's Class (the slides)

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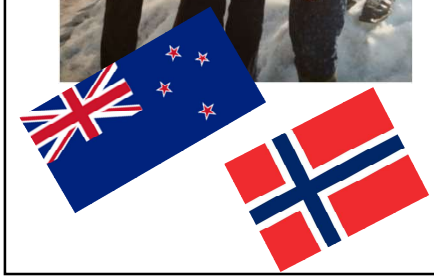

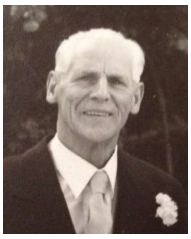

Dr William Charles Lawson - Palmer Graduate 1924

1999 NZCC Graduate

2008 PhD

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CENTRE FOR CHIROPRACTIC RESEARCH

New Zealand College of Chiropractic

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Key References for today's talk

Heidi Haavik, Nitika Kumari, Kelly Holt, Imran Khan Niazi, Imran Amjad, Amit N. Pujari, Kemal Sitki Türker, Bernadette Murphy. (2021a) The contemporary model of vertebral column joint dysfunction and impact of high-velocity, low-amplitude controlled vertebral thrusts on neuromuscular function. Invited Review. European Journal of Applied Physiology. https://doi.org/10.1007/s00421-021-04727-z

Heidi Haavik, Imran Khan Niazi, Nitika Kumari, Imran Amjad, Jenna Duehr, Kelly Holt. (2021b) The potential mechanisms of High-Velocity, Low-Amplitude, Controlled Vertebral Thrusts on Neuroimmune Function: A narrative review. Medicina 2021, 57, 536. https://doi.org10.3390/medicina57060536

Imran Khan Niazi, Muhammad Samran Navid, Christopher Merkle, Imran Amjad, Nitika Kumari, Robert J. Trager, Kelly Holt, Heidi Haavik. 2024 A randomized controlled trial comparing different sites of high-velocity low amplitude thrust on sensorimotor integration parameters. Scientific Report. 14(1), p.1159. https://www.nature.com/articles/s41598-024-51201-9

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Do you have a spine model in your practice?

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Do you have a brain model in your practice?

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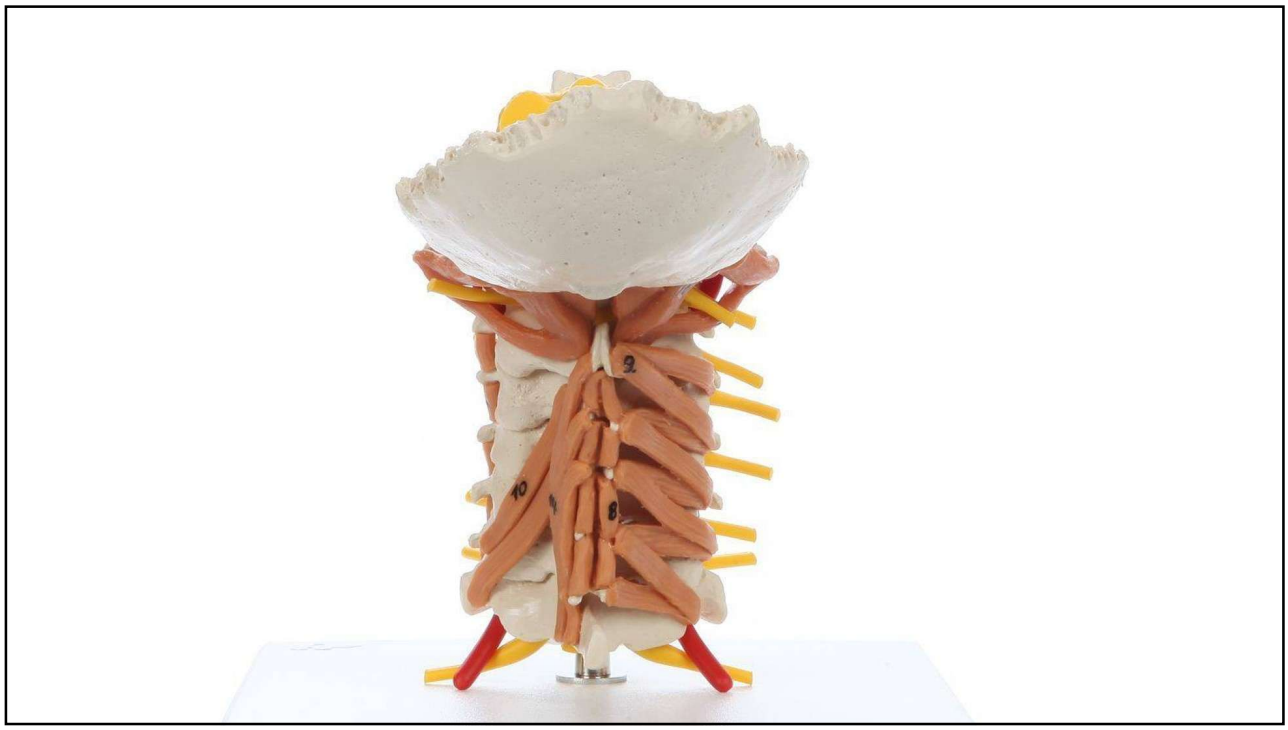

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Outline

- What is the Brain Model of Chiropractic?
- How do you incorporate this new science into practice?
- How often, and for how long should we see our patients – according to the available science?
- The power of a single adjustment session
- Where in the brain do we find changes after chiropractic care?
- The latest brain network research
- Symptoms, and how they become a chronic problem, and how chiropractic care can help
- Future directions

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TODAY'S HANDOUT
& Gifts

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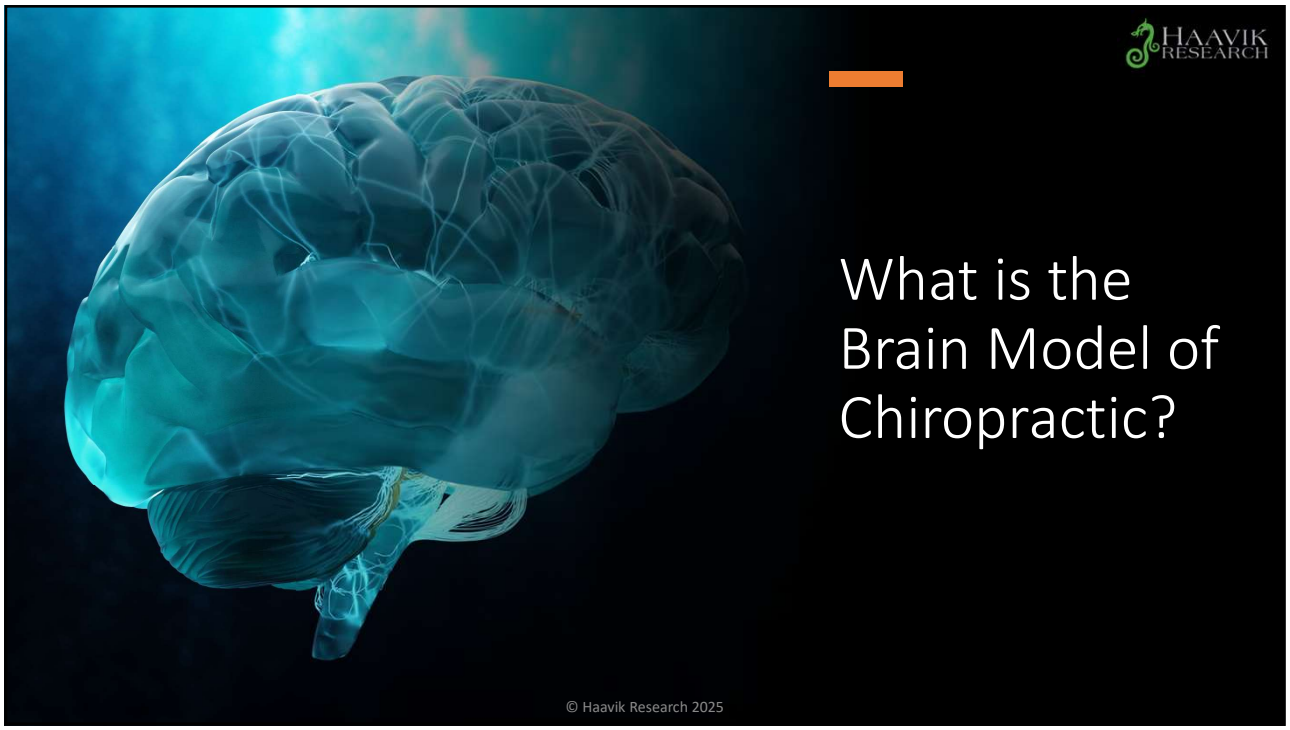

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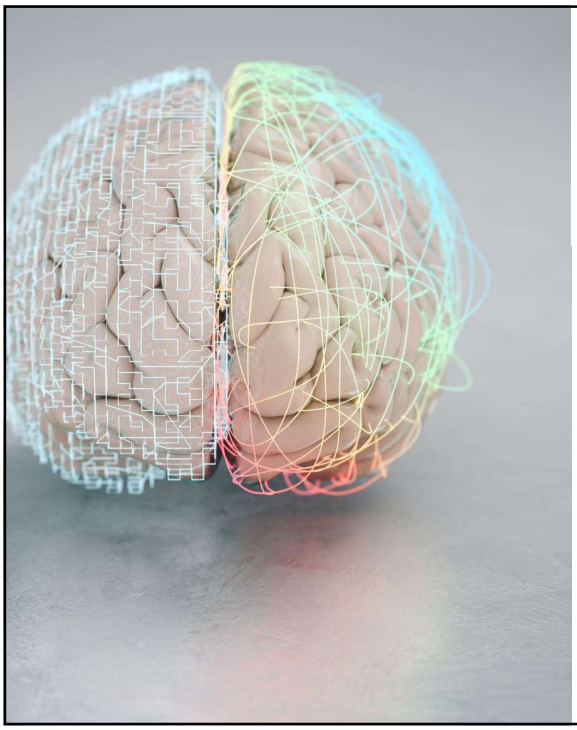

Short Version
What is Chiropractic?

"Research indicates that chiropractic care, that includes the adjustment of vertebral subluxations, enhances brain-body communication, allowing your brain to more accurately interpret internal and external signals. This improved perception of what is happening inside you and around you enables your brain to optimize bodily functions and adapt more effectively to your environment."

Heidi Haavik

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Research indicates:

1. That chiropractic care, that includes the adjustment of vertebral subluxations,
2. Enhances brain-body communication,
3. Allowing your brain to more accurately interpret internal and external signals.
4. This improved perception of what is happening inside you and around you
5. Enables your brain to optimize bodily functions and
6. Adapt more effectively to your environment.

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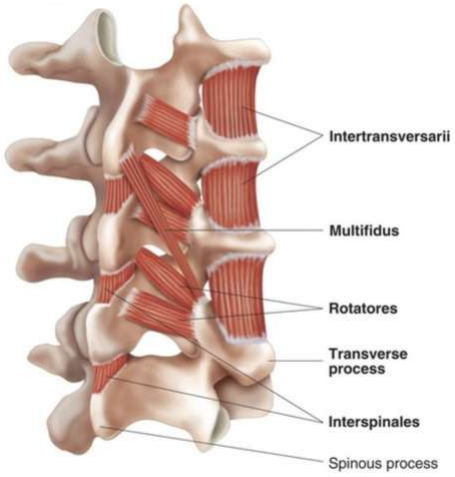

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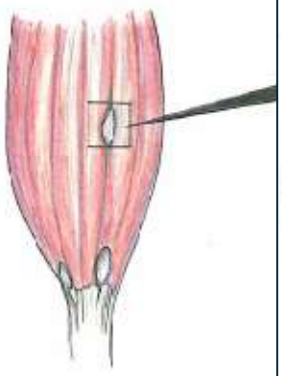

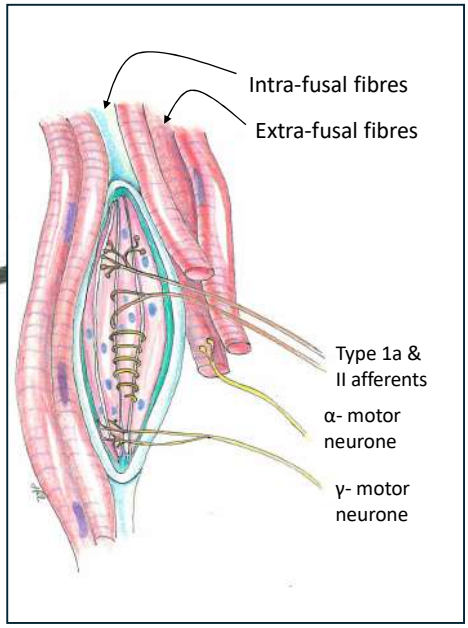

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The Contemporary Brain Model of the Subluxation & Effects of the Adjustment

Interoceptive input:
- Pain
- Temperature
- Chemoreception
- Emotions
- Proprioception

Exteroceptive input:
- Vision
- Olfaction
- Audition
- Gustation

Past experiences and expectations about the future

Spinal adjustment

Altered vertebral column afferent input

Abnormal multisensory processing and filtering of exteroceptive and interoceptive stimuli and abnormal sensorimotor integration

Impacting:
- Whole body proprioception
- Whole body motor control
- Whole body control, homeostasis, neuro- and bio-plasticity
- Resilience, adaptability, function, wellbeing

Vertebral subluxation

Altered vertebral column function

Altered vertebral column motor control

Haavik et al 2021 EJAP

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What is a Subluxation according to the science?

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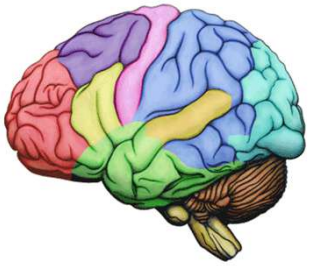

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Vertebral Subluxation

What is spinal dysfunction?
What is normal spinal function?

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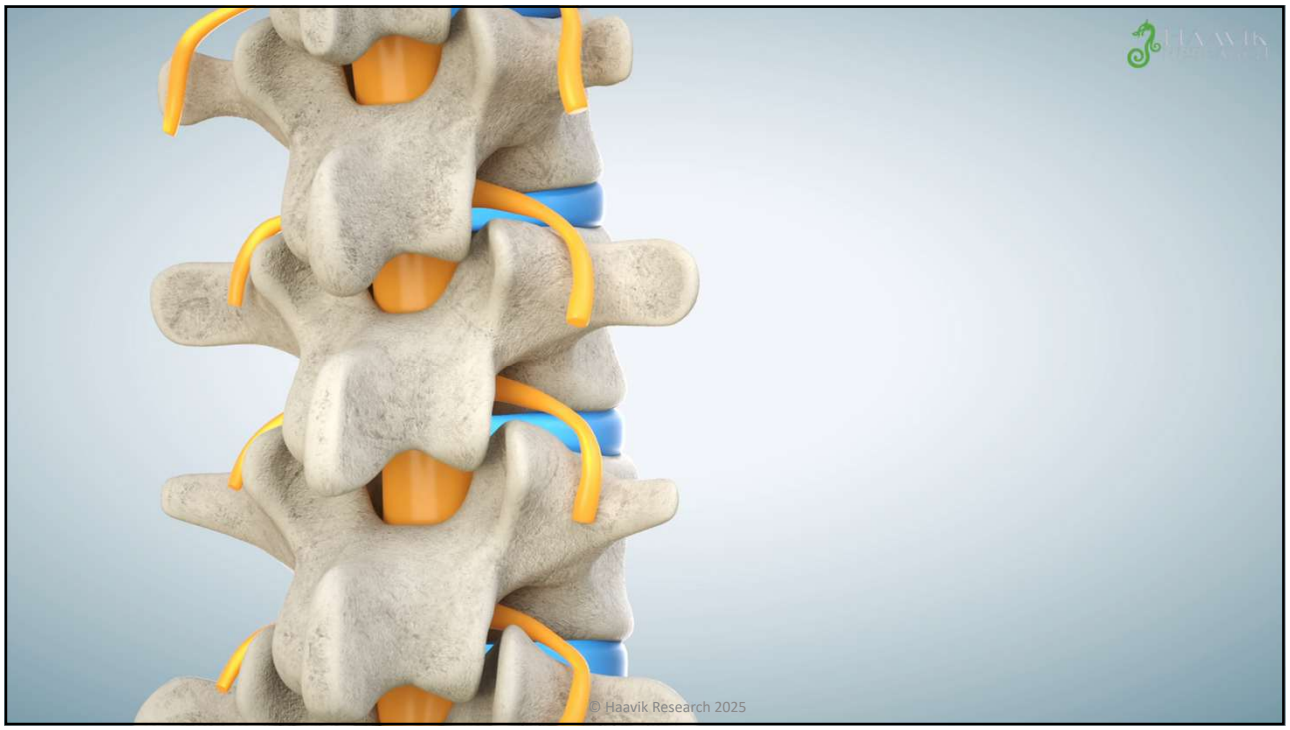
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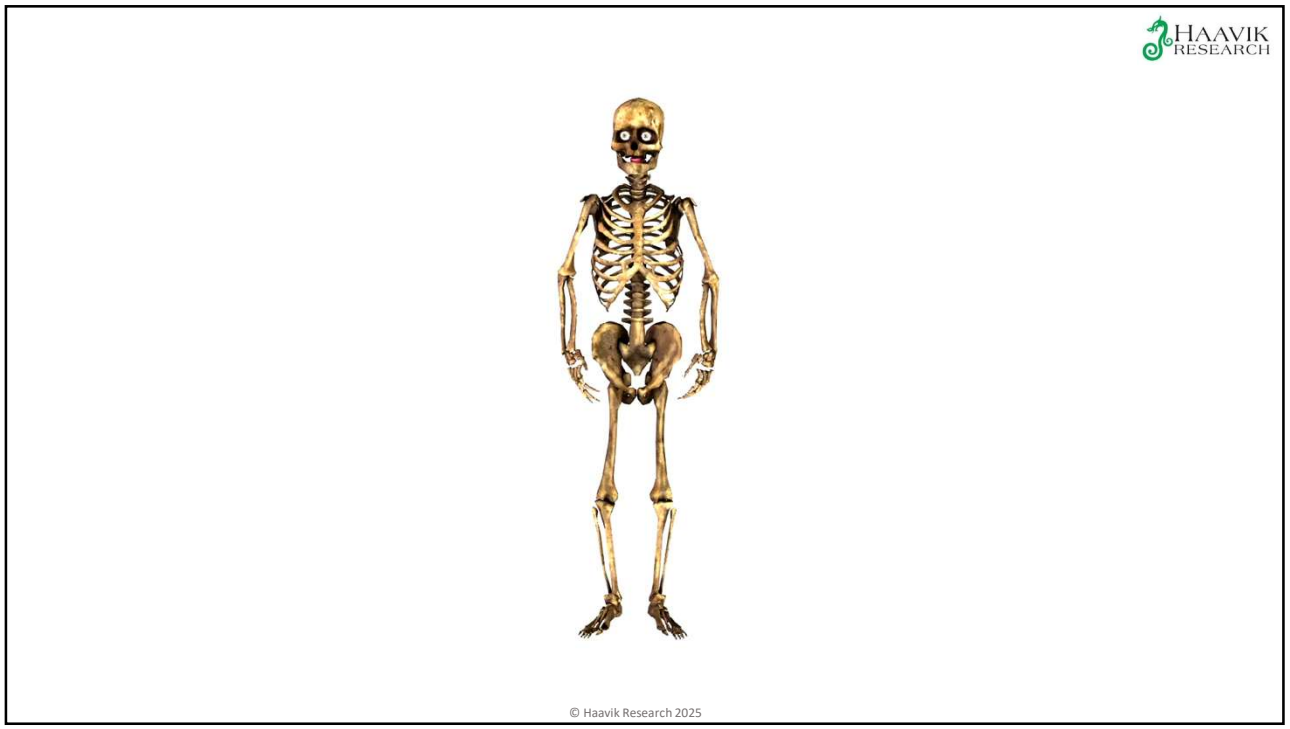
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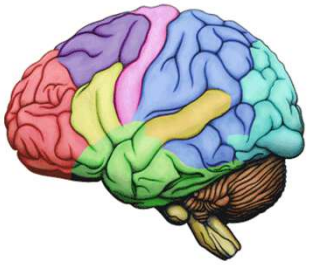
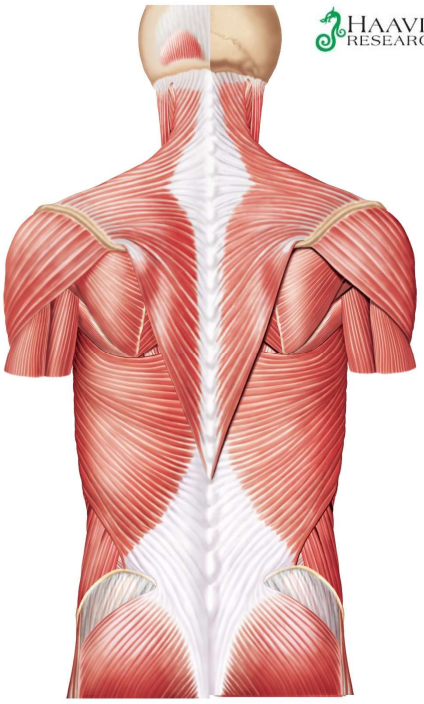
Bones do not move themselves





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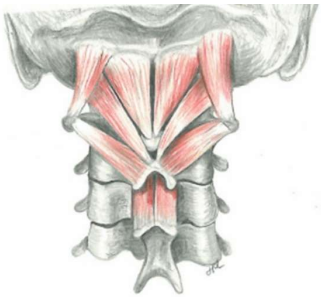
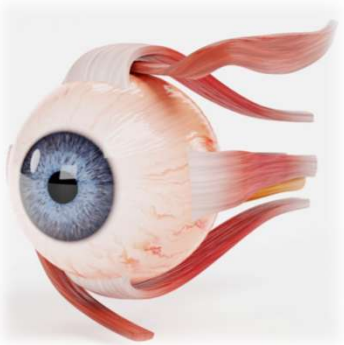
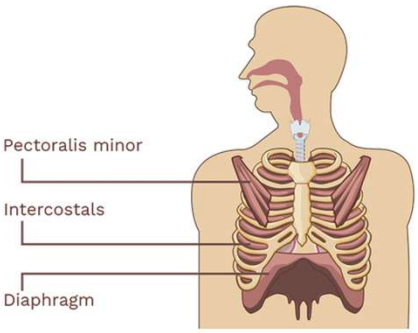
It is a complex system

- Reactive
- Feed-forward (predictive)
- Tonic







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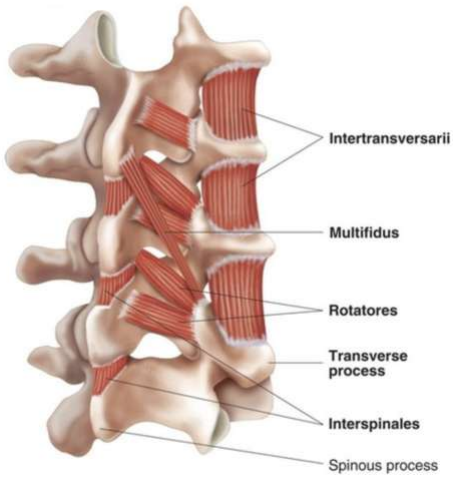

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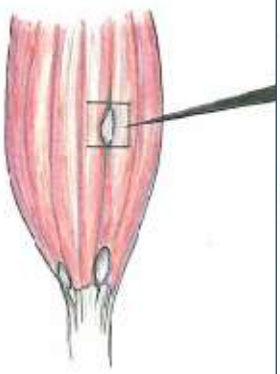

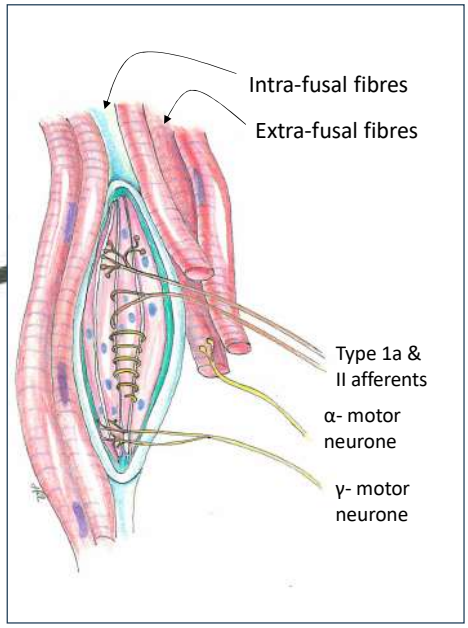

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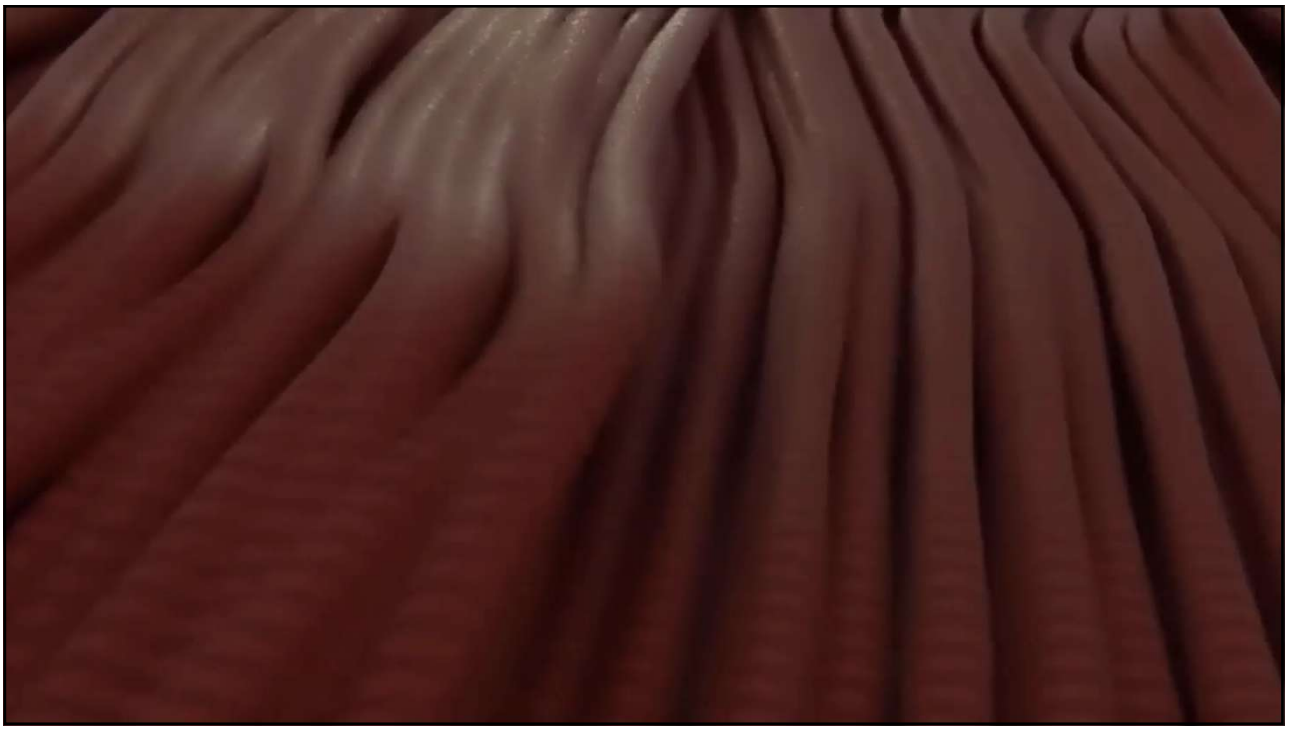

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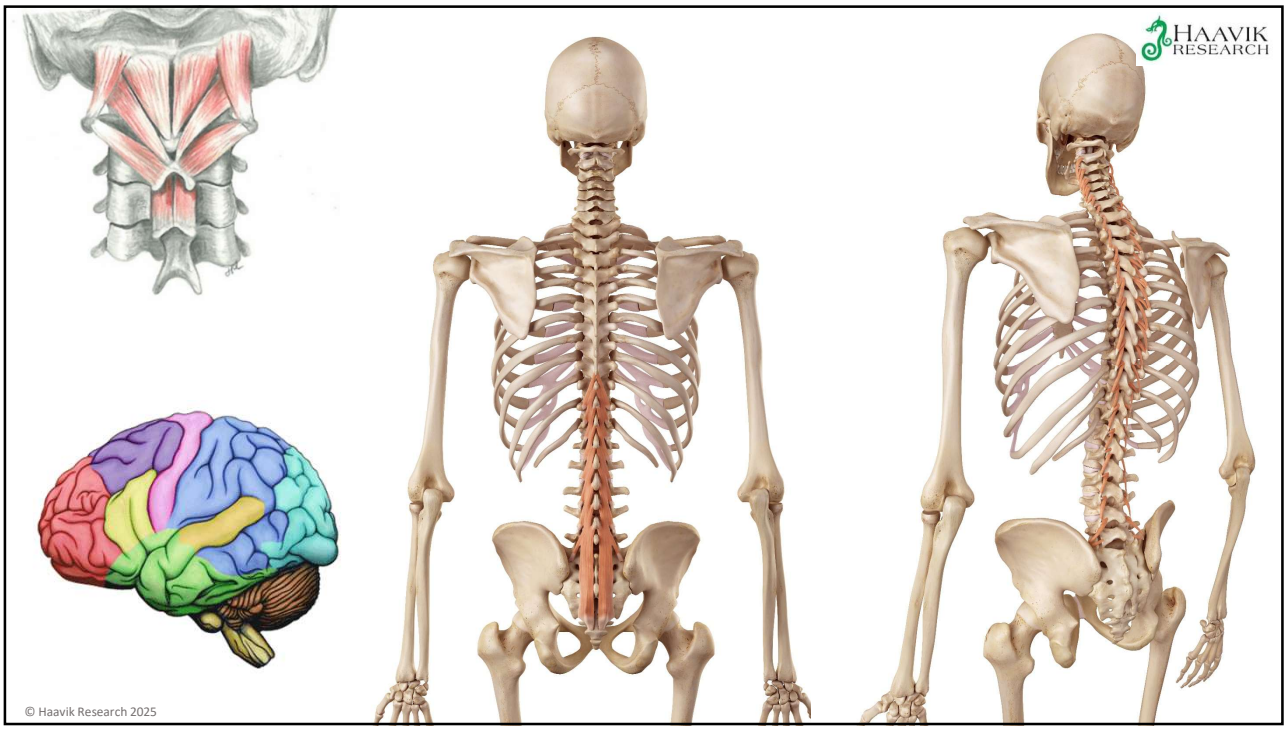

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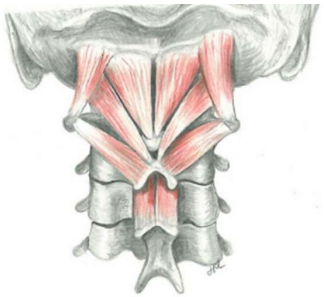
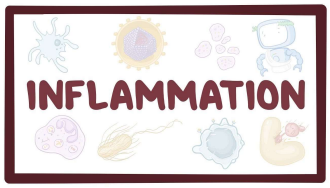
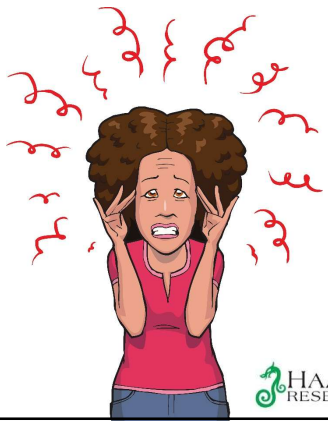
What can causes vertebral subluxations?







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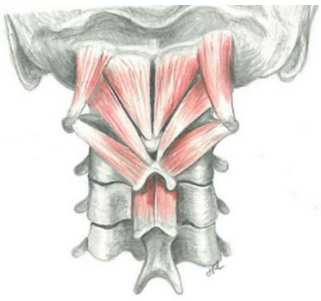
What happens when the spine dysfunctions?

Subluxated segment deep paraspinal muscles over time become:

- Stiff and Fibrotic
- Atrophied (shrunk)
- Fatty infiltration
- Change fibre type
- Degeneration around joint
- Stretch receptors dysfunction

NOT Good



Deep paraspinal muscles around a 'healthy' segment are:

- Plump
- Larger in size
- Slow-twitch fibre type
- No fatty infiltration
- Move freely
- Healthy stretch receptors

Good

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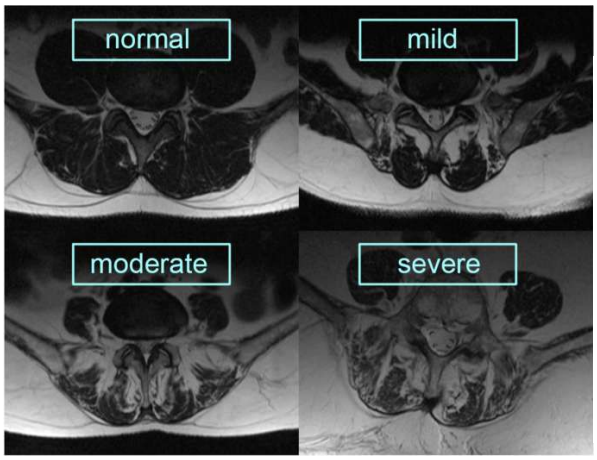

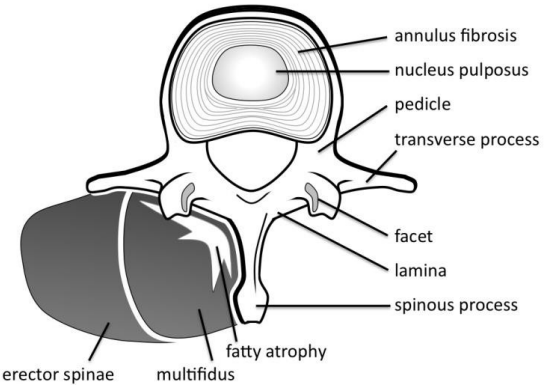

Faur, C., Patrascu, J.M., Haragus, H. and Anglitoiu, B., 2019. Correlation between multifidus fatty atrophy and lumbar disc degeneration in low back pain. BMC musculoskeletal disorders, 20(1), pp.1-6.

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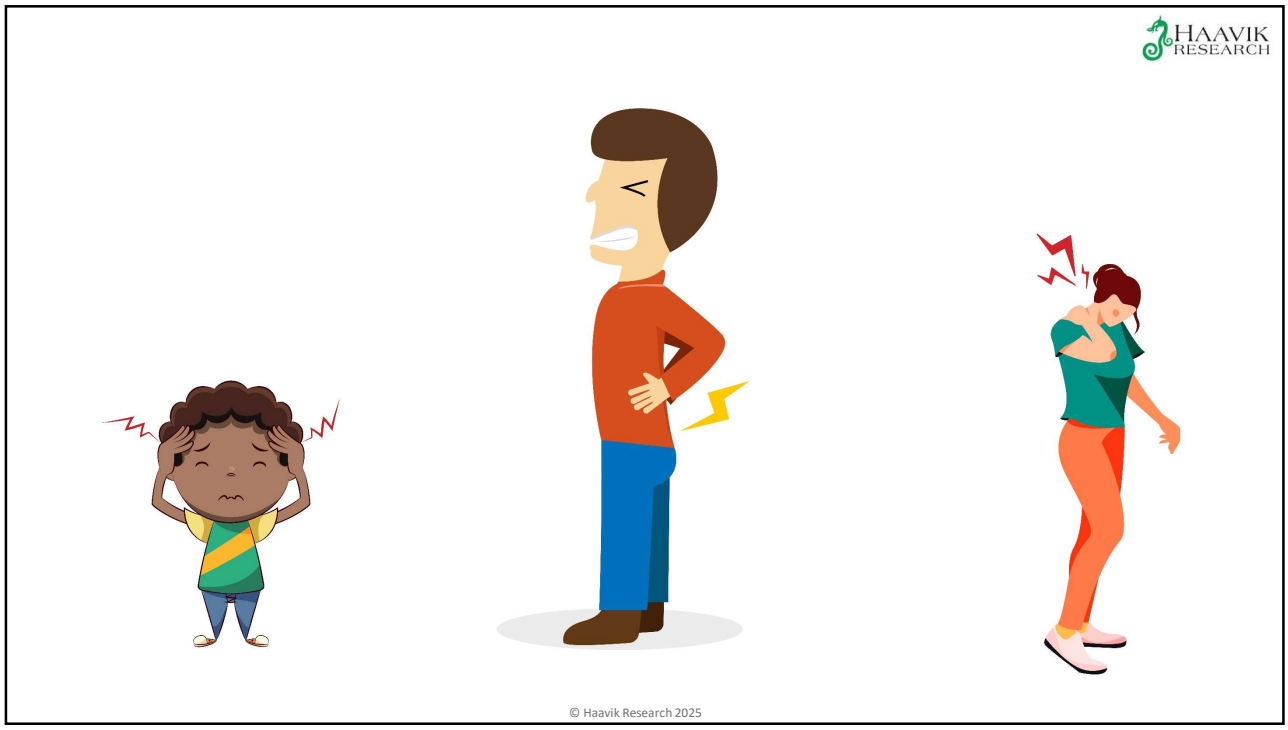
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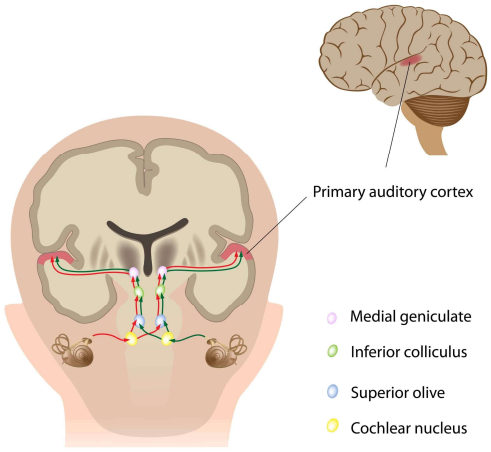
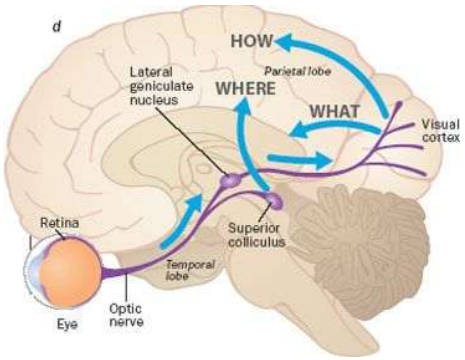
Interpreting sound and visual information





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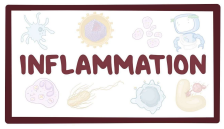

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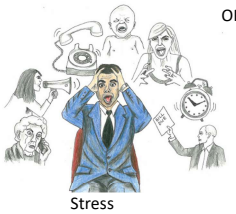
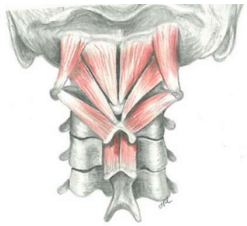
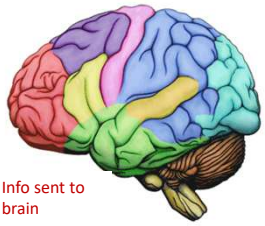


Stress

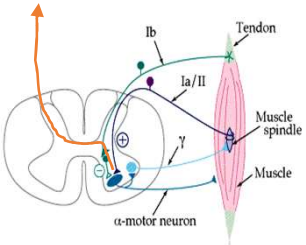
Injury

Small muscles closest to spine and skull go to sleep





Info sent to brain



Altered messages going to brain from spine

Poor body awareness
Poor body control
Poor function

So brain does NOT know accurately what is going on

Changes brains internal representations about what is going on inside and outside body

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This is where your chiropractor can help

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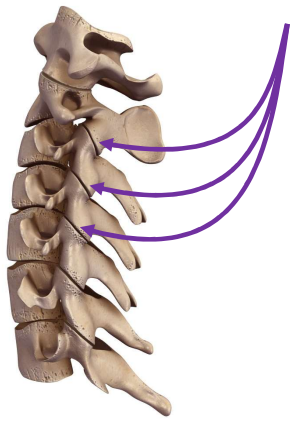
The facet joints gap during a thrust and you get increased intersegmental ROM!



Anderst et al. 2018 The Spine Journal.

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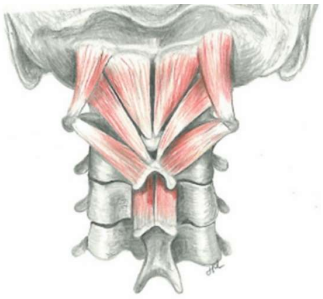
What happens when the spine dysfunctions?

Subluxated segment deep paraspinal muscles over time become:

- Stiff and Fibrotic
- Atrophied (shrink)
- Fatty infiltration
- Change fibre type /function
- Degeneration around joint
- Stretch receptors dysfunction

NOT Good



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- Plump
- Larger in size
- Slow-twitch fibre type
- No fatty infiltration
- Move freely
- Healthy stretch receptors

Good

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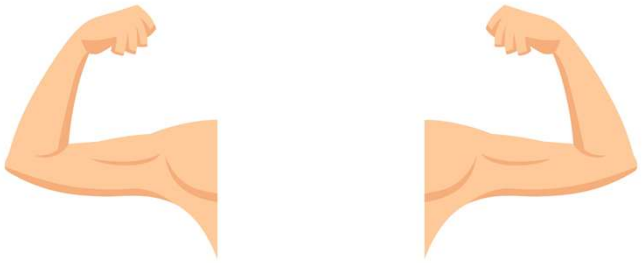
It takes more than four weeks of exercise before you alter the morphology of the muscle



Implications for practice!

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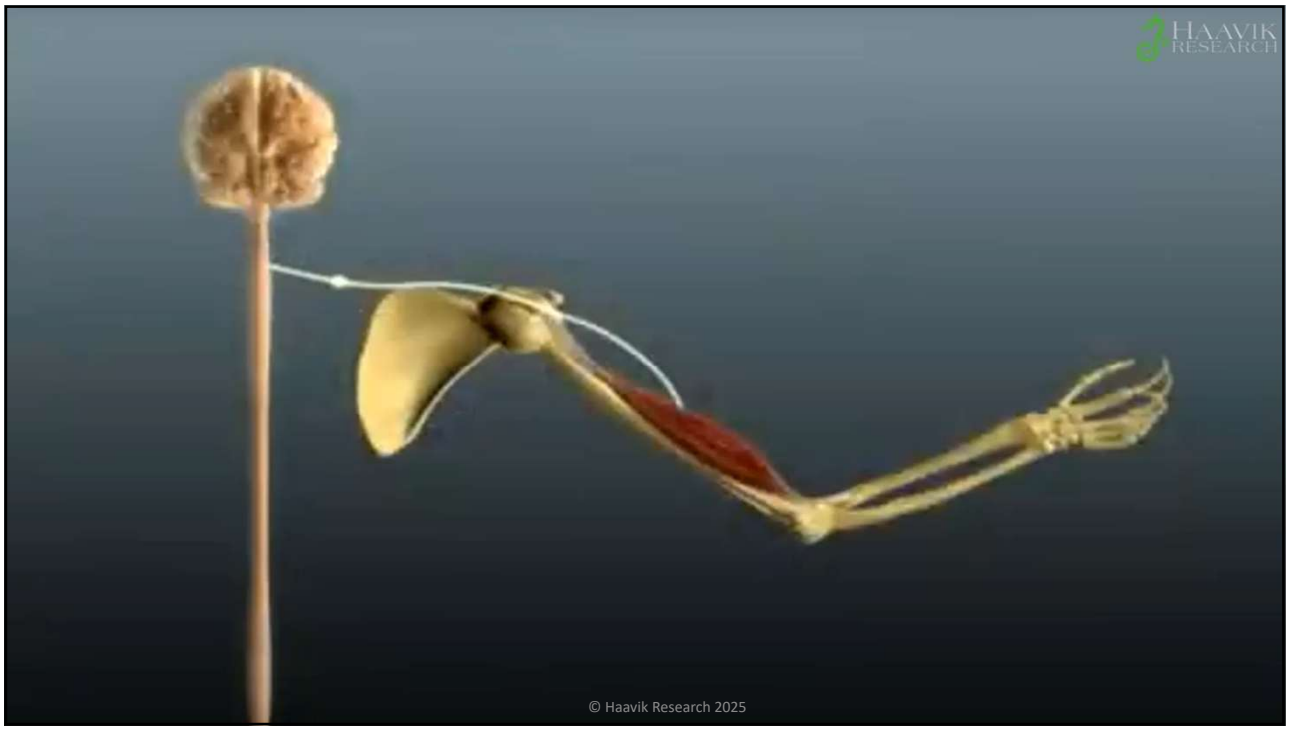
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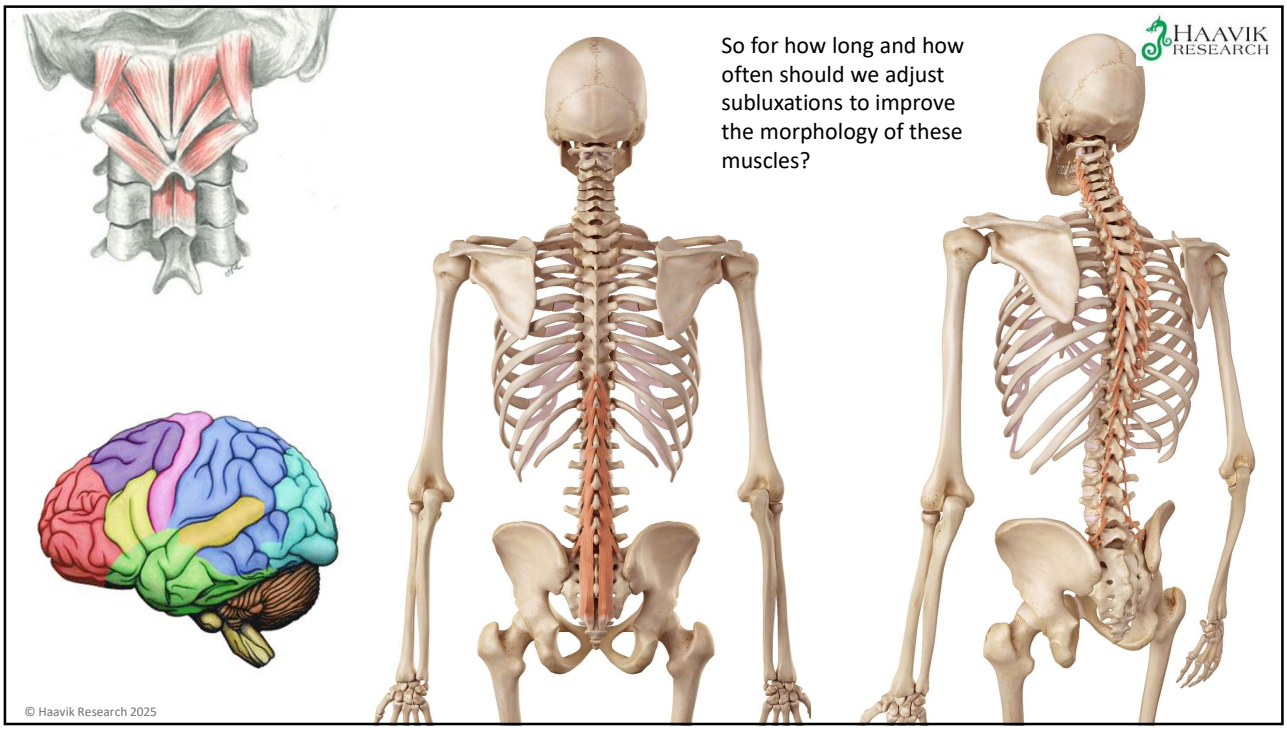
So for how long and how often should we adjust subluxations to improve the morphology of these muscles?
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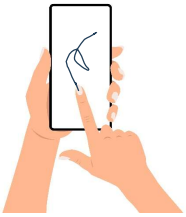
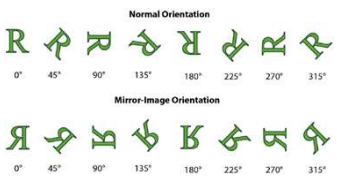
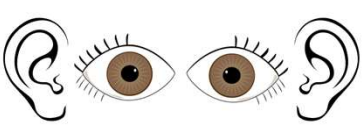
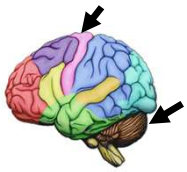
Spinal dysfunction vs Healthy people









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This tells me that for some people, being subluxations, has resulted in their brain….

- Not controlling their neck muscle function in an ideal way
- Not controlling arm muscles in an ideal way
- Altering body posture
- Reducing the accuracy with which the brain interprets sound and visual information
- Changing communication between different parts of the brain
- Making the brain less accurately aware of what is occurring in the arm
- Reducing the brains ability to accurately mentally rotate items

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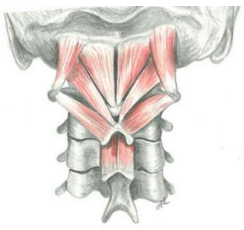
Adjustment

Stretches small muscles closest to spine and scull



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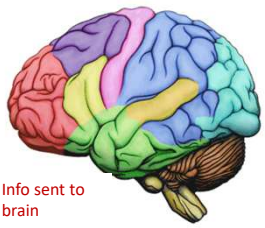
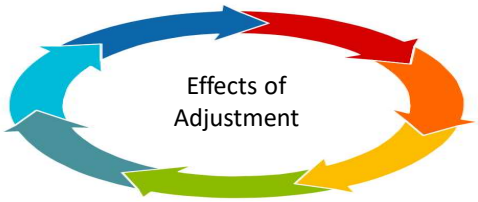
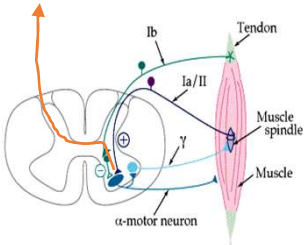


Info sent to brain



Improved body awareness
Improved body control
Improved function



Bombards brain with mechanoreceptor input

So brain knows MORE accurately what is going on

Changes brains internal representations about what is going on inside and outside body

48

Implications

- The brain model is FAR MORE impactful that the structural pathology MOPI model ever could be
- Because EVERY adjustment impacts the BRAIN!!! (Prefrontal cortex and Cerebellum)

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TODAY'S HANDOUT & Gifts

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How do you incorporate this new science into practice?

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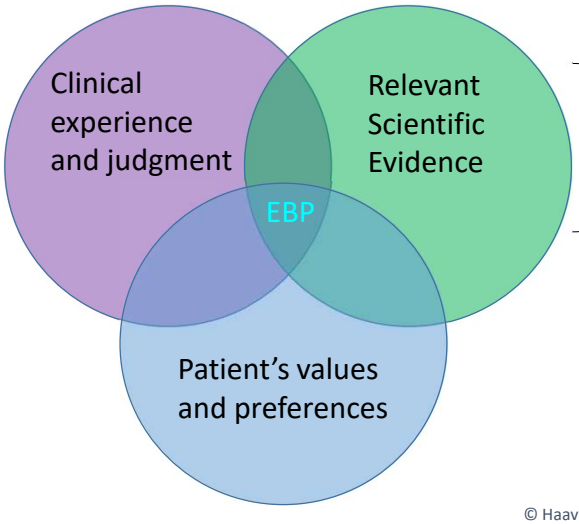
Patient-Focused, Evidence-Based Practice

Dr David Sackett - The father of evidence-based medicine



1. What the condition is
2. How your care works

Basic Science

3. The efficacy & safety of chiropractic care
4. The efficacy & safety of current medical care

Clinical Science

52

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Basic Science

- Mechanisms
- How something works
- What something is
- What happens in the brain after an adjustment

vs

Clinical Science

- What effect an intervention has on a health outcome
- What health benefits there are from an intervention
- How safe is an intervention

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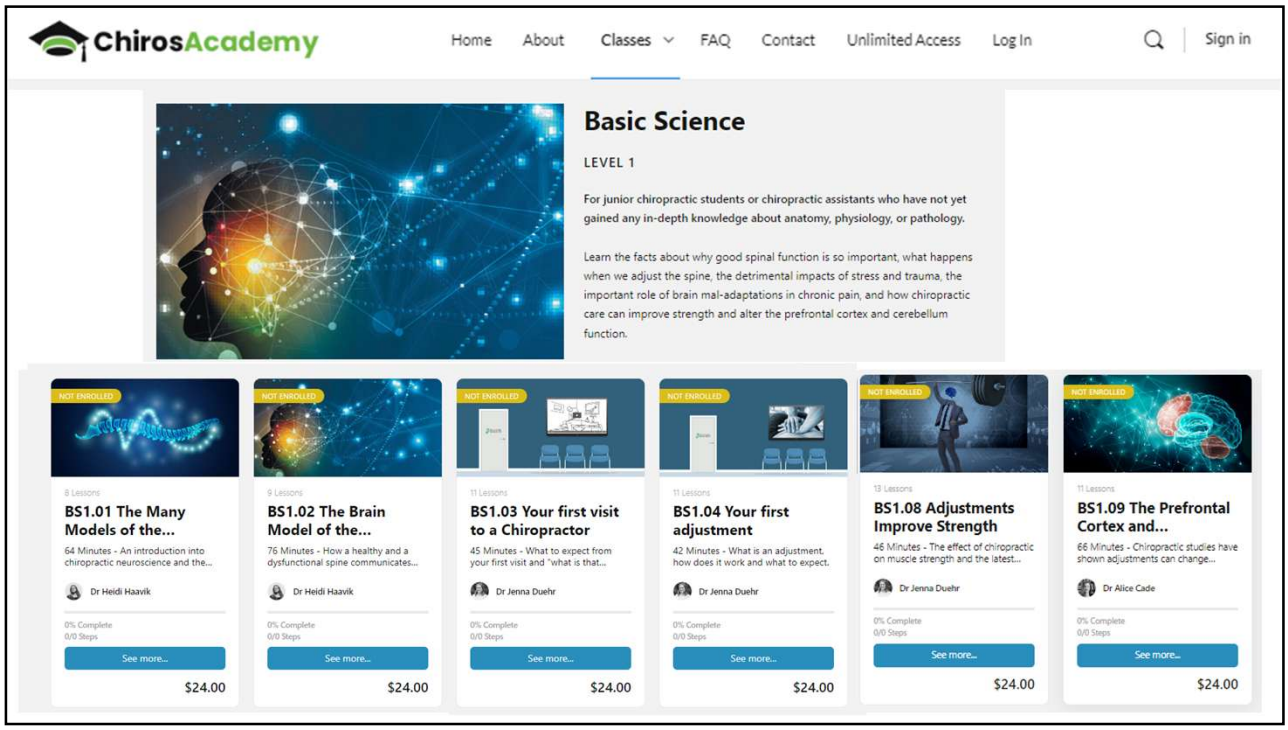
DO YOU OWN YOUR SCIENCE?

ChirosAcademy

54



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2

Click on the up arrow

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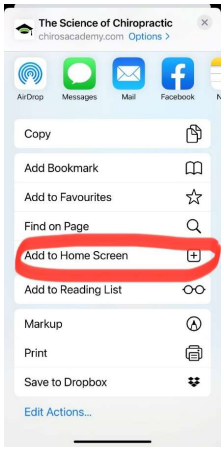

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ChirosAcademy will now appear as an App on your phone!

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Confidence and Clarity

Being able to confidently and clearly articulating a value proposition of chiropractic care impacts:

- Customer engagement
- New patients signing up
- Increased credibility and trust
- Business growth
- Competitive differentiation

Equals a major difference to the success of a small (or big) private practice

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Las neuronas que se activan simultáneamente refuerzan la sinapsis
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LearningHub
Online classes for your chiropractic assistants!

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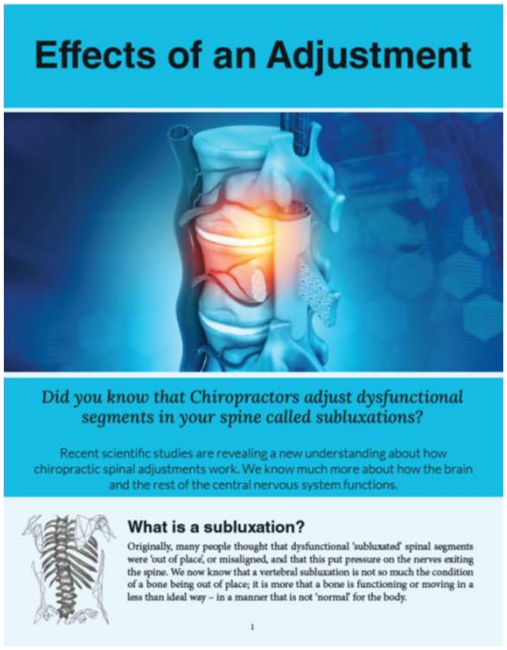

63

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Click on the up arrow

3

Click on 'Add to Home Screen'

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Change the name to 'Chiros Hub'

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Chiros Hub will now appear as an App on your phone!

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ALL ONLINE

- 20 Steps for chiros
  - https://chirosacademy.com/the-new-brain-model-2024/
- 13 Steps for CAs
  - https://chiroslearninghub.com/enlighten-practice-members-2024/

Plus LIVE DC workshops roughly every second months
- covers live Q&A plus a topic

65

Some changes in the brain take longer

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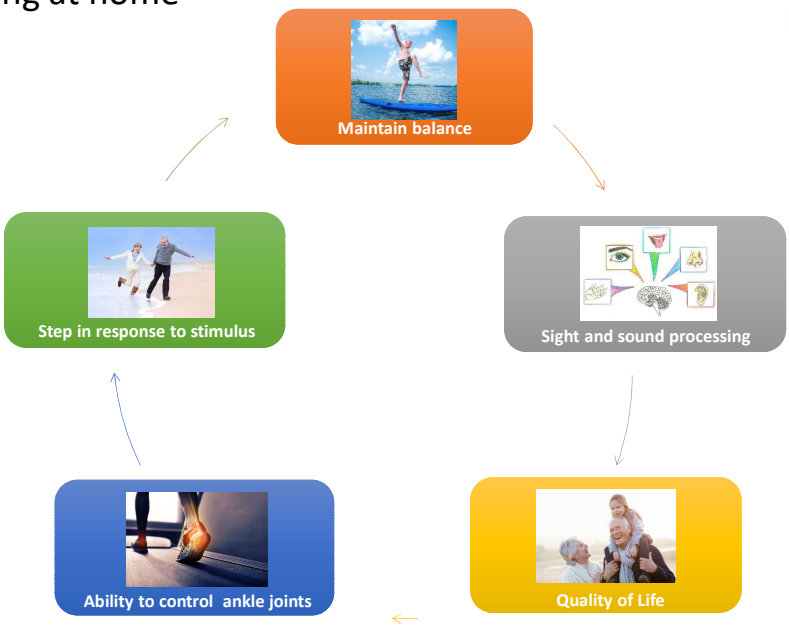
Holt, K., Haavik, H., Lee, A.C.L., Murphy, B., & Raina Elley, R. (2015) Effectiveness of chiropractic care to improve sensorimotor function associated with falls risk in older people: A randomized controlled trial. Journal of Manipulative and Physiological Therapeutics. May;39(4):267-78. doi: 10.1016/j.jmpt.2016.02.003.

66

60 older adults living at home

We recorded at:
Baseline
After 4 weeks
After 12 weeks



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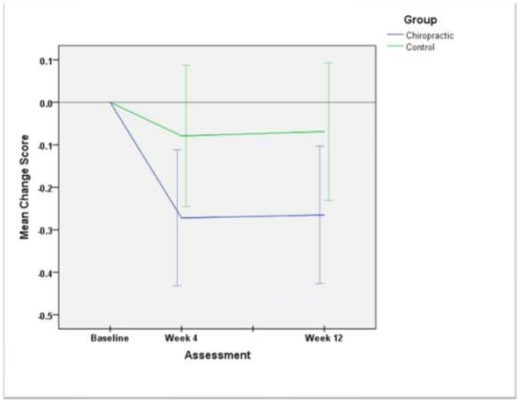
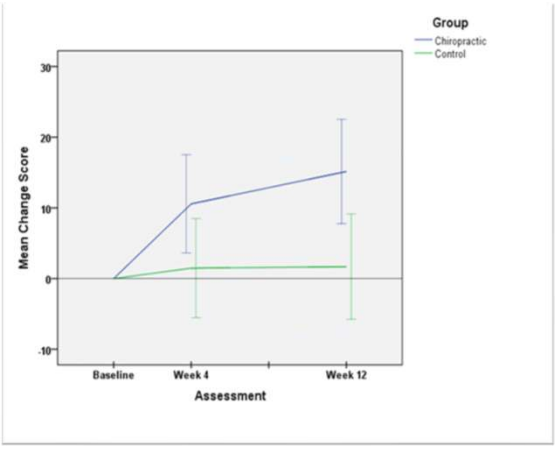
Improved ankle joint position sense



68

Improved interpretation of sound and visual information at the same time



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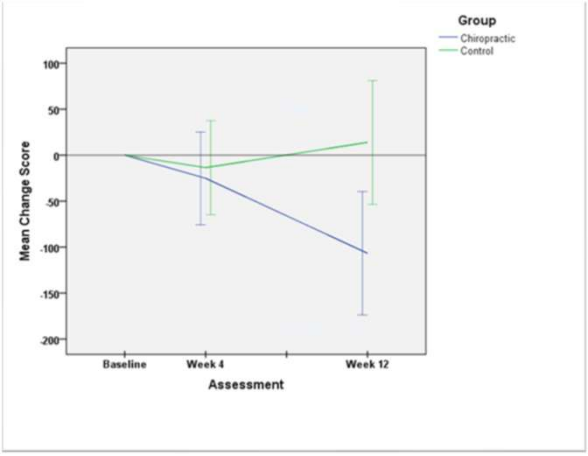
Improved stepping times

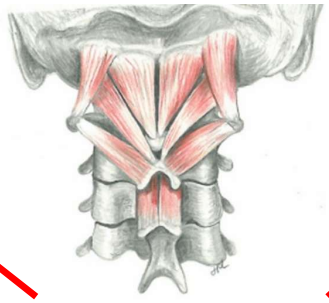


70

Why might some changes take time?

Subluxated segment deep paraspinal muscles over time become:

- Stiff and Fibrotic
- Atrophied (shrunk)
- Fatty infiltration
- Change fibre type
- Degeneration around joint
- Stretch receptors dysfunction



From this to this!

Deep paraspinal muscles around a 'healthy' segment are:

- Plump
- Larger in size
- Slow-twitch fibre type
- No fatty infiltration
- Move freely
- Healthy stretch receptors

Probably because we need to exercise these muscles back into proper function!

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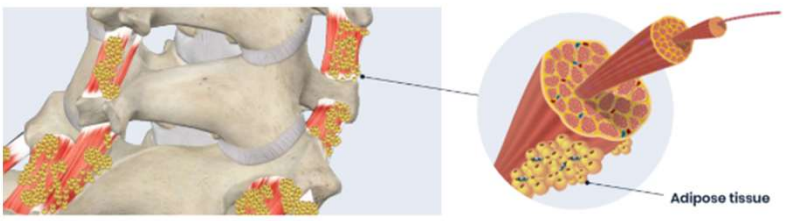
HEALTHY

SUBLUXATED



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Implications for question answers

- Chiropractors' role is to exercise the spine back into proper function

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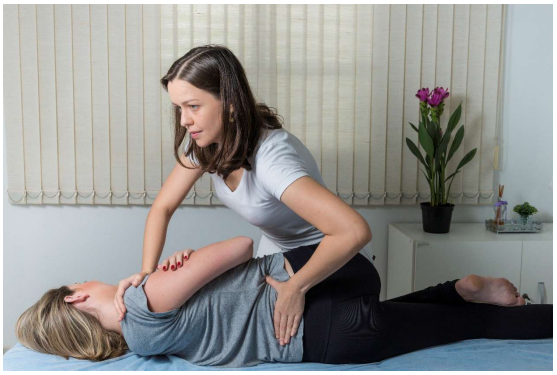
What does the evidence say about frequency of care?



75

Dose-Response Low Back Pain (LBP) Study

- 1,2,3, or 4 chiropractic visits per week for three weeks
- 72 patients with chronic LBP
- HVLA spinal manipulation + some other physical modalities
- Relief was substantial for patients receiving care 3 to 4 times per week for three weeks

(Haas et al 2004)

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Follow Up Larger Study

400 patients with chronic low back pain

0,6,12, or 18 sessions of SM over 6 weeks

Pain scores better in groups getting adjusted

At 12 weeks- 2x per week had best results

At 52 weeks- 3x week had best results

Only modest differences so not conclusive results

(Haas et al 2014)

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Dose Response for Cervicogenic Headaches

24 patients with cervicogenic headaches

1,3, or 4 chiropractic visits per week for three weeks

3 or 4 times per week showed substantial benefits at twelve weeks compared to once per week

(Haas et al 2004; 2010)

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Follow Up Larger Study

- 80 patients with cervicogenic headaches.
- 1 or 2 visits per week for eight weeks.
- Control group receiving light massage 1 or 2x per week.
- Outcomes assessed - pain scales, frequency of headaches, medication use.
- Followed over twenty-four weeks.
- Results:
  - Significant improvement in pain and disability scores in chiropractic group.
  - Fewer headaches at twelve weeks in chiropractic group.
  - Less medication use at twenty-four weeks in chiropractic group.
  - Frequency of care not significantly different but in general more frequent had better outcomes.

(Haas et al 2010)

79

Chronic Cervicogenic Headaches

- 256 participants.
- 1, 2, or 3 chiropractic visits per week for six weeks.
- Control group receiving light massage.
- Main outcome assessed of number of headache days at twelve and twenty-four weeks.
- Results:
  - The more adjustment visits, the fewer headache days.

(Haas et al 2018)

80

Nordic Maintenance Care Program

- Several research groups working together to conduct several studies looking at maintenance care and its benefits in Nordic countries.

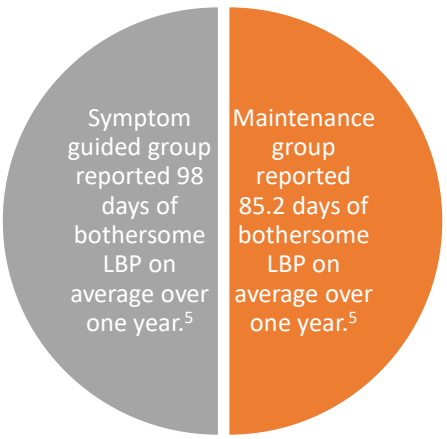
(Eklund et al 2018)

81

What They Did:

- 328 patients with non-specific LBP from 40 Swedish chiropractic clinics.[5]
- Good responses to care.[5]
- Received chiropractic maintenance care for the next year, or symptom-guided care.[5]
- Outcomes: number of days with bothersome back pain over one year.[5]

Results:



(Eklund et al 2018)

82

Take-home Message About Maintenance Care

"For patients with recurrent low back pain who respond well to chiropractic care, they should consider getting checked regularly by their chiropractor even if their pain doesn't come back because it may help them to have fewer days where their backpain interferes with their lives."

(Eklund et al 2018)

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Summary of Frequency of Care

84

Implications for question answers

- Chiropractors' role is to exercise the spine back into proper function
- Science shows it's better for you to see me more often early on in care, and this even gives you long term benefits (CGHAs and LBP)
- Science shows maintenance care gives you less days of pain compared to coming back only when it hurts

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How often should you visit a Chiropractor?

When you first see your chiropractor, you will probably ask "how often do I need to come?"

Often the answer people want to hear is 'once' but chiropractic care, like most things that are really good for us, rarely makes a long-term difference to your health and wellness after just one visit.

The 1,000th straw that breaks the camel's back

A problem can build up day after day as you sit hunched over your desk, or bend and twist as you lift, or tense up as you deal with your daily stress, and then one day, you bend to tie your shoelaces and all of a sudden something hurts! You can rest assured that tying your shoelaces isn't what caused the problem - it's simply the thousandth straw that broke the camel's back (or was too much for your back) and that's why you're in pain.

Maintenance Care

Did you know that 50% of patients visit a chiropractor simply to maintain their health and well-being!

Lato - Light Aenean ac tincidunt lectus, eu facilisis leo. Donec sodales libero sit amet lacus ornare feugiat. Nulla gravida a lectus vitae efficitur.

What is maintenance care?

Maintenance care is when patients go to a chiropractor even when they are not in pain or discomfort. The idea with maintenance care is that regular adjustments will help maintain your spine and nervous system function at its optimal level and help you to be your best and to prevent new episodes of pain developing.[1]

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The power of a single adjustment session

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NEW ZEALAND COLLEGE OF CHIROPRACTIC

Strength Changes with chiropractic adjustments

Exp Brain Res
DOI 10.1007/s00221-014-4193-5

RESEARCH ARTICLE

Changes in H-reflex and V-waves following spinal manipulation

Imran Khan Niazi · Kemal S. Türker · Stanley Flavel · Mat Kinget · Jens Duehr · Heidi Haavik

Received: 14 May 2014 / Accepted: 22 December 2014

Abstract This study investigates whether spinal manipulation leads to neural plastic changes involving cortical drive and the H-reflex pathway. Soleus evoked V-wave, H-reflex, and M-wave recruitment curves and maximum voluntary contraction (MVC) in surface electromyogra- in afferents. Spinal manipulation appears to prevent fatigue developed during maximal contractions. Spinal manipulation appears to alter the net excitability of the low-threshold motor units, increase cortical drive, and prevent fatigue.

Niazi et al 2015 Exp Brain Res

90

16% increase in strength
No change H-reflex
Large increase in V wave

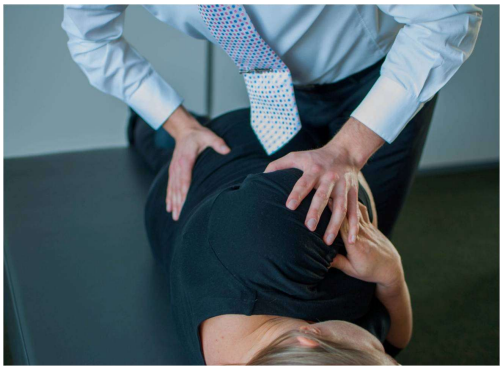
Niazi et al 2015. Exp Brain Res

6% increase in strength
No change H-reflex
Large increase in V wave

Christiansen et al 2018 *European Journal of Applied Physiology*

91

One adjustment vs 3 weeks of strength training



Niazi I, Türker K, Flavel S, Kinget M, Duehr J, Haavik H. Changes in H-reflex and V waves following spinal manipulation. Exp Brain Res. 2015;233:1165-73. Vila-Chã C, Falla D, Correia MV, Farina D. Changes in H reflex and V wave following short-term endurance and strength training. Journal of Applied Physiology. 2012;112(1):54-63.

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First Chronic Stroke Study

65% increase in strength
No change H-reflex
Large increase in V wave

Holt et al 2019 Scientific Reports

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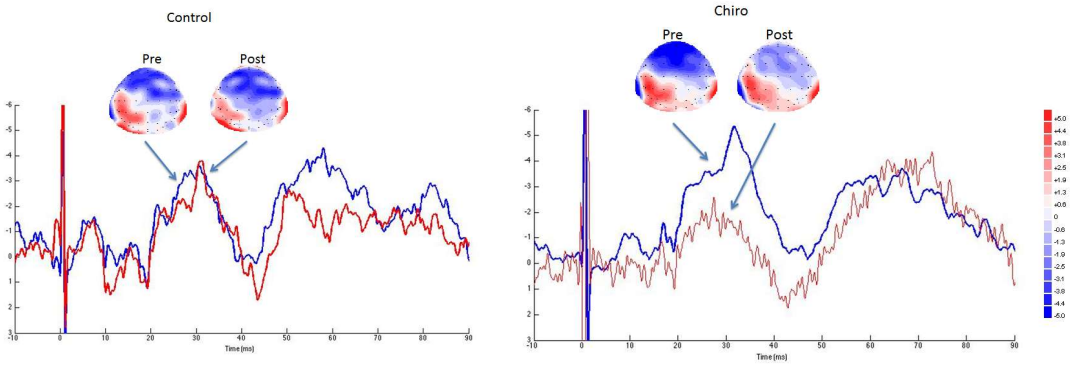
64 channel EEG and source localisation

Lelic, D., Niazi, I.K., Holt, K., Jochumsen, M., Dremstrup, K., Yielder, P., Murphy, B., Drewe,s A. M., & Haavik, H. (2016). Manipulation of dysfunctional spinal joints affects sensorimotor integration in the prefrontal cortex: A brain source localization study. Neural Plasticity, 1.doi:10.1155/2016/3704964.

99

N30 brain processing changes were occurring in the Pre-Frontal Cortex



Lelic, D., Niazi, I.K., Holt, K., Jochumsen, M., Dremstrup, K., Yielder, P., Murphy, B., Drewe,s A. M., & Haavik, H. (2016). Manipulation of dysfunctional spinal joints affects sensorimotor integration in the prefrontal cortex: A brain source localization study. Neural Plasticity, 1.doi:10.1155/2016/3704964.

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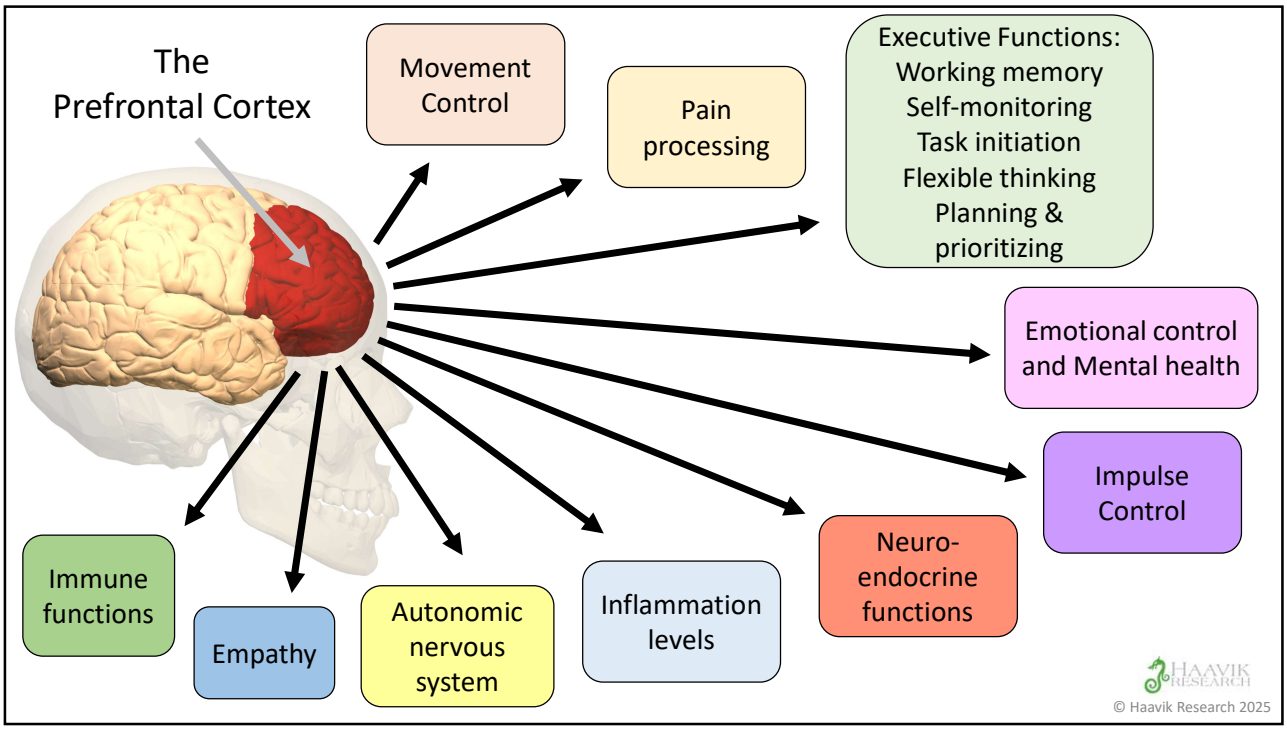

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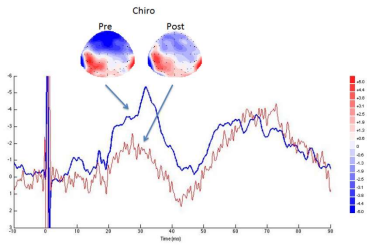
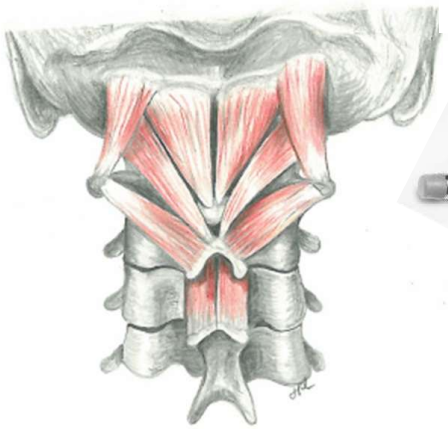
Does specificity matter?





Niazi, et al. 2024 Scientific Report. 14(1), p.1159.

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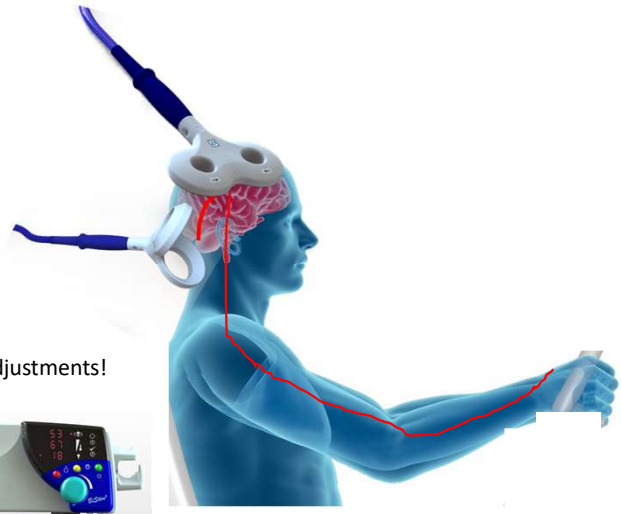
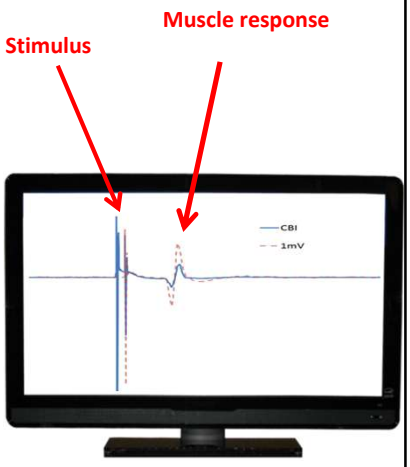
Cerebellum- M1 Inhibition with TMS





SCNP have poor CBI
Increase CBI after adjustments!

Baarbé, J.K., Yielder, P., Haavik, H., Holmes M.W.R., Murphy, B. (2018) Subclinical recurrent neck pain and its treatment impacts motor training-induced plasticity of the cerebellum and motor cortex. Plos One. 2018;13(2):e0193413. Daligadu, Haavik, Yielder, Baarbé & Murphy (2013) Alterations in cortical and cerebellar motor processing in SCNP following spinal manipulation. JMPT. 36:527-537

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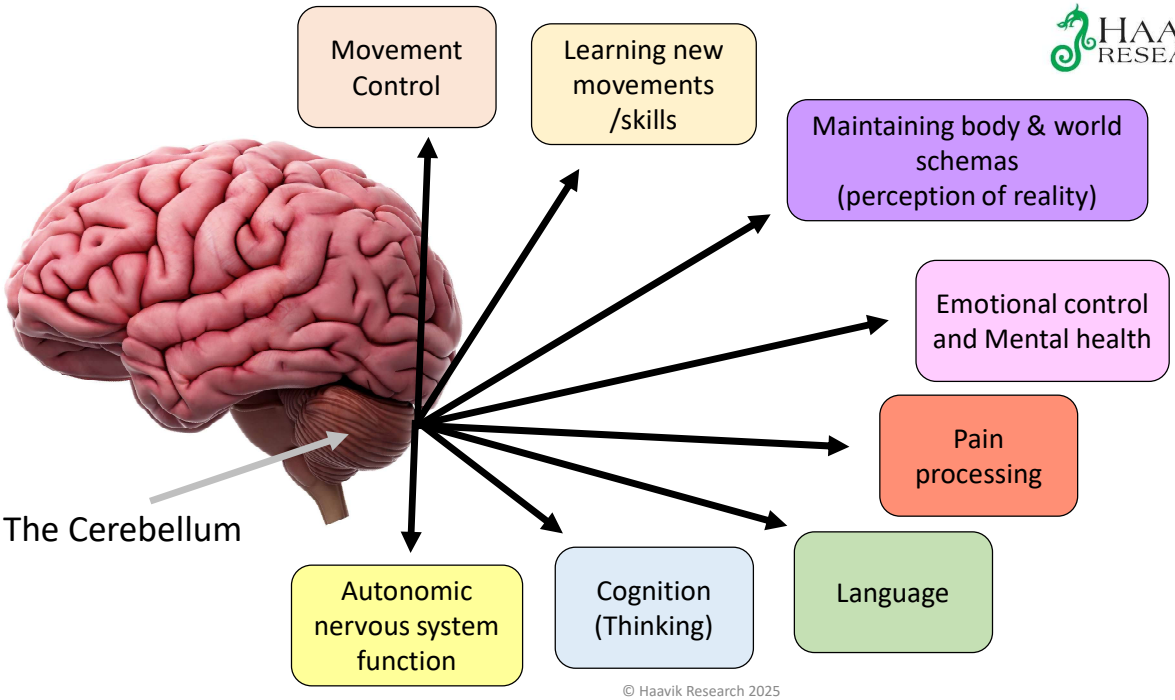

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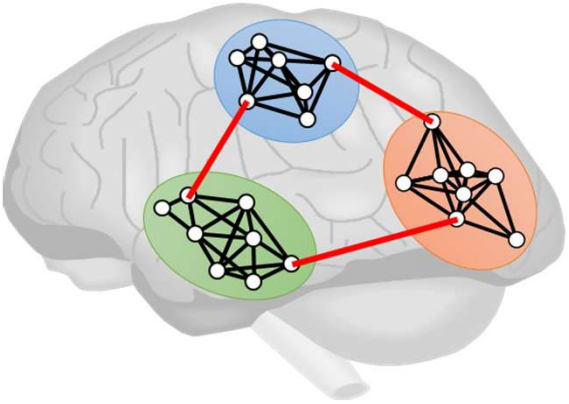
Biological Networks in the Brain (and Hubs)

- A biological neural network in the brain is a complex network of neurons that are chemically connected by synapses.
- Neurons send and receive electrochemical signals to each other, and the brain uses these signals to process information.



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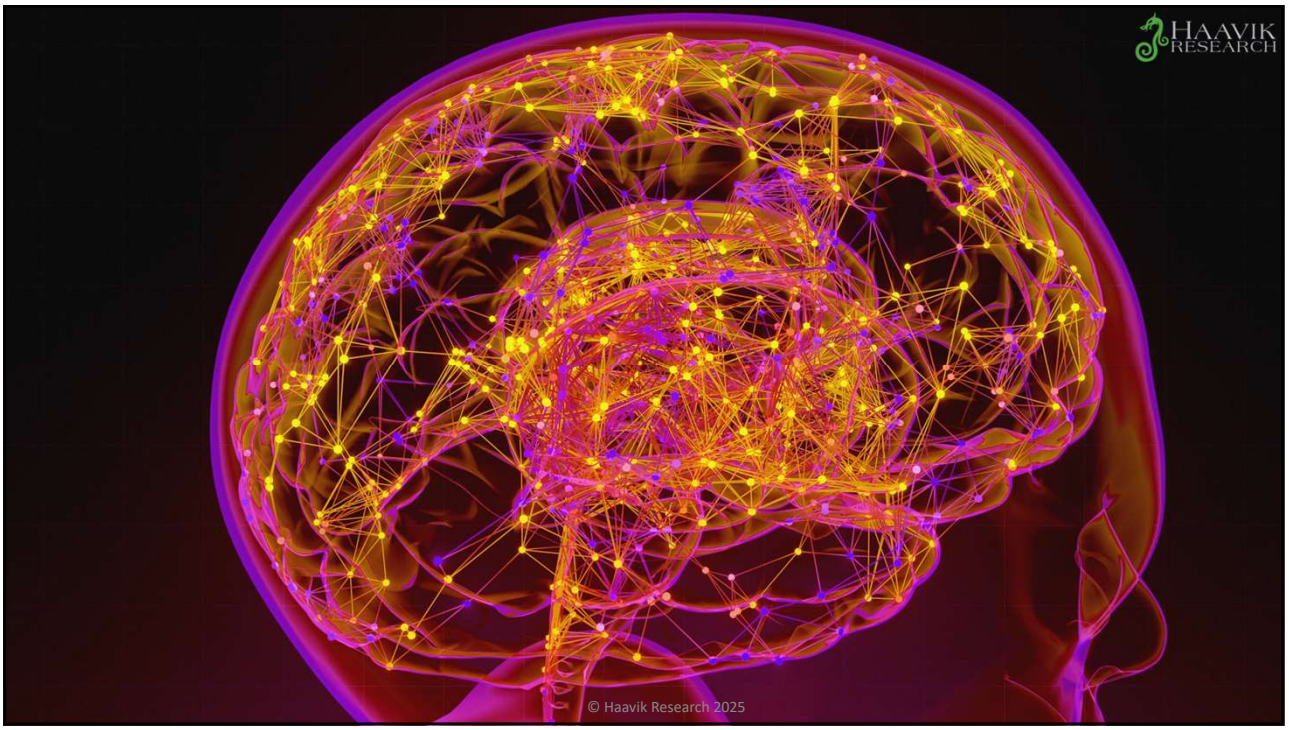

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Triple Brain Network & Consciousness

Outward facing!

Sensorimotor Networks

- Goal & task oriented
- Pay attention (& not judging)
- Focus on tasks
- Solve problems
- Make decisions

Salience Network

- Threat detection
- Monitors internal and external stimuli
- Directs attention towards most important (salient) stimuli in environment, body or thoughts

Sensory Networks

- Self-referential thinking
- Introspection
- Processing of emotions and memories
- Our story of self

Executive Network

Default Mode Network

Inward facing!
Past, present & future

(De Ridder et al. 2022)

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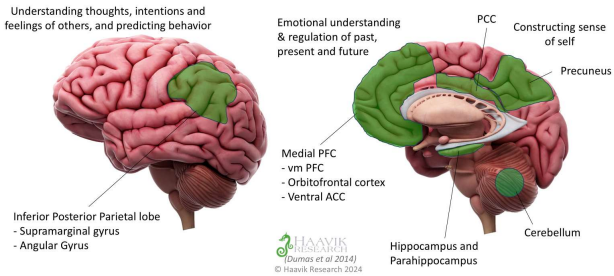
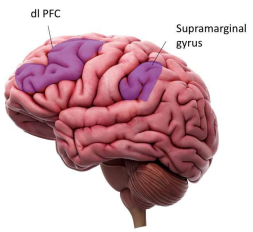
Default Mode Network

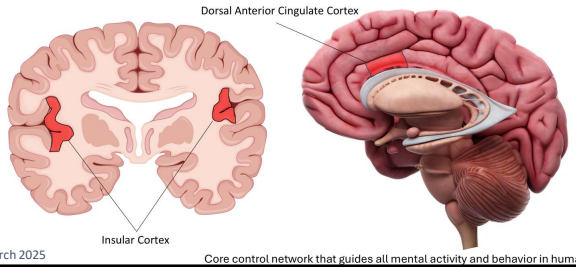


Fronto-parietal (Executive Control) Network

- It is Goal and Task oriented
- When you are actively engaged in a task
- Actively paying attention (and not judging)
- Capable of recruiting a wide variety of brain systems
- Multiple FP / EC networks
- Key Regions
  - Dorsolateral PFC
  - Posterior parietal cortex (supramarginal gyrus)



Salience Network



(Witt, van Ettinger-Veenstra et al. 2021; Menon and D'Esposito 2022; Menon and D'Esposito 2022)

Core control network that guides all mental activity and behavior in humans

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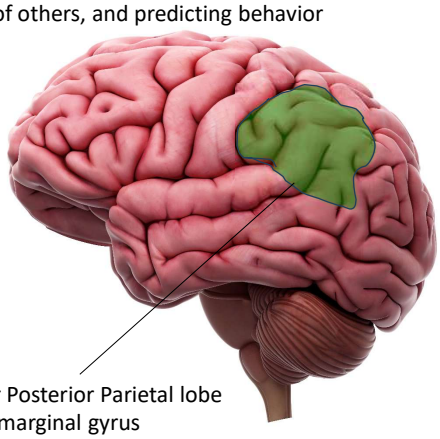
Default Mode Network

Understanding thoughts, intentions and feelings of others, and predicting behavior



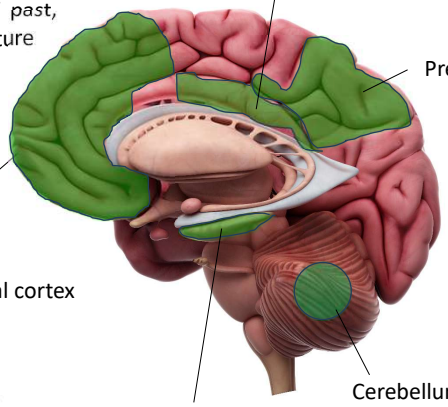
Inferior Posterior Parietal lobe
- Supramarginal gyrus
- Angular Gyrus

Emotional understanding & regulation of *past*, present and future

PCC

Constructing sense of self

Precuneus



Medial PFC
- vm PFC
- Orbitofrontal cortex
- Ventral ACC

Cerebellum

Hippocampus and parahippocampal cortex

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(Dumas et al 2014)

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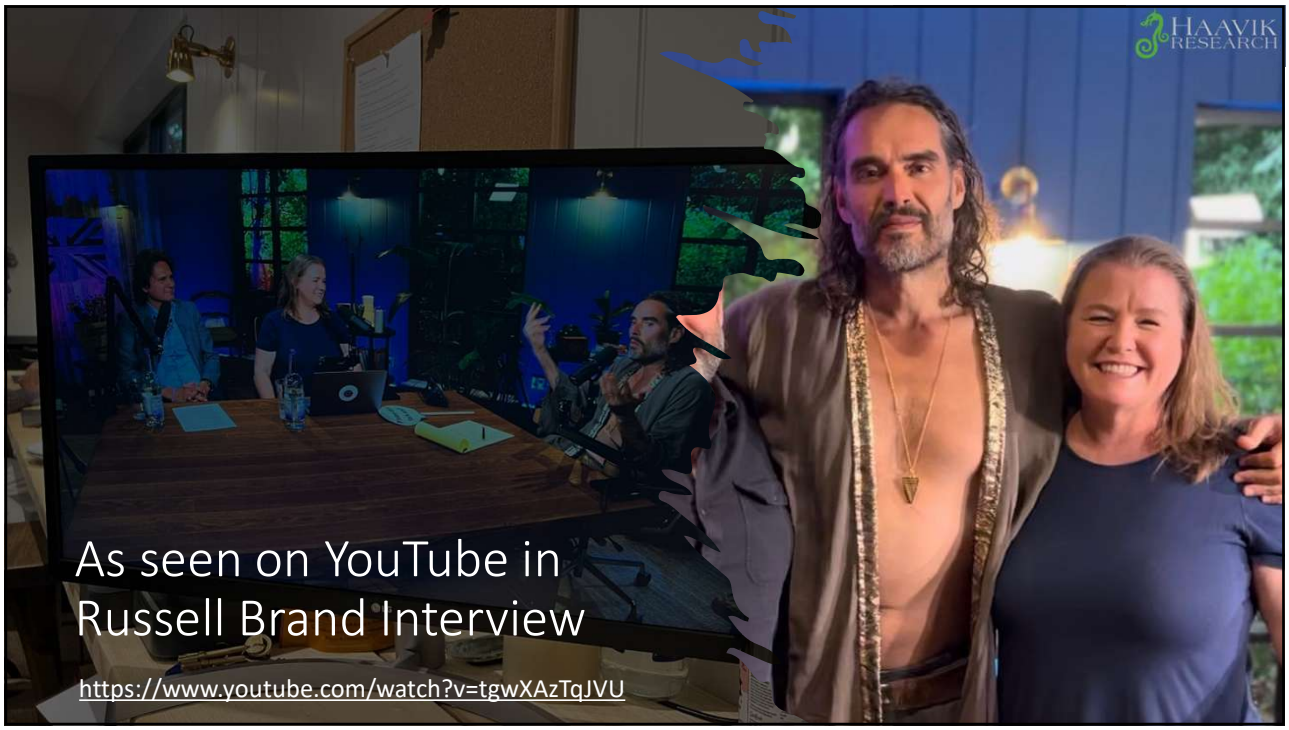


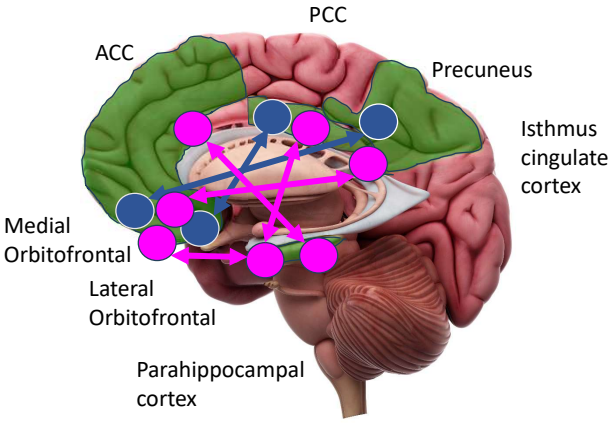
111

NEW ZEALAND COLLEGE OF CHIROPRACTIC

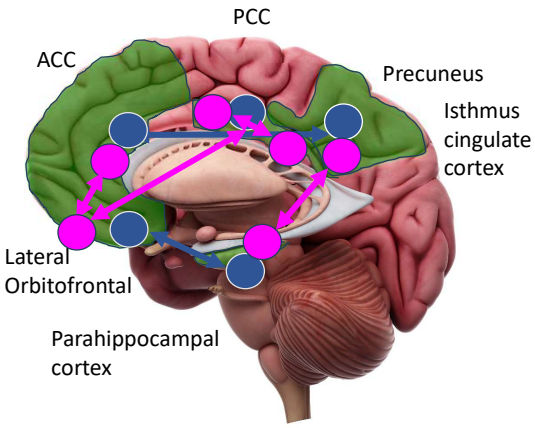
DMN changes after Chiro Care

HAAVIK RESEARCH

Pre and Post Chiro



Pre and Post 4 weeks Chiro



(Haavik et al 2024, Brain Sciences)

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Questionnaire Results

Control Group

NO significant changes at all

Chiropractic Group

- Improved QOL overall
- Improved Physical function
- Less Depression
- Less anxiety
- Less Fatigue
- Less pain interference
- Less pain intensity

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Unmedicated depressed people have significantly increased functional connectivity between the Precuneus and the prefrontal cortex

Increased functional connectivity of the posterior cingulate cortex with the lateral orbitofrontal cortex in depression (Cheng, Rolls et al. 2018B)

The increased connectivity of the precuneus and/or PCC with the prefrontal cortex short-term memory system may contribute to the rumination about low self-esteem in depression.

(Cheng, et al 2018A; Cheng, Rolls et al. 2018B*)*

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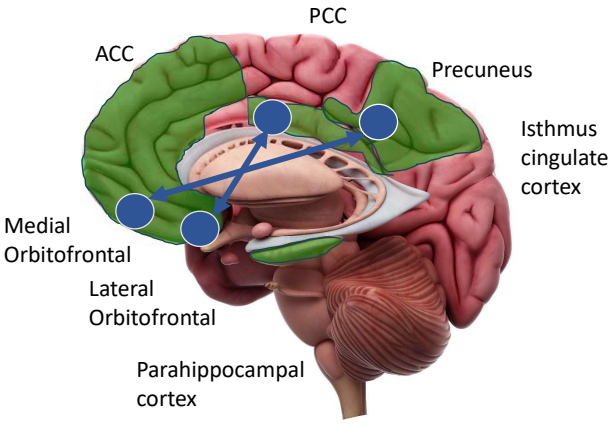
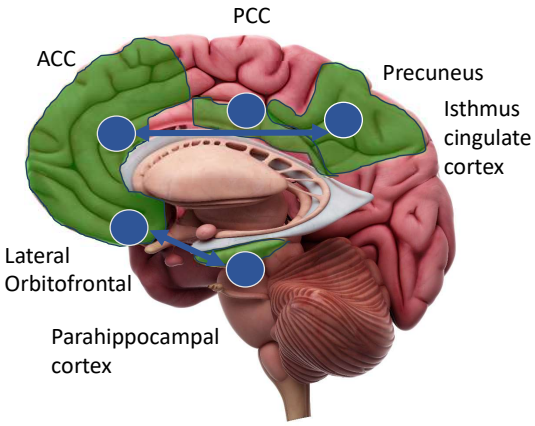
DMN changes after Chiro Care

Pre and Post Chiro



Pre and Post 4 weeks Chiro



(Haavik et al 2024, Brain Sciences)

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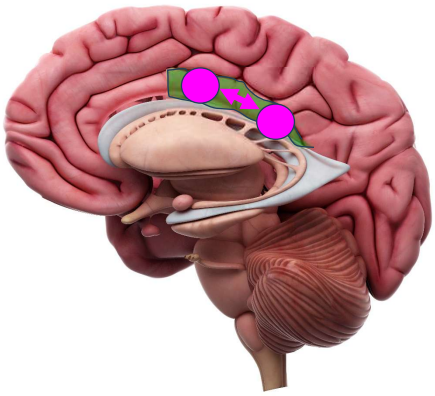
In depression there is asymmetry in the thickness of Posterior Cingulate Cortex

SEPs Alpha ↑ L isthmus-cingulate- R PCC

- PCC deals with internally focused, self-referential processing
- I.e. Construction of the narrative sense of self, including autobiographical memories
- Implicated in depression: ↑ cortical thickness in left vs right PCC
- Depressed individuals with higher somatic symptoms (e.g. sleep disturbance, appetite disturbance, and fatigue or loss of energy) have greater asymmetry in **PCC** thickness



Thus, this change may reflect altered narrative sense of self in a manner that is reducing symptoms of depression and improvements in fatigue

(Haavik et al 2024, Brain Sciences)

(Dotson et al. 2021; van Eijndhoven et al. 2013)

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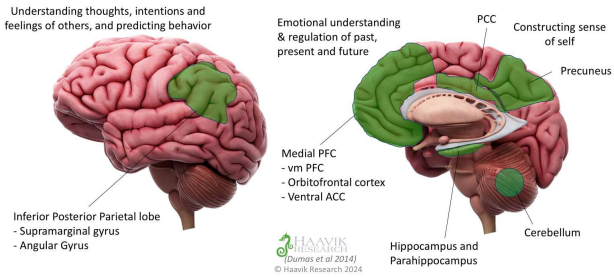
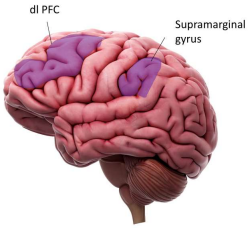
Default Mode Network

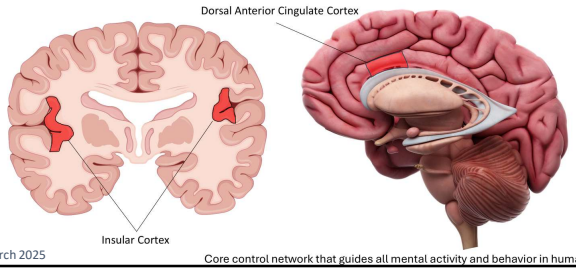


Fronto-parietal (Executive Control) Network

- It is Goal and Task oriented
- When you are actively engaged in a task
- Actively paying attention (and not judging)
- Capable of recruiting a wide variety of brain systems
- Multiple FP / EC networks
- Key Regions
  - Dorsolateral PFC
  - Posterior parietal cortex (supramarginal gyrus)



Salience Network



(Witt, van Ettinger-Veenstra et al. 2021; Menon and D'Esposito 2022; Menon and D'Esposito 2022)

Core control network that guides all mental activity and behavior in humans

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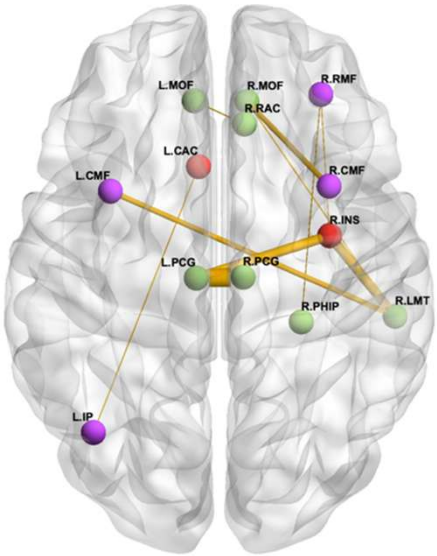
After first Adjustment session Chiro Group



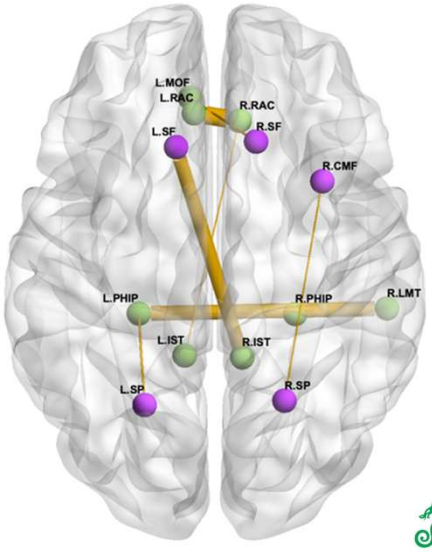
Preliminary Results NOT published yet

Alpha

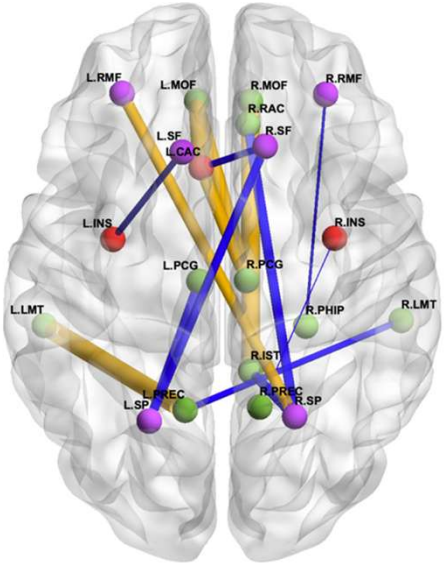
118

Preliminary Results NOT published yet

After 4 weeks Chiro Group Brain changes



Alpha



Beta

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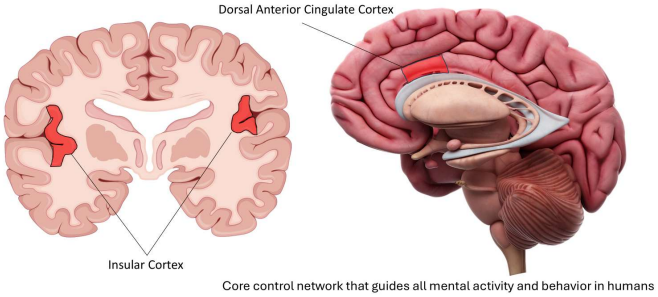
Salience Network Activation is likely where the brain recalibrates after an adjustment!

Salience Network



Core control network that guides all mental activity and behavior in humans

120

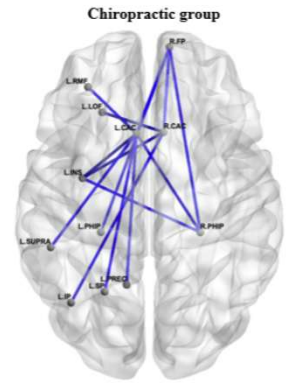


Figure 7: PRE vs POST-6W_EC_Beta

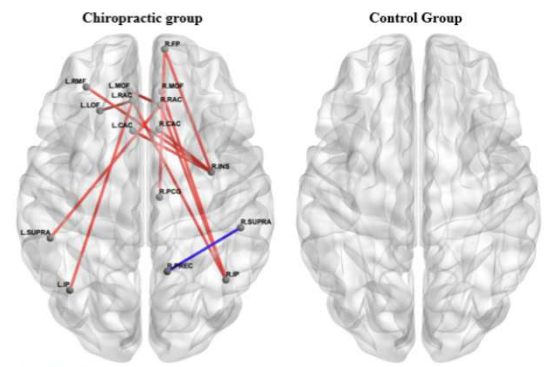


Figure 9: SIS3_EC_Alpha

Pre vs Post-12W (Eyes Open) – Alpha

So what about kid's brains?

- Pakistan RCT in teenagers
- Clinically meaningful (and significant) improvement in Quality of Life

Preliminary Results NOT published yet

THE KID'S SUMMIT

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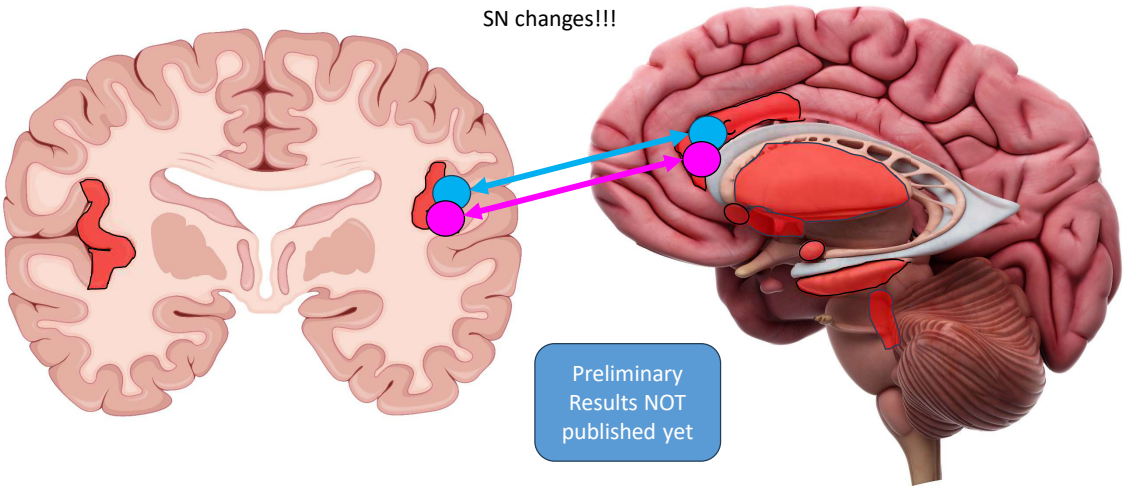
Resting EEG results CHIRO Both 6 &12weeks

Insular cortex key hub for Interoceptive processing

ACC is vital for recognizing, understanding and regulating own emotions

SN changes!!!



Preliminary Results NOT published yet

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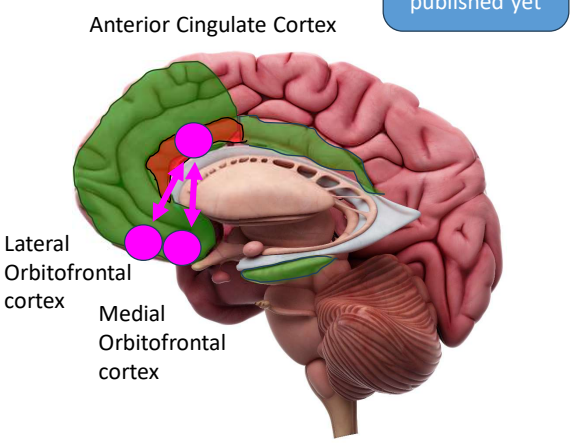
Resting EEG results CHIRO Pre vs Post 12weeks

- The Orbitofrontal cortex plays a key role in the executive control of information processing and behavioral expression, decision-making and emotional regulation. It is important for the construction of the narrative sense of self and processing information about own mental states, beliefs, intentions and desires
- The Anterior Cingulate Cortex plays a key role in error detection, cognitive control, emotional regulation and autonomic regulation. It is vital for recognizing, understanding and regulating own emotions.

- May reflects the teenagers' brain's altered processing of interoceptive signals, improving sense of self
- This may support more flexible decision-making and better emotional regulation.
- It could be why they reported improved quality of life.

Preliminary Results NOT published yet



123

heidihaavik.com

TODAY'S HANDOUT & Gifts

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Symptoms don't just appear out of thin air

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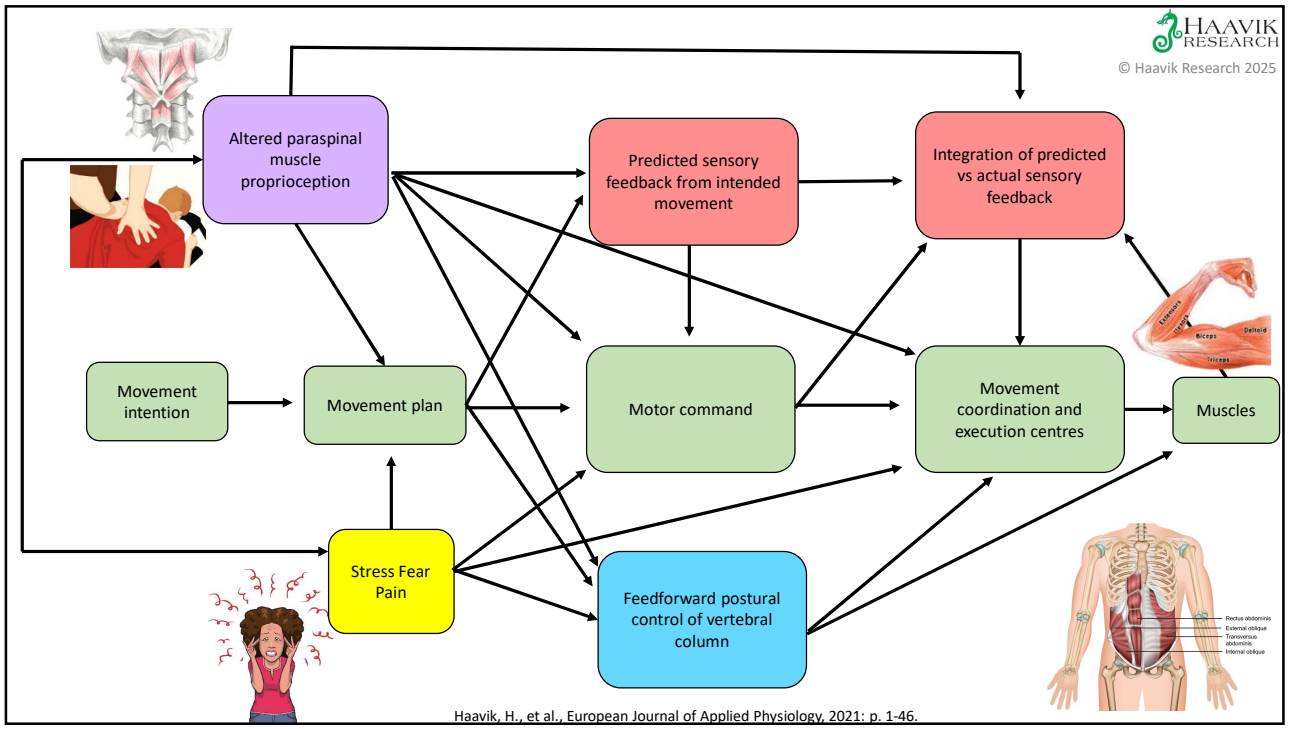

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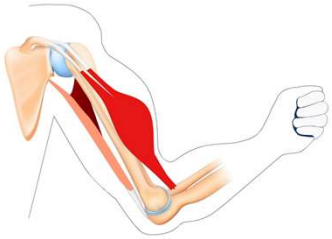
Microtrauma



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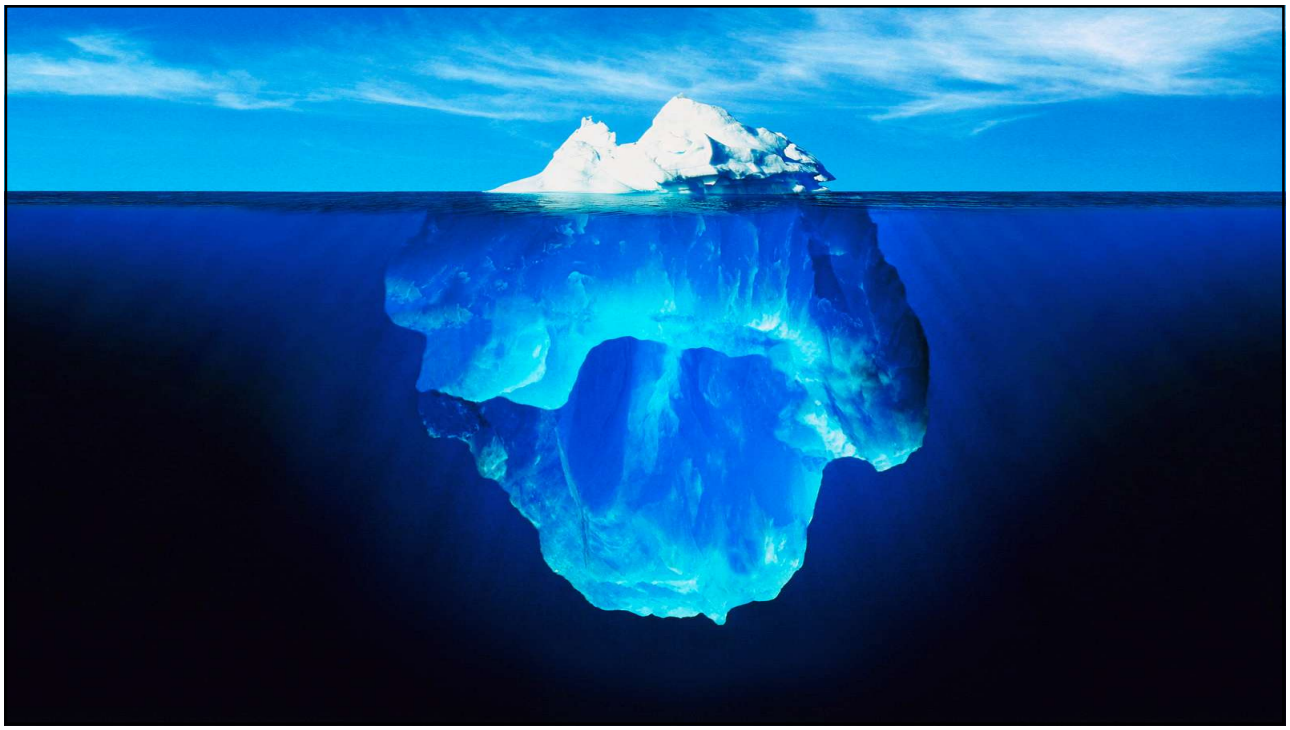

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Chronic Pain

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Apkarian et al. 2011 Pain and the brain: specificity and plasticity of the brain in clinical chronic pain. Pain; May 2008 Chronic pain may change the structure of the brain. Pain; Costigan et al 2009 Neuropathic Pain: A Maladaptive Response of the Nervous System to Damage. Annual Review of Neuroscience.

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The Chronicity of Pain

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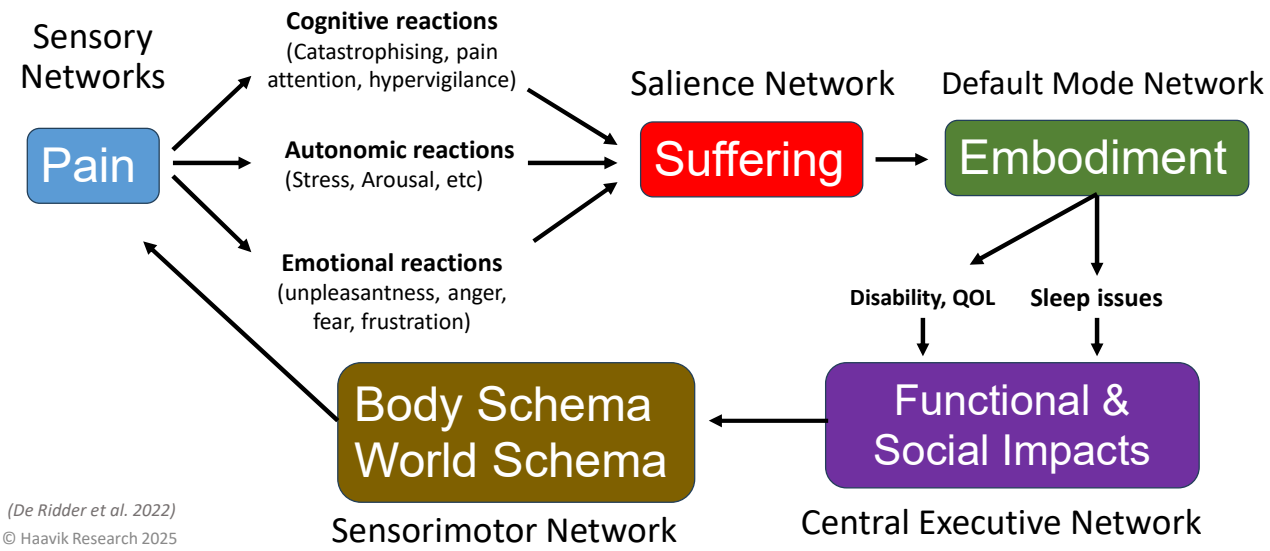

(De Ridder et al. 2022)

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SYSTEMATIC REVIEW

The Effect of Neuroscience Education on Pain, Disability, Anxiety, and Stress in Chronic Musculoskeletal Pain

Adriaan Louw, PT, MAppSc, Ina Diener, PT, PhD, David S. Butler, PT, EdD, Emilio J. Puentedura, PT, DPT

ABSTRACT. Louw A, Diener I, Butler DS, Puentedura EJ. The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. Arch Phys Med Rehabil 2011;92:2041-56.

Objective: To evaluate the evidence for the effectiveness of neuroscience education (NE) for pain, disability, anxiety, and stress in chronic musculoskeletal (MSK) pain.

Data Sources: Systematic searches were conducted on Biomed Central, BMJ.com, CINAHL, the Cochrane Library, NLM Central Gateway, OVID, ProQuest (Digital Dissertations), PsycInfo, PubMed/Medline, ScienceDirect, and Web of Science. Secondary searching (PEARLing) was undertaken, whereby reference lists of the selected articles were reviewed for additional references not identified in the primary search.

Study Selection: All experimental studies including randomized controlled trials (RCTs), nonrandomized clinical trials, and case series evaluating the effect of NE on pain, disability, anxiety, and stress for chronic MSK pain were considered for inclusion. Additional limitations: studies published in English, published within the last 10 years, and patients older than 18 years. No limitations were set on specific outcome measures of pain, disability, anxiety, and stress.

Data Extraction: Data were extracted using the participants, interventions, comparison, and outcomes (PICO) approach.

Data Synthesis: Methodological quality was assessed by 2 reviewers using the Critical Review Form–Quantitative Studies. This review includes 8 studies comprising 6 high-quality RCTs, 1 pseudo-RCT, and 1 comparative study involving 401 subjects. Most articles were of good quality, with no studies rated as poor or fair. Heterogeneity across the studies with respect to participants, interventions evaluated, and outcome measures used prevented meta-analyses. Narrative synthesis of results, based on effect size, established compelling evidence that NE may be effective in reducing pain ratings, increasing function, addressing catastrophization, and improving movement in chronic MSK pain.

Conclusions: For chronic MSK pain disorders, there is compelling evidence that an educational strategy addressing neurophysiology and neurobiology of pain can have a positive effect on pain, disability, catastrophization, and physical performance.

Key Words: Education; Musculoskeletal System; Neurophysiology; Neurosciences; Pain; Rehabilitation.

PAIN IS A POWERFUL motivating force that guides treatment-seeking behaviors in patients.[1-3] Patient education has long been explored in the management of pain, anxiety, and stress associated with low back pain (LBP).[4-7] In the orthopedic domain, there are a number of studies on the effect of patient education on pain, with outcomes ranging from "excellent"[8] to "poor."[9,10] The study by Udermann et al[8] demonstrated that introduction of an individualized educational booklet on back biomechanics can result in decreased pain and frequency of LBP episodes in patients with chronic LBP (CLBP). In contrast to those findings, 2 systematic reviews[9,10] on the effect of individualized and/or group education for LBP and mechanical neck pain showed little efficacy for such education.

Most education programs for orthopedic patient populations have used anatomic and biomechanical models for addressing pain,[4,11-14] which not only have shown limited efficacy,[4,11,12,15,16] but may even have increased patient fears, anxiety, and stress, thus negatively impacting their outcomes.[11,17-19] Several educational strategies are advocated for patients with LBP, including biomechanical/back school type of education, evidence-based guideline education (ie, *The Back Book*[20]), cognitive behavioral therapy, and recently, neuroscience education (NE).

NE can be best described as an educational session or sessions describing the neurobiology and neurophysiology of pain, and pain processing by the nervous system. Instead of a

List of Abbreviations

BPPT	brachial plexus provocation test
CFS	chronic fatigue syndrome
CLBP	chronic low back pain
CONSORT	Consolidated Standards of Reporting Trials
LBP	low back pain
MSK	musculoskeletal
NE	neuroscience education

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Neuroscience education about pain helps on its own!!

Conclusions: For chronic MSK pain disorders, there is compelling evidence that an educational strategy addressing neurophysiology and neurobiology of pain can have a positive effect on pain, disability, catastrophization, and physical performance.

Louw, A., Diener, I., Butler, D. S., & Puentedura, E. J. (2011). The effect of neuroscience education on pain, disability, anxiety, and stress in chronic musculoskeletal pain. *Archives of Physical Medicine and Rehabilitation, 92*(12), 2041-2056.

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ChirosHub

PA: Understanding Chronic Pain

ARE YOU A CONFIDANT COMMUNICATOR?

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What you tell your patient matters!

JOURNAL OF MANUAL & MANIPULATIVE THERAPY, 2017
VOL. 25, NO. 5, 227–234
https://doi.org/10.1080/10669817.2016.1231860

Taylor & Francis
Taylor & Francis Group

HAAVIK RESEARCH

The effect of manual therapy and neuroplasticity education on chronic low back pain: a randomized clinical trial

Adriaan Louw[a], Kevin Farrell[b], Merrill Landers[c], Martin Barclay[b], Elise Goodman[b], Jordan Gillund[b], Sara McCaffrey[b] and Laura Timmerman[b]

[a]International Spine and Pain Institute, Story City, IA, USA; [b]Department of Physical Therapy Education, Residency Program, St. Ambrose University, Davenport, IA, USA; [c]Department of Physical Therapy, School of Allied Health Sciences, University of Nevada, Las Vegas, NV, USA

ABSTRACT

Objective: To determine if a neuroplasticity educational explanation for a manual therapy technique will produce a different outcome compared to a traditional mechanical explanation. **Methods**: Sixty-two patients with chronic low back pain (CLBP) were recruited for the study. Following consent, demographic data were obtained as well as pain ratings for low back pain (LBP) and leg pain (Numeric Pain Rating Scale), disability (Oswestry Disability Index), fear-avoidance (Fear-Avoidance-Beliefs Questionnaire), forward flexion (fingertips-to-floor), and straight leg raise (SLR) (inclinometer). Patients were then randomly allocated to receive one of two explanations (neuroplasticity or mechanical), a manual therapy technique to their lumbar spine, followed by post-intervention measurements of LBP, leg pain, forward flexion, and SLR. **Results**: Sixty-two patients (female 35 (56.5%)), with a mean age of 60.1 years and mean duration of 9.26 years of CLBP participated in the study. There were no statistically significant interactions for LBP ($p = .325$), leg pain ($p = .172$), and trunk flexion ($p = .818$) between the groups, but SLR showed a significant difference in favor of the neuroplasticity explanation ($p = .041$). Additionally, the neuroplasticity group were 7.2 times (95% confidence interval = 1.8–28.6) more likely to improve beyond the MDC on the SLR than participants in the mechanical group. **Discussion**: The results of this study show that a neuroplasticity explanation, compared to a traditional biomechanical explanation, resulted in a measureable difference in SLR in patients with CLBP when receiving manual therapy. Future studies need to explore if the increase in SLR correlated to changes in cortical maps of the low back.

KEYWORDS
Pain; brain; plasticity; education; manual therapy; straight leg raise; remapping

Discussion: The results of this study show that a **neuroplasticity explanation**, compared to **a traditional biomechanical explanation**, resulted in a measureable difference in SLR in patients with CLBP when receiving manual therapy.

Louw, A., Farrell, K., Landers, M., Barclay, M., Goodman, E., Gillund, J., . . . Timmerman, L. (2017). The effect of manual therapy and neuroplasticity education on chronic low back pain: a randomized clinical trial. Journal of Manual & Manipulative Therapy, 25(5), 227-234.

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Rheumatology 2005;44:509–516
Advance Access publication 11 January 2005
doi:10.1093/rheumatology/keh529

Simulating sensory–motor incongruence in healthy volunteers: implications for a cortical model of pain

C. S. McCabe, R. C. Haigh[1], P. W. Halligan[2] and D. R. Blake

Objectives. Conflict between motor–sensory central nervous processing has been suggested as one cause of pain in those conditions where a demonstrable or local nociceptive aetiology cannot be convincingly established (e.g. complex regional pain syndrome type I, repetitive strain injury, phantom limb pain and focal hand dystonia). The purpose of this study was to discover whether pain could be induced in pain-free healthy volunteers when this conflict was generated transiently in a laboratory setting.

Methods. Forty-one consecutively recruited healthy adult volunteers without a history of motor or proprioceptive disorders performed a series of bilateral upper and lower limb movements whilst viewing a mirror/whiteboard, which created varied degrees of sensory–motor conflict during congruent/incongruent limb movements. A qualitative method recorded any changes in sensory experience.

Results. Twenty-seven subjects (66%) reported at least one anomalous sensory symptom at some stage in the protocol despite no peripheral nociceptive input. The most frequent symptoms occurred when incongruent movement was performed whilst viewing the reflected limb in the mirror condition, the time of maximum sensory–motor conflict. Symptoms of pain were described as numbness, pins and needles, moderate aching and/or a definite pain. Other sensations included perceived changes in temperature, limb weight, altered body image and disorientation. There were indications that some individuals were more susceptible to symptom generation than others.

Conclusions. Our findings support the hypothesis that motor–sensory conflict can induce pain and sensory disturbances in some normal individuals. We propose that prolonged sensory–motor conflict may induce long-term symptoms in some vulnerable subjects.

McCabe et al 2005. Simulating sensory–motor incongruence in healthy volunteers: implications for a cortical model of pain. Rheumatology

135

McCabe et al 2005. Simulating sensory–motor incongruence in healthy volunteers: implications for a cortical model of pain. Rheumatology

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Did you know.....

Pain that you have had for more than 3 months means that your brain has learnt to be in pain, and my job is to retrain your brain out of pain. Because we know that the dysfunction of the spine plays a major role in both causing and maintaining these brain changes.

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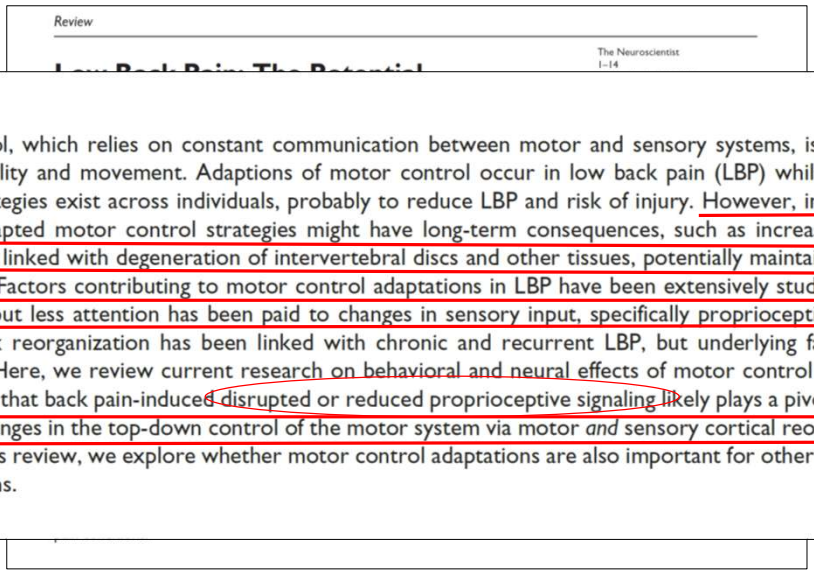
Why is all this important to understand?



Review

The Neuroscientist
1–14

Abstract

Motor control, which relies on constant communication between motor and sensory systems, is crucial for spine posture, stability and movement. Adaptions of motor control occur in low back pain (LBP) while different motor adaption strategies exist across individuals, probably to reduce LBP and risk of injury. However, in some individuals with LBP, adapted motor control strategies might have long-term consequences, such as increased spinal loading that has been linked with degeneration of intervertebral discs and other tissues, potentially maintaining recurrent or chronic LBP. Factors contributing to motor control adaptations in LBP have been extensively studied on the motor output side, but less attention has been paid to changes in sensory input, specifically proprioception. Furthermore, motor cortex reorganization has been linked with chronic and recurrent LBP, but underlying factors are poorly understood. Here, we review current research on behavioral and neural effects of motor control adaptions in LBP. We conclude that back pain-induced disrupted or reduced proprioceptive signaling likely plays a pivotal role in driving long-term changes in the top-down control of the motor system via motor *and* sensory cortical reorganization. In the outlook of this review, we explore whether motor control adaptations are also important for other (musculoskeletal) pain conditions.

Meier, M. L., Vrana, A., & Schweinhardt, P. (2018). Low Back Pain: The Potential Contribution of Supraspinal Motor Control and Proprioception. The Neuroscientist, 1073858418809074. doi:10.1177/1073858418809074

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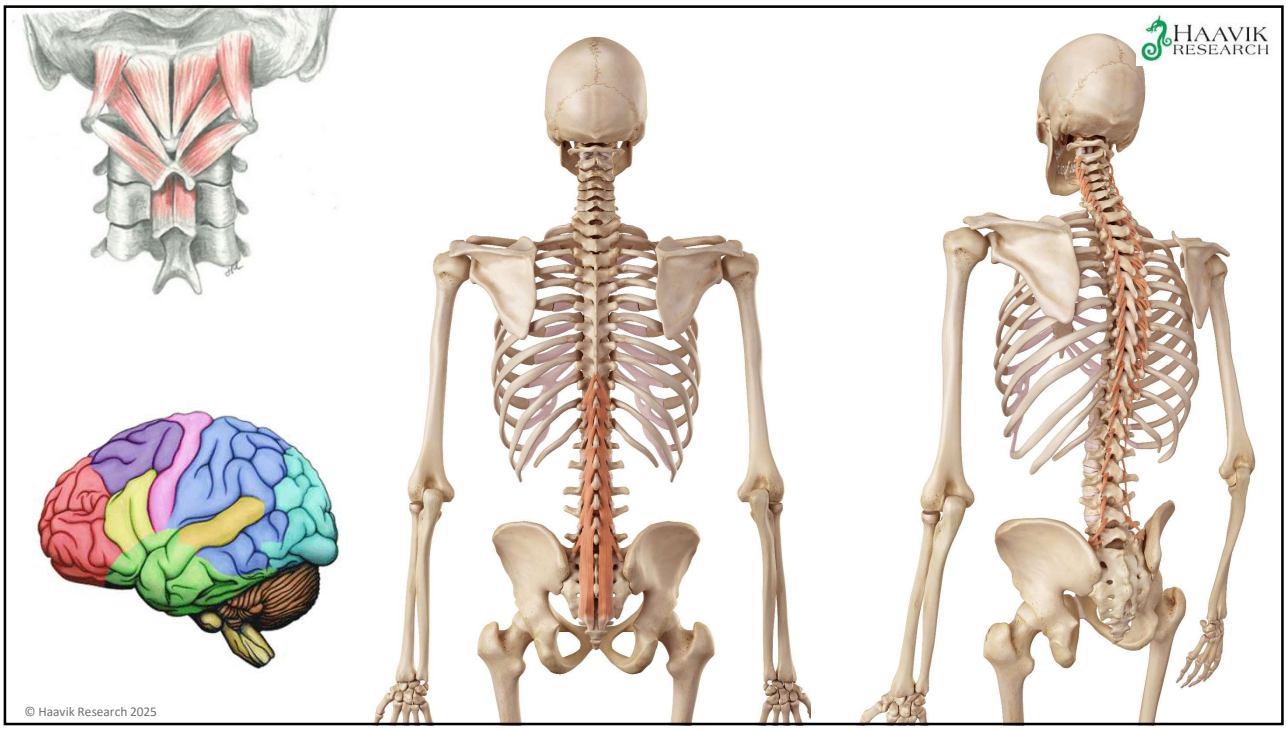
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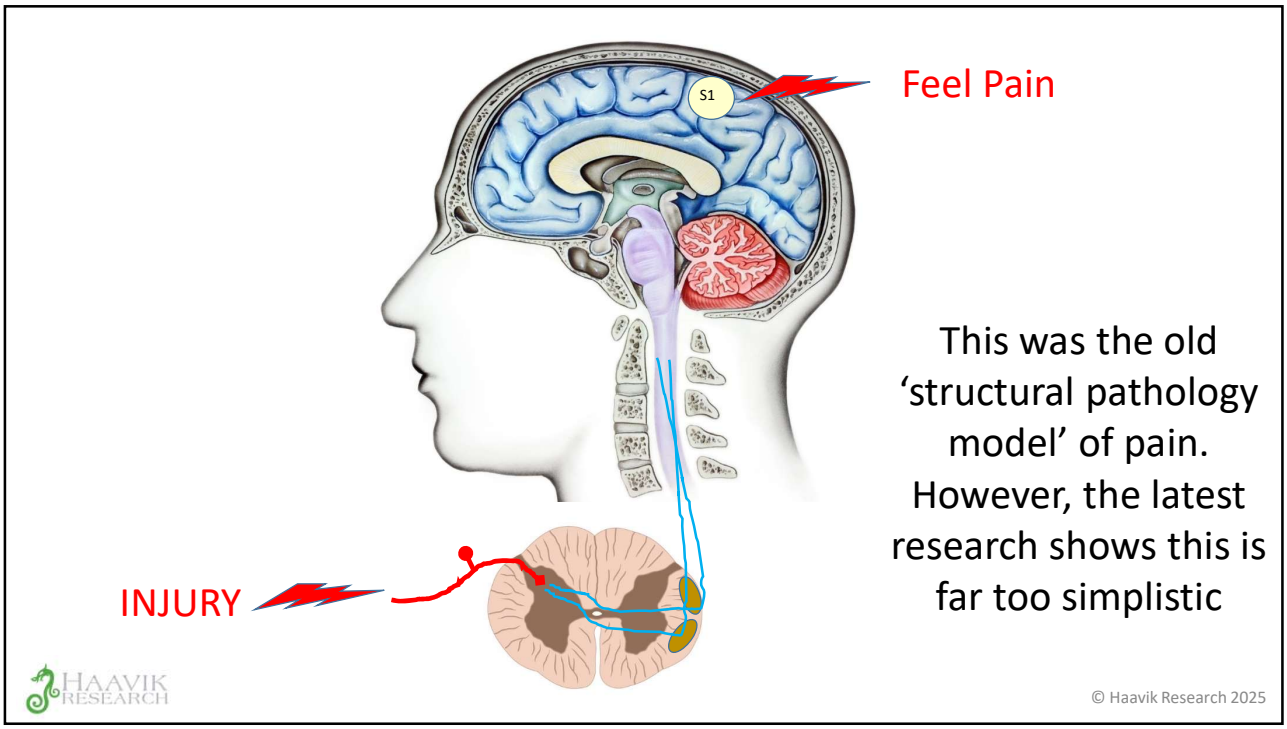
S1
Feel Pain
INJURY
This was the old 'structural pathology model' of pain. However, the latest research shows this is far too simplistic
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Systemic inflammation

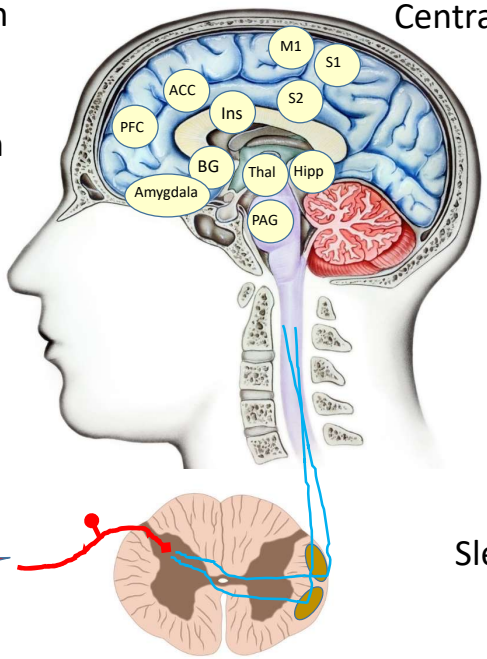
Stress autonomic sympathetic activation

Poverty

Mental health issues

Expectations

Diet



INJURY

Central neuroimmune Influences

Stress HPA activation

Attitudes & Personality

Social problems

Learning effects

Thoughts

Sleep

Microbiome

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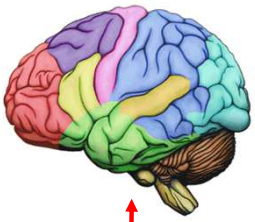
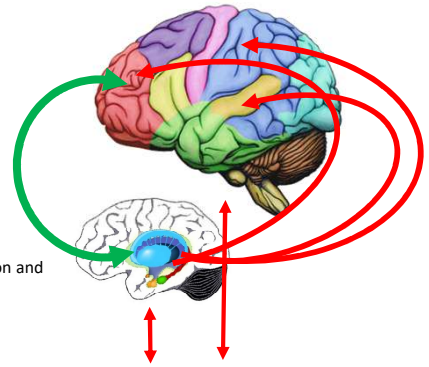
3 months +

Acute Pain vs Chronic Pain



Nociception

INJURY



Nociception

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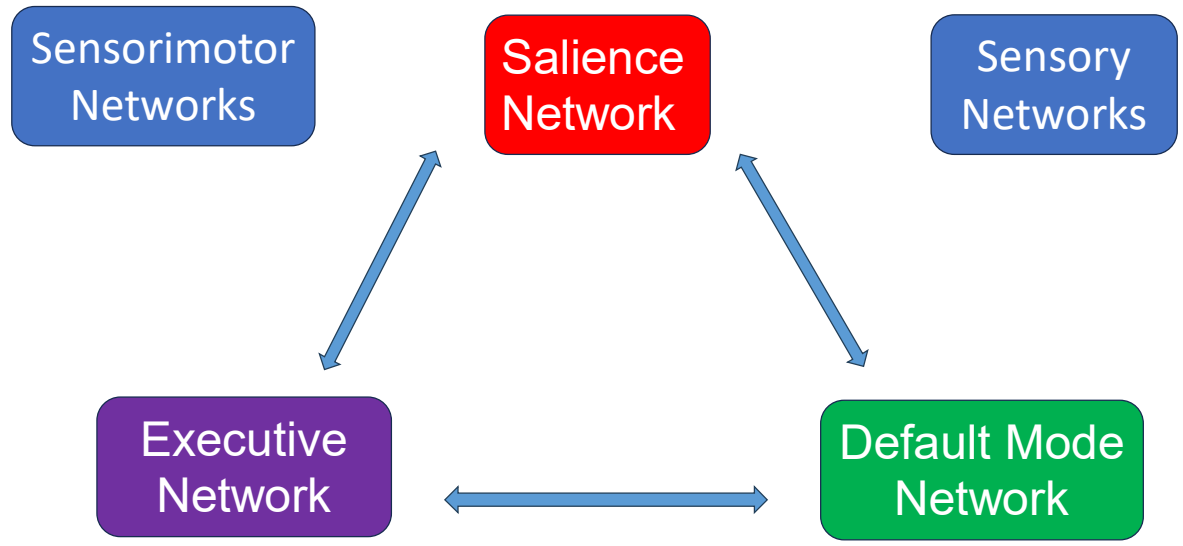
Triple Brain Network



(De Ridder et al. 2022)

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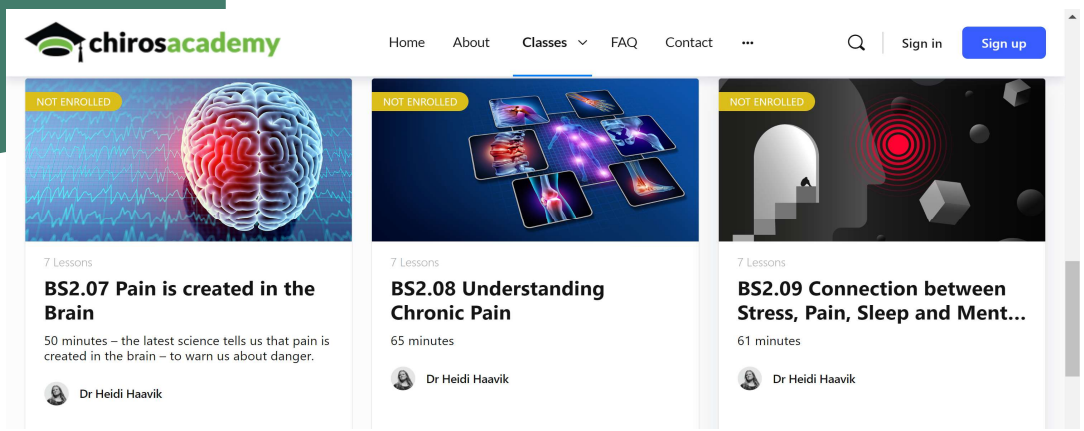
Understanding Pain Campaign

Are you concerned you do not know enough to answer Questions?

ChirosAcademy.com
The science of chiropractic



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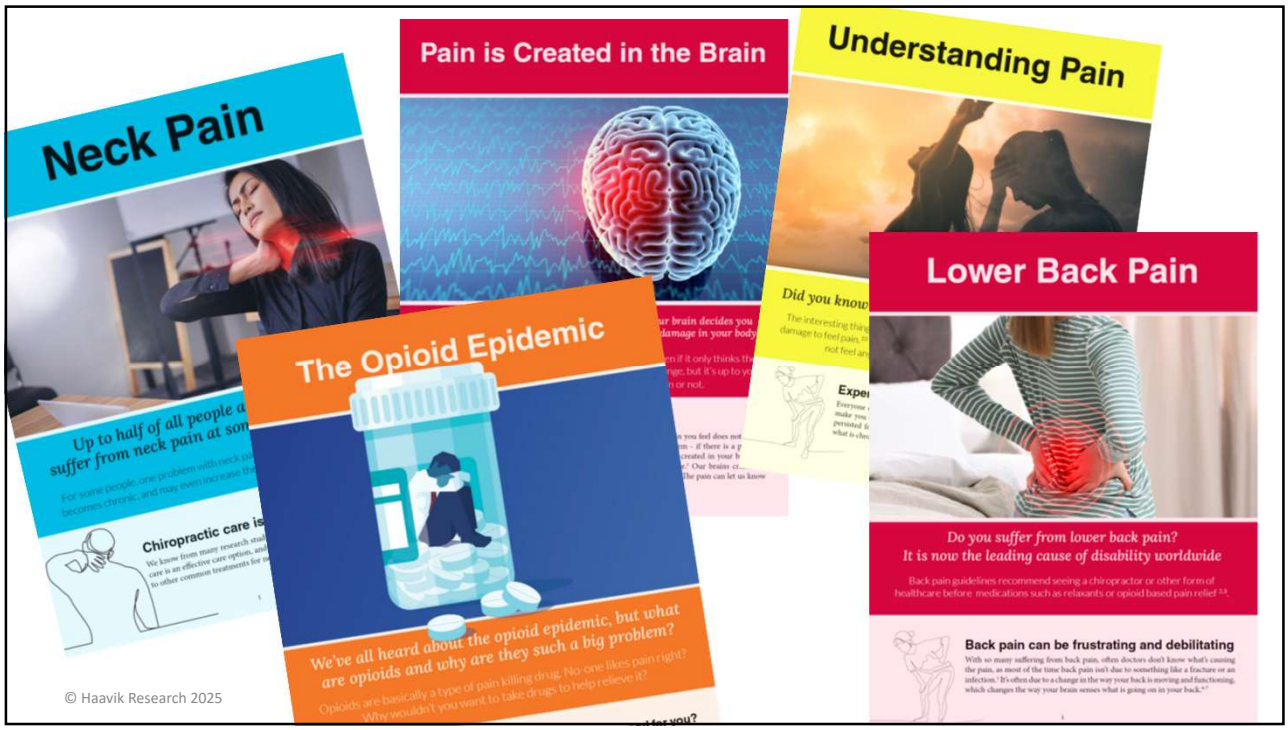

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Did you know...

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HAAVIK RESEARCH

Current scientific understanding is showing us that how your spine "talks" to your brain is vitally important to enable your brain to control and accurately move your head, neck and back properly.

If your spine is not working properly, it does not "talk" to the brain properly, and this is known to both cause and maintain neck and back pain.

My job as a chiropractor is to train your spine back into proper function, so it can "talk" to you brain properly.

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HAAVIK RESEARCH

We don't yet know exactly what symptoms your subluxations will be causing for you!

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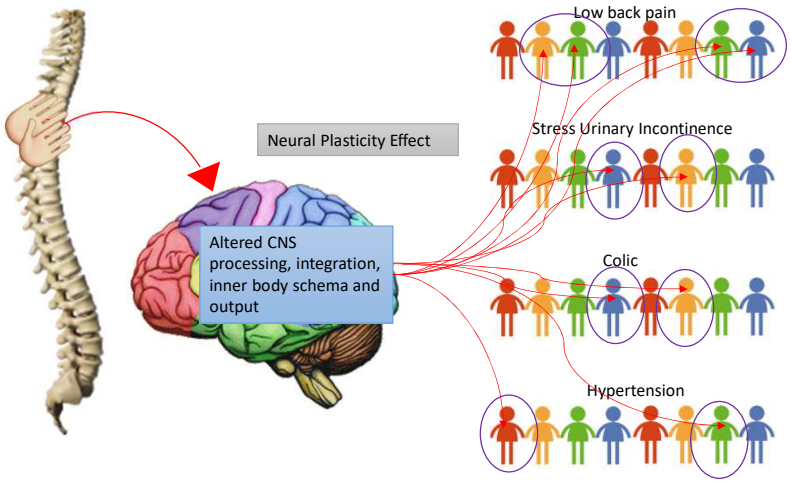
HAAVIK RESEARCH

Responders vs Non-responders



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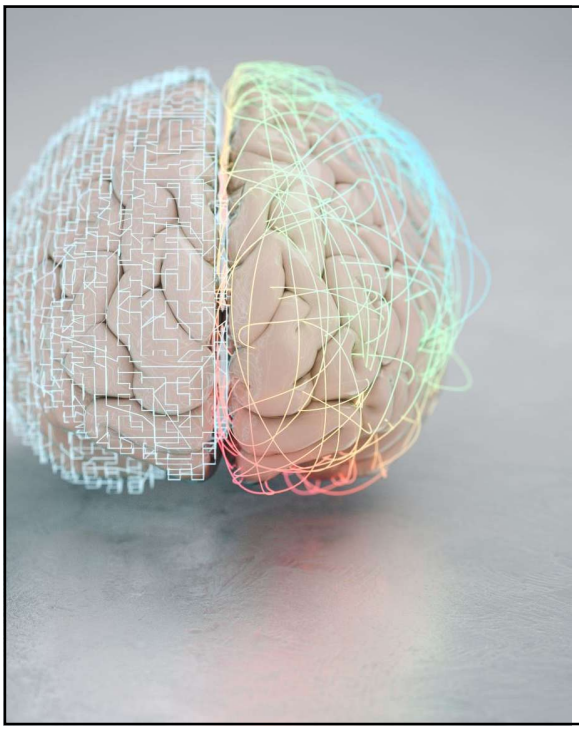

HAAVIK RESEARCH

The Short Version

"Research indicates that chiropractic care, that includes the adjustment of vertebral subluxations, enhances brain-body communication, allowing your brain to more accurately interpret internal and external signals. This improved perception of what is happening inside you and around you enables your brain to optimize bodily functions and adapt more effectively to your environment."

Heidi Haavik

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Bruce Lipton & Heidi Haavik

https://www.youtube.com/watch?v=WDWS3Xgj4WM

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Implications for question answers

- You do not need to adjust where they hurt, but instead where the subluxation is

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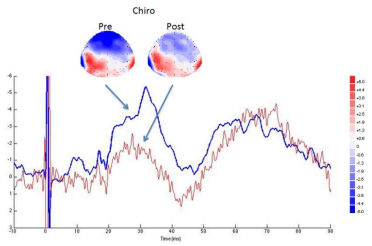
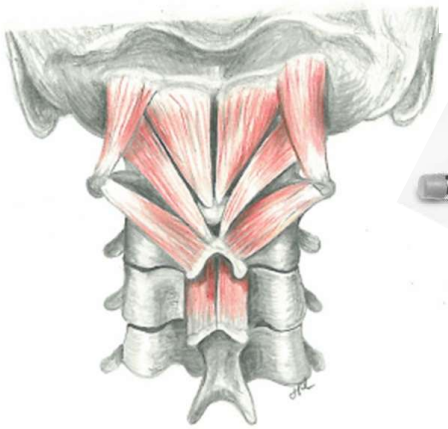
Does specificity matter?





Imran Khan Niazi, Muhammad Samran Navid, Christopher Merkle, Imran Amjad, Nitika Kumari, Robert J. Trager, Kelly Holt, Heidi Haavik. 2024 A randomized controlled trial comparing different sites of high-velocity low amplitude thrust on sensorimotor integration parameters. Scientific Report. 14(1), p.1159.

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Implications for question answers

- Pain is a danger warning system, not necessarily reflective of where the problem is.

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HAAVIK RESEARCH

Do you now think it would be a good idea to get yourself a brain model for your practice?

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Cool Upcoming Research

- Dr Jenna Duher's PhD project at Auckland University
- Baby RCT
- Infant babies
- 3 months care
- EEG
- Movement measures at 6 months

Jenna Duehr

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Enlighten the world about the science of the spine

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