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Platinum Neuro Integration 3

Adaptation & Regulation: How Change Becomes Lasting



NEW ZEALAND COLLEGE of CHIROPRACTIC

TE KĀRETI KAIKOROHITI o AOTEAROA

1

Any Questions Regarding Membership?

support@chiroshub.com

- Technical Support - Dave



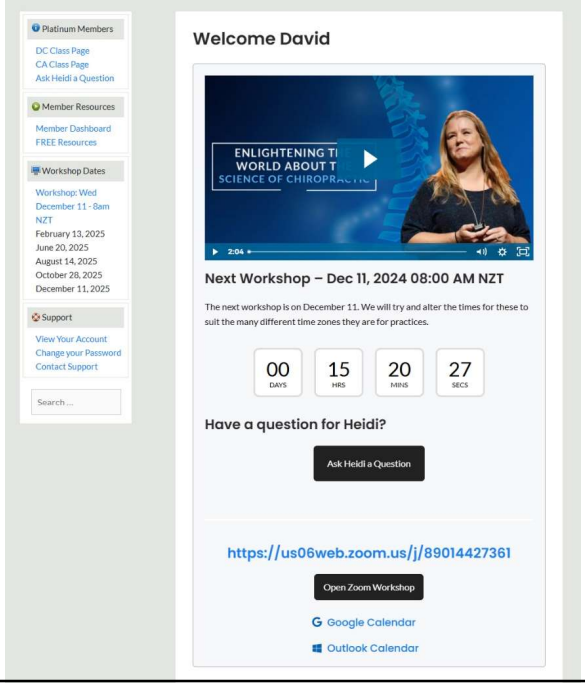


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Platinum Member on ChirosHub

- The Platinum Member also has a dedicated platinum member site on ChirosHub.com
- Next life workshop countdown
- Question for Heidi
- Next workshop link
- Prefrontal cortex poster
- Cerebellum poster

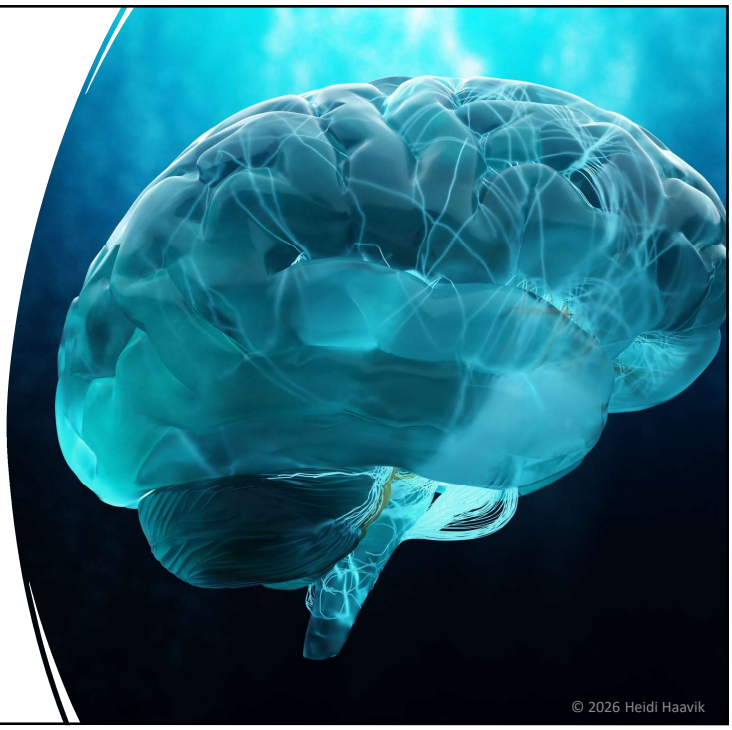


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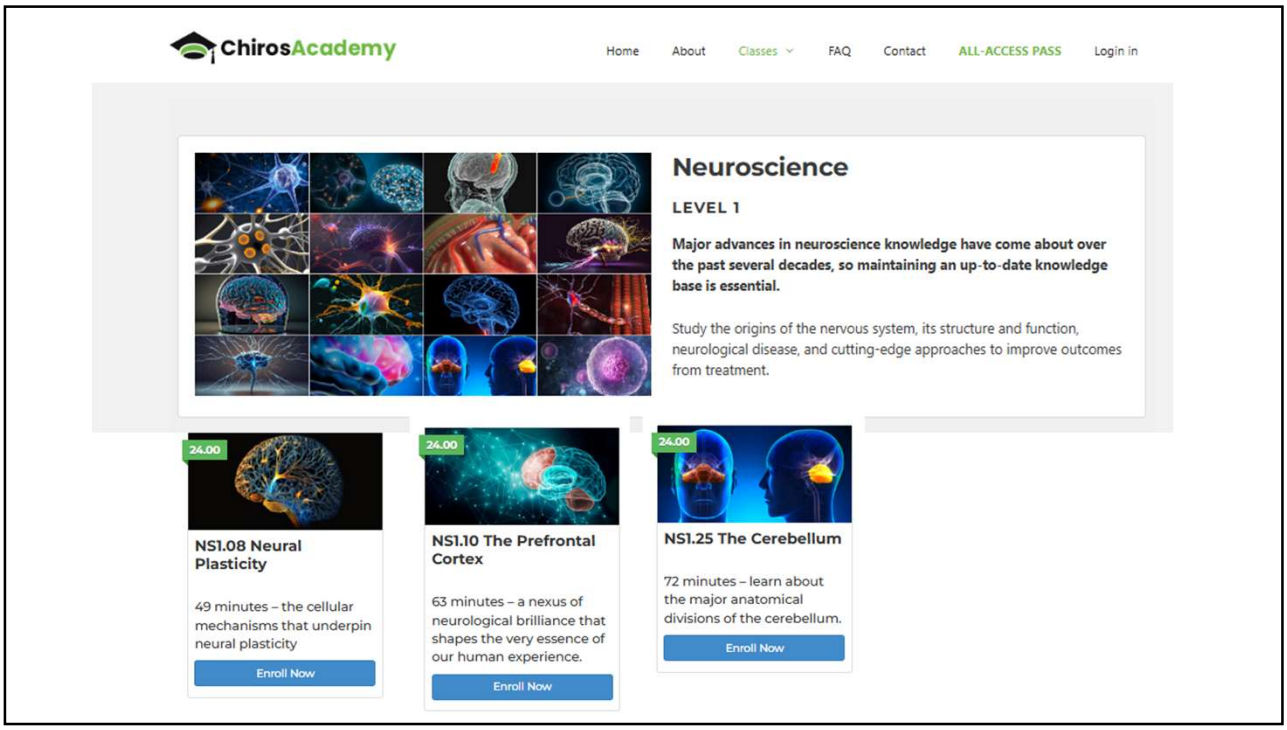
Purpose

Explain where and how longer-term change is coordinated in the brain.



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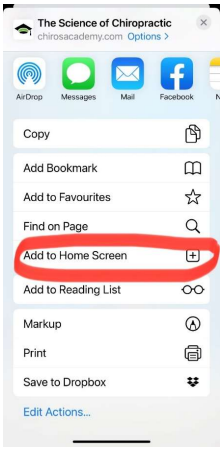
On your smart phone click on Safari and type in ChirosAcademy.com

2



Click on the up arrow

3



Click on 'Add to Home Screen'

4



ChirosAcademy will now appear as an App on your phone!

6



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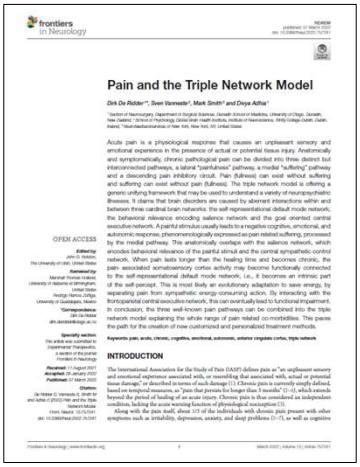
Readings


brain sciences

MDPI

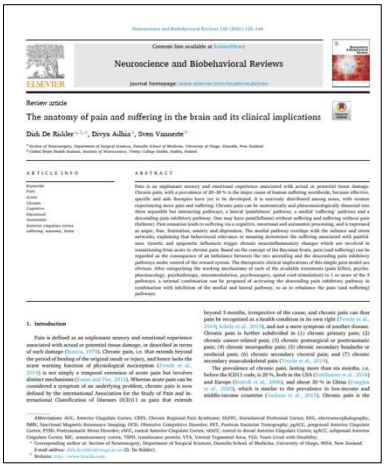
Article

Neuroplastic Responses to Chiropractic Care: Broad Impacts on Pain, Mood, Sleep, and Quality of Life


frontiers in Neurology

REVIEW

Pain and the Triple Network Model


Neuroscience and Biobehavioral Reviews

Review article

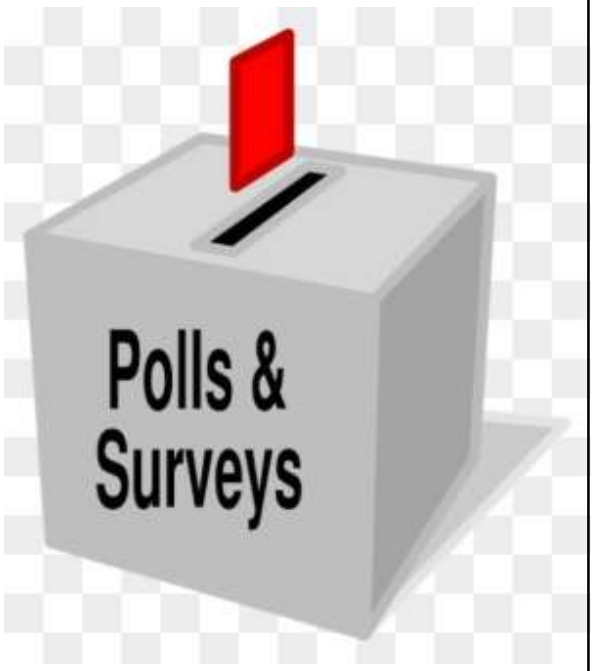
The anatomy of pain and suffering in the brain and its clinical implications

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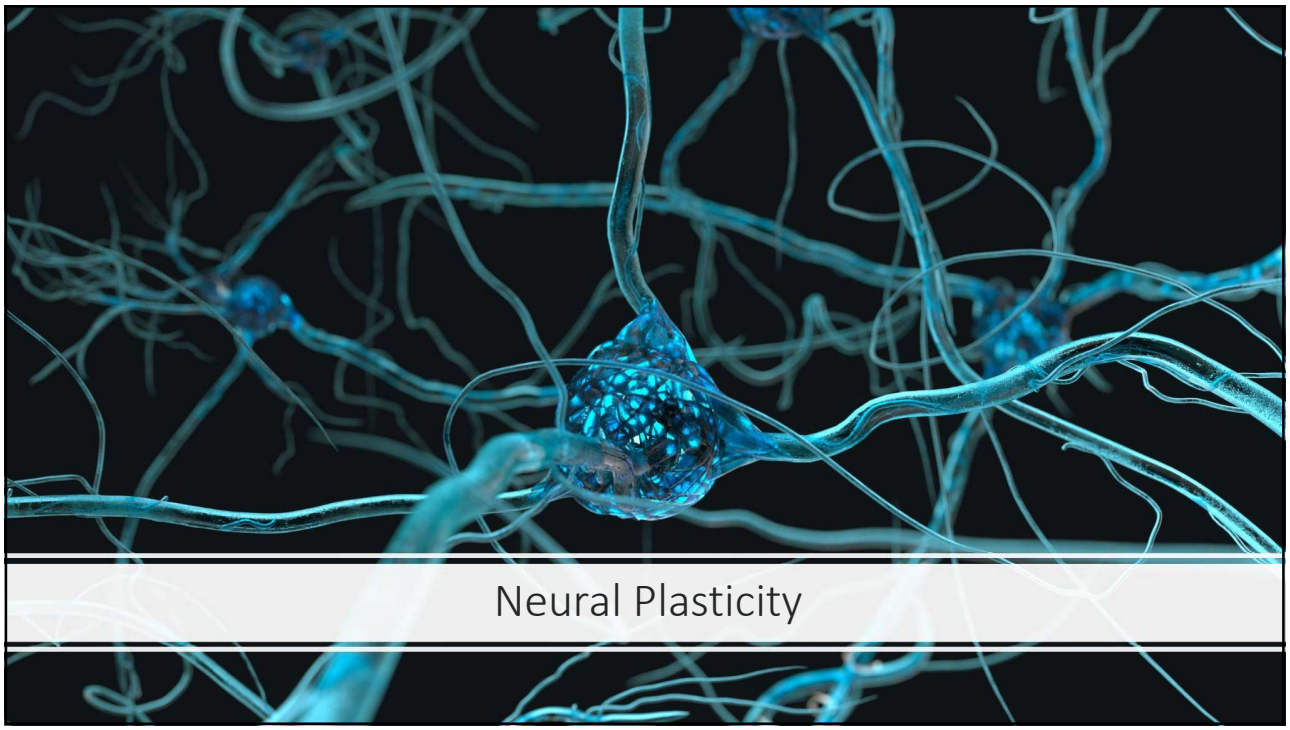
Have you read these articles?

I am very conscious that I'm covering a lot of information and I'm wondering if we should slow down a bit so pleas answer honestly



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Neural Plasticity

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Short Term vs Long Term Plasticity

Short-term plasticity refers to the temporary changes in neural activity that occur within seconds to minutes of a neural event.

This type of plasticity is typically mediated by changes in the release or uptake of neurotransmitters at the synapse and can affect the strength and duration of the neural signal.

Long-term plasticity, on the other hand, refers to more permanent changes in neural activity that occur over hours to days or even longer.

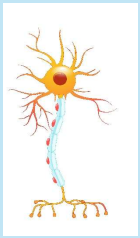
This type of plasticity is typically mediated by changes in the structure or function of neural connections and can result in lasting changes in behavior or cognition.

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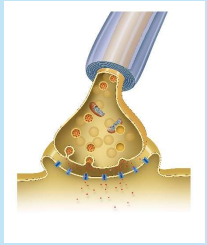
Cellular Level

Structural Plasticity



Number, size, density and/or morphology of:
- Dendritic spines
- Axons
- Synapses

Functional (Synaptic)



- Long term potentiation
- Long term depression
- Homeostatic plasticity

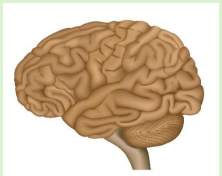
Network Level

Structural network Plasticity



- Gray matter density changes
- Changes in size of nuclei, ganglia etc.

Functional Network Plasticity



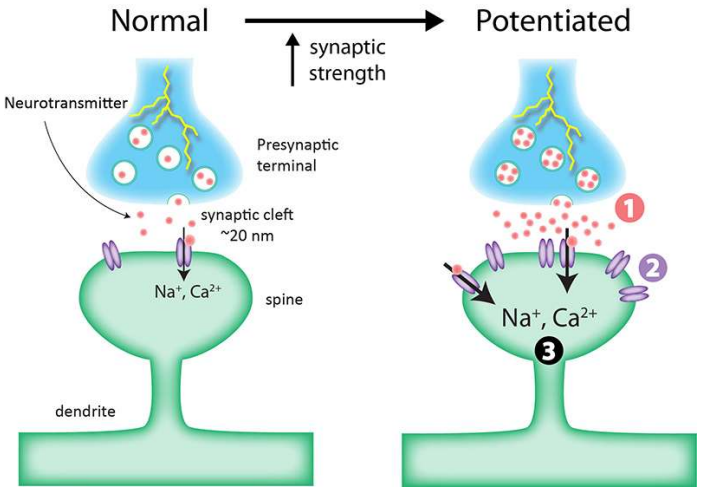
- Sensory maps
- Motor maps
- Inner body schema
- External world schema

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Synaptic Plasticity Mechanisms

- Changes in neurotransmitter release from pre-synaptic membrane.
- Changes in number and function of receptors on post-synaptic membrane.



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Homeostasis vs Growth & Development

Homeostasis is the maintenance of a stable internal environment, and it refers to the brain's ability to maintain an optimal balance between inputs and outputs, and to keep physiological and neural activity within certain parameters.



Neural plasticity is the brain's ability to adapt and change throughout life. Neural plasticity allows the brain to reorganize itself in response to various stimuli or experiences, and it can manifest as changes in the strength and number of synapses, the formation of new neural connections, or the creation of new neurons.

This is why it can be hard to learn new skills. It takes time and repetition because you need to overcome the pull of homeostasis.

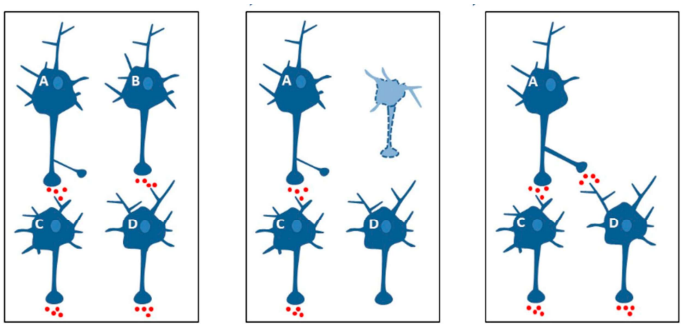
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Structural Plasticity

- Structural plasticity refers to the ability of neurons to change their physical structure over time in response to changes in the environment or experiences.
- This can involve changes in the number, size, or shape of dendrites, axons, or synapses.

Growing new synapses



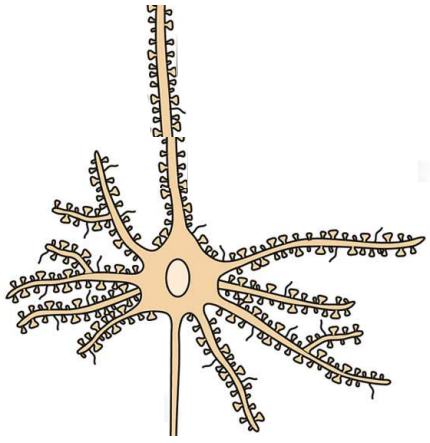
Normal Condition | Injury of Neuron B | Growth of New Synapse Between A and D

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Structural Plasticity - Dendritic Spine Density Changes

- Dendritic spines are small protrusions on dendrites that receive synaptic input from other neurons.
- The number and distribution of dendritic spines can vary widely depending on a variety of factors, including developmental stage, neural activity, and experience.
- Changes in spine density can occur relatively quickly and can have significant effects on neural processing and behavior.



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The Role of Glial Cells in Neural Plasticity

- There are three major classes of glia in the central nervous system (CNS) that play a major role in Neural Plasticity:
    1. Astrocytes
    2. Microglia and
    3. Oligodendrocytes

- These cells have dynamic morphological and functional properties.
- They constantly surveil neural activity throughout life.
- They are vital for sculpting synaptic plasticity.

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Plasticity – positive or negative?

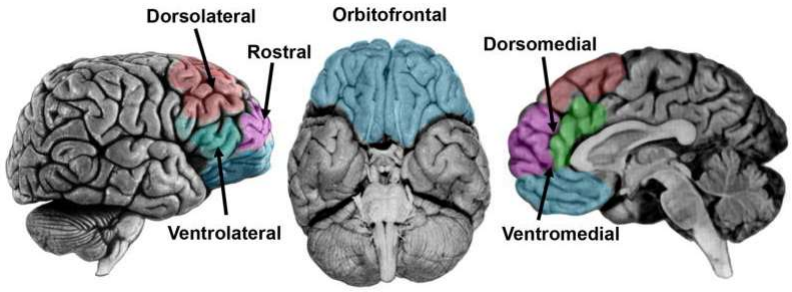
Maladaptive plasticity

Adaptive plasticity

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Prefrontal cortex



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The Prefrontal Cortex

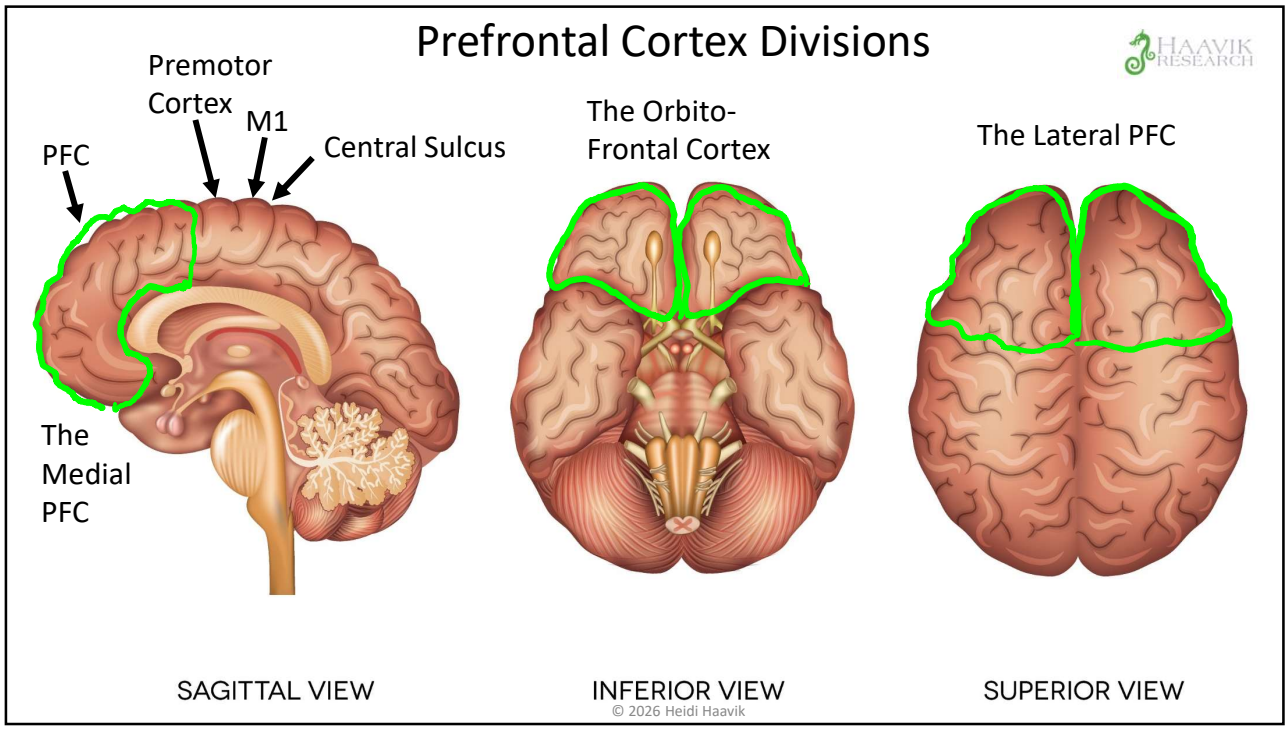
- Multi-modal Integration
- Sensorimotor Integration
- Motor Control
- Preparation of Movement
- Pain & Stiffness
- Executive Functions (Intelligence)
- Planning & Decision-making
- Inhibitory Control
- Selective Attention
- Working Memory
- Error Monitoring
- Complex Sequences of Actions
- Anticipation & Motivation



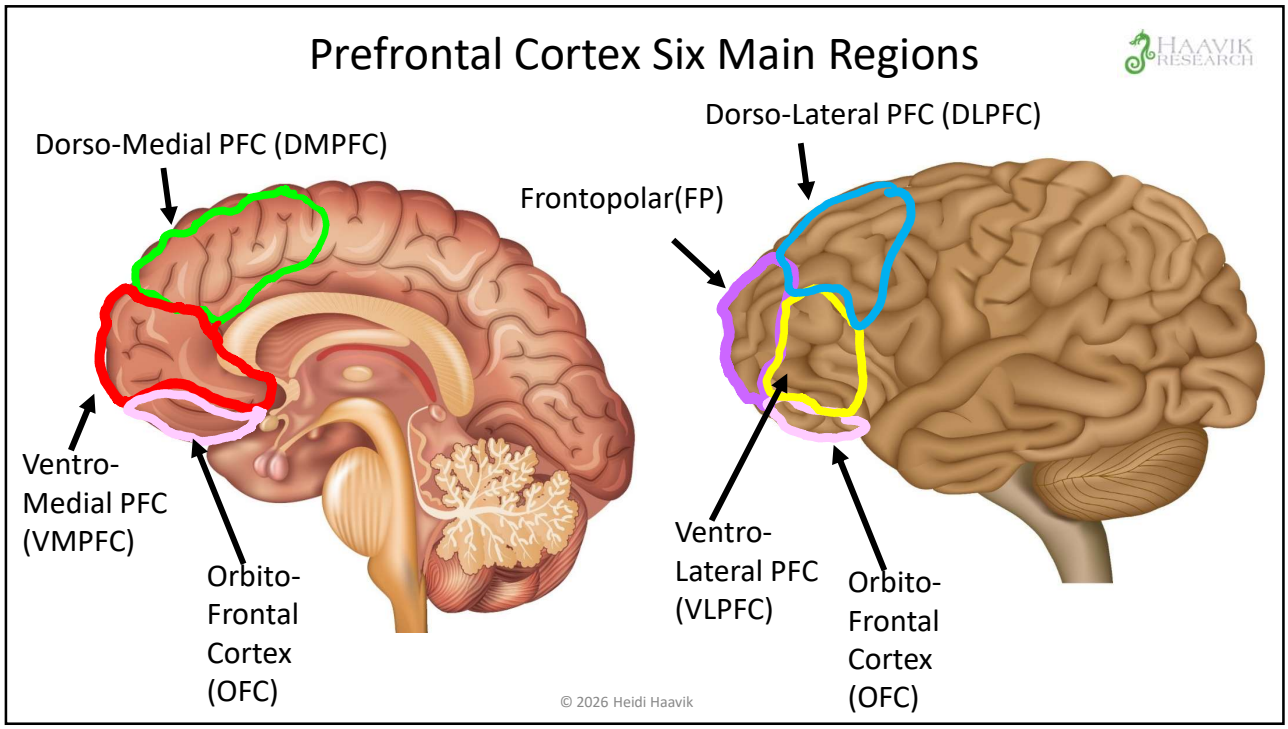
- Emotional Control
- Mental Health
- Apathy, Depression, Anxiety, Euphoria
- Empathy & Moral behavior
- Autonomic Nervous System Control
- Endocrine Control (HPA)
- Stress Response
- BP, HR, HRV, Breathing Rate
- Gastrointestinal Problems
- Inflammation
- Sleep
- Immune system

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Prefrontal Cortex Divisions
HAAVIK RESEARCH
Premotor Cortex
M1
PFC
Central Sulcus
The Orbito-Frontal Cortex
The Lateral PFC
The Medial PFC
SAGITTAL VIEW
INFERIOR VIEW
SUPERIOR VIEW
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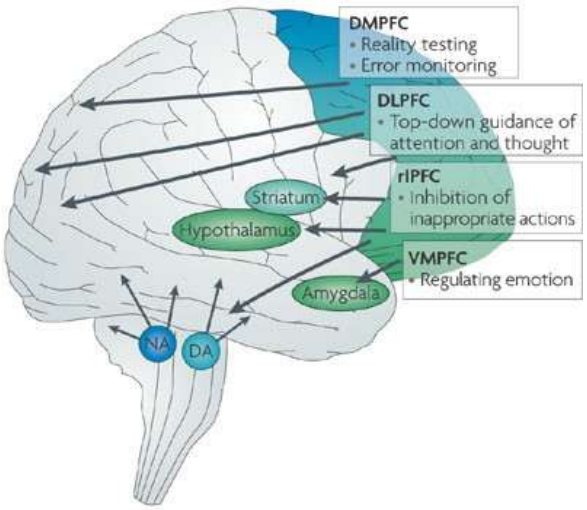
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Prefrontal Cortex Six Main Regions
HAAVIK RESEARCH
Dorso-Medial PFC (DMPFC)
Dorso-Lateral PFC (DLPFC)
Frontopolar(FP)
Ventro-Medial PFC (VMPFC)
Orbito-Frontal Cortex (OFC)
Ventro-Lateral PFC (VLPFC)
Orbito-Frontal Cortex (OFC)
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Without Stress

- Thinks before acting
- Maintains attention
- Uses working memory
- Plans and prioritises
- Makes flexible decisions
- Inhibits inappropriate responses
- Regulates emotions
- Evaluates threat in context
- Considers consequences
- Supports goal directed behaviour



Bottom line: "I can think, evaluate and choose my response."

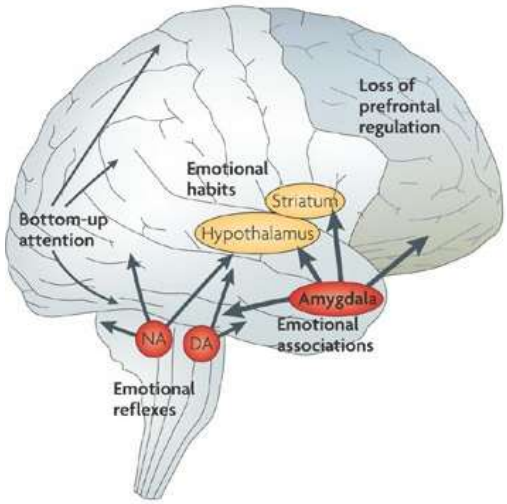
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With Stress

- Working memory deteriorates
- Attention becomes threat biased
- Flexible thinking decreases
- Planning becomes harder
- Decision making changes
- Impulse control decreases
- Emotional regulation weakens
- Threat responses gain influence
- Habitual responses become more dominant
- Behaviour becomes increasingly reactive

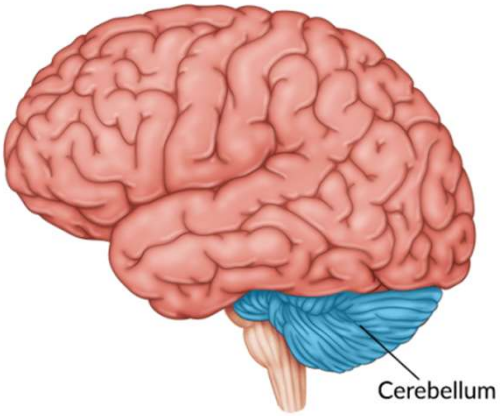
Bottom line: "React first. Think later."



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The Cerebellum

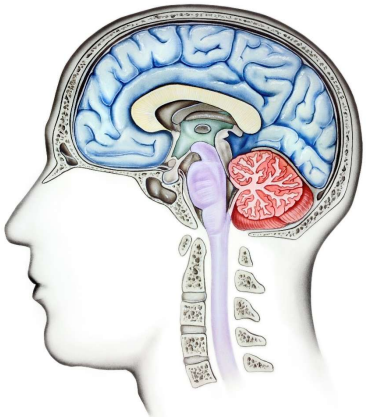


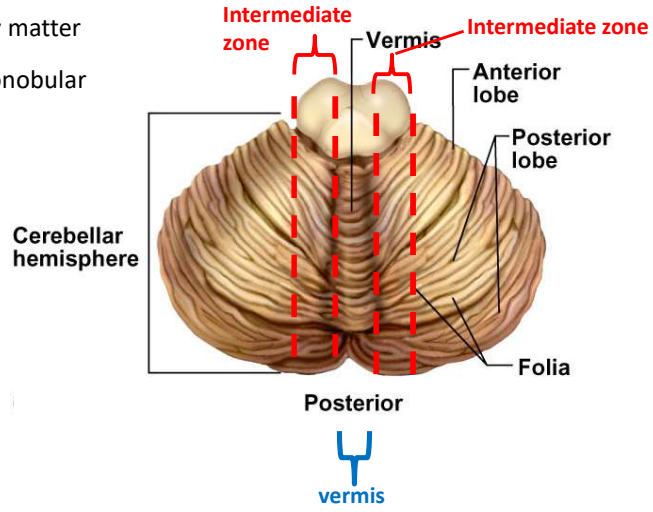
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The Cerebellum

- Right and left hemispheres connected by vermis
- Parallel surface folds called folia are gray matter
- Three lobes; Anterior, Posterior, Flocculonobular





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Sensorimotor Integration; World & Body Schema

- The Cerebellum acts as a unique hub in the CNS to accommodate and integrate both afferent and efferent inputs (i.e., sensorimotor integration) from almost the entire brain, including:
  - Exteroceptive inputs (e.g., vestibular, acoustic, visual)
  - Interoceptive inputs (e.g., somatosensory)
- **Body Schema:** The cerebellum contributes to the internal representation of the body, integrating sensory feedback to maintain an accurate sense of body position and movement, both vital for spatial awareness and balance.
- **World Schema:** By processing sensory inputs from the environment, the cerebellum helps form a mental model of the external world, allowing for effective interaction with our surroundings.
- It aids in predicting the sensory consequences of movements, helping to create a dynamic model of both the body and environment that adjusts based on experience and context.

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Motor Control

Coordination and Adaptation

- The cerebellum integrates sensory information (like visual, auditory, and proprioceptive inputs) to fine-tune motor commands, ensuring smooth and accurate movements.
- The cerebellum facilitates motor adaptation, allowing individuals to adjust their movements in response to changing environments or conditions (e.g., walking on uneven surfaces).

Error Detection and Fine turning

- It continuously compares intended movements with actual outcomes, helping to correct errors in real-time and refine motor skills through feedback loops.

Timing and Rhythm

- Is essential for timing aspects of movement, allowing for coordinated sequences, such as those seen in activities like playing an instrument or sports.

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Motor Learning

- The cerebellum is involved in the acquisition of new motor skills, helping to automate movements through practice and repetition.
- It plays a role in storing motor memories, helping to retain learned movements for future performance, thereby enhancing efficiency and speed.
- The cerebellum helps encode learned motor sequences, facilitating the automatic execution of complex movements without conscious effort over time.

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Autonomic Interactions

- The cerebellum receives afferents from the autonomic nervous system.
- It fine-tunes cortical arousal by acting on a distributed network of forebrain regions.
- The cerebellum is involved in the control of voluntary and autonomic rhythmic behaviors (e.g., modulation of breathing).
- Plays a key role in the central autonomic network (CAN) that includes higher levels of cortical and subcortical brain structures along with cerebellum and brainstem for both bottom-up and top-down regulation of autonomic responses.



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Cognition & Language

- Cerebellar lesions (particularly in the posterior lobe) of the cerebellum lead to:
  - Visuospatial and language dysfunctions
  - Working memory problems
  - Abstract reasoning issues
  - Social cognition issues
  - Problem-solving difficulty
- Language problems include difficulty with:
  - Verbal fluency
  - Melodic and rhythmic aspects of speech
  - Finding the right words, particularly nouns
  - Constructing grammatically correct sentences



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Pain processing

- Modulation of pain perception
- Coordination of pain responses
- Implicated in chronic Pain
- Emotional and cognitive aspects of pain experience



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Emotional Control, Social & Mental Health

- Cerebellar lesions affecting the vermal and paravermal regions lead to:
  - Inappropriate behavior, mood disturbances including disinhibitions as well as regressive or compulsive behavior.
  - Disorders of attentional and emotional control, deficits in social behavior as well as autism and psychosis spectrum disorders.
- The cerebellum is connected with the hypothalamus and ACC and is involved in automatic motor aspects of emotional processing, including facial expressions and the startle, withdrawal, avoidance reflexes, and pain processing.
- Cerebellar participation in autonomic pathways and emotional regulation is indicated by impaired cardiovascular and autonomic responses during emotional processing in the presence of cerebellar lesions.



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ADEXI

- Check email for information sheet with simple scoring, clinical interpretation, appropriate uses and limitations.
- ADEXI can be particularly useful when a patient reports:
  - Difficulty concentrating or holding information in mind
  - Forgetting instructions, exercises or appointments
  - Difficulty planning, organising or completing activities with several steps
  - Becoming overwhelmed when several things need attention
  - Difficulty starting tasks despite intending to do them
  - Acting or responding before having time to think
  - Difficulty regulating behaviour when tired, stressed or in pain

ADULT EXECUTIVE FUNCTIONING INVENTORY (ADEXI)
SELF-REPORT VERSION

Below you will find a number of statements. Please circle a number to the right of each statement to indicate how well that statement describes how you are as a person. People that you know might feel differently about you – we want to know what <u>you</u> think about yourself. Try to respond as honestly as possible.

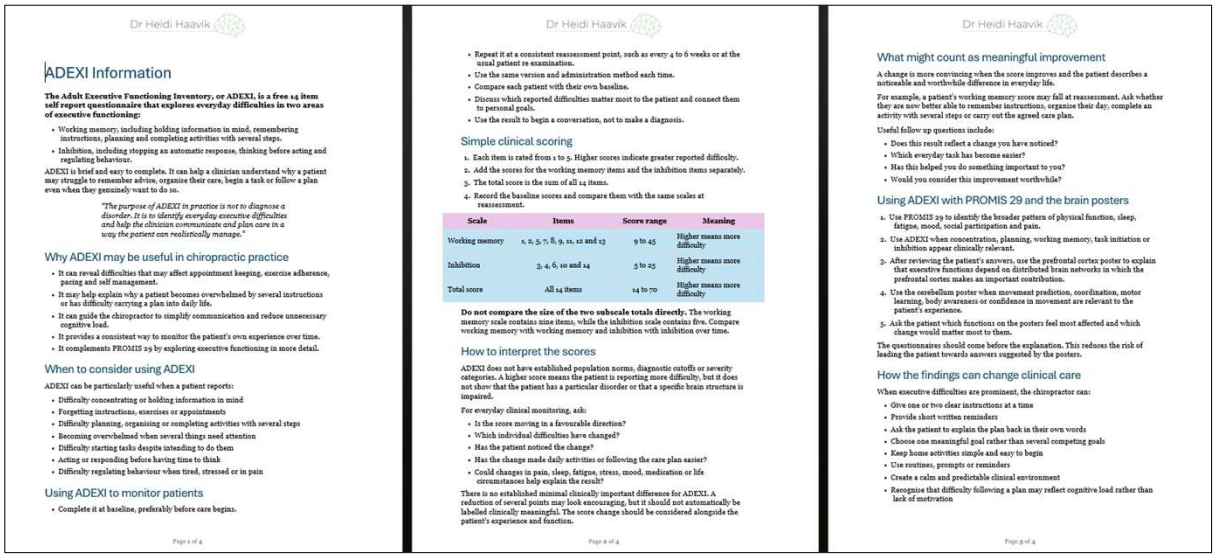
	Definitely not true 1	Not true 2	Partially true 3	True 4	Definitely true 5

1.	I have difficulty remembering lengthy instructions	1	2	3	4	5
2.	I sometimes have difficulty remembering what I am doing in the middle of an activity	1	2	3	4	5
3.	I have a tendency to do things without first thinking about what could happen	1	2	3	4	5
4.	I sometimes have difficulty stopping myself from doing something that I like even though someone tells me that it is not allowed.	1	2	3	4	5
5.	When someone asks me to do several things, I sometimes remember only the first or last	1	2	3	4	5
6.	I sometimes have difficulty refraining from smiling or laughing in situations where it is inappropriate	1	2	3	4	5
7.	I have difficulty coming up with a different way of solving a problem when I get stuck	1	2	3	4	5
8.	When someone asks me to fetch something, I sometimes forget what I am supposed to fetch	1	2	3	4	5
9.	I have difficulty planning for an activity (e.g., remembering to bring everything necessary when going on a trip/to work/to school)	1	2	3	4	5
10.	I sometimes have difficulty stopping an activity that I like (e.g., I watch TV or sit in front of the computer in the evening even though it is time to go to bed)	1	2	3	4	5
11.	I sometimes have difficulty understanding verbal instructions unless I am also shown <u>how</u> to do something	1	2	3	4	5
12.	I have difficulties with tasks or activities that involve several steps	1	2	3	4	5
13.	I have difficulty thinking ahead or learning from experience	1	2	3	4	5
14.	People that I meet sometimes seem to think that I am more lively/wilder compared to other people my age	1	2	3	4	5

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ADEXI Information Sheet



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ADEXI Information

The Adult Executive Functioning Inventory, or ADEXI, is a free 14 item self report questionnaire that explores everyday difficulties in two areas of executive functioning:

- Working memory, including holding information in mind, remembering instructions, planning and completing activities with several steps.
- Inhibition, including stopping an automatic response, thinking before acting and regulating behaviour.

ADEXI is brief and easy to complete. It can help a clinician understand why a patient may struggle to remember advice, organise their care, begin a task or follow a plan even when they genuinely want to do so.

"The purpose of ADEXI in practice is not to diagnose a disorder. It is to identify everyday executive difficulties and help the clinician communicate and plan care in a way the patient can realistically manage."

Why ADEXI may be useful in chiropractic practice

- It can reveal difficulties that may affect appointment keeping, exercise adherence, pacing and self management.
- It may help explain why a patient becomes overwhelmed by several instructions or has difficulty carrying a plan into daily life.
- It can guide the chiropractor to simplify communication and reduce unnecessary cognitive load.
- It provides a consistent way to monitor the patient's own experience over time.
- It complements PROMIS 29 by exploring executive functioning in more detail.

When to consider using ADEXI

ADEXI can be particularly useful when a patient reports:

- Difficulty concentrating or holding information in mind
- Forgetting instructions, exercises or appointments
- Difficulty planning, organising or completing activities with several steps
- Becoming overwhelmed when several things need attention
- Difficulty starting tasks despite intending to do them
- Acting or responding before having time to think
- Difficulty regulating behaviour when tired, stressed or in pain

Using ADEXI to monitor patients

- Complete it at baseline, preferably before care begins.

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- Repeat it at a consistent reassessment point, such as every 4 to 6 weeks or at the usual patient re examination.
- Use the same version and administration method each time.
- Compare each patient with their own baseline.
- Discuss which reported difficulties matter most to the patient and connect them to personal goals.
- Use the result to begin a conversation, not to make a diagnosis.

Simple clinical scoring

1. Each item is rated from 1 to 5. Higher scores indicate greater reported difficulty.
2. Add the scores for the working memory items and the inhibition items separately.
3. The total score is the sum of all 14 items.
4. Record the baseline scores and compare them with the same scales at reassessment.

Scale	Items	Score range	Meaning
Working memory	1, 2, 5, 7, 8, 9, 11, 12 and 13	9 to 45	Higher means more difficulty
Inhibition	3, 4, 6, 10 and 14	5 to 25	Higher means more difficulty
Total score	All 14 items	14 to 70	Higher means more difficulty

Do not compare the size of the two subscale totals directly. The working memory scale contains nine items, while the inhibition scale contains five. Compare working memory with working memory and inhibition with inhibition over time.

How to interpret the scores

ADEXI does not have established population norms, diagnostic cutoffs or severity categories. A higher score means the patient is reporting more difficulty, but it does not show that the patient has a particular disorder or that a specific brain structure is impaired.

For everyday clinical monitoring, ask:

- Is the score moving in a favourable direction?
- Which individual difficulties have changed?
- Has the patient noticed the change?
- Has the change made daily activities or following the care plan easier?
- Could changes in pain, sleep, fatigue, stress, mood, medication or life circumstances help explain the result?

There is no established minimal clinically important difference for ADEXI. A reduction of several points may look encouraging, but it should not automatically be labelled clinically meaningful. The score change should be considered alongside the patient's experience and function.

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What might count as meaningful improvement

A change is more convincing when the score improves and the patient describes a noticeable and worthwhile difference in everyday life.

For example, a patient's working memory score may fall at reassessment. Ask whether they are now better able to remember instructions, organise their day, complete an activity with several steps or carry out the agreed care plan.

Useful follow up questions include:

- Does this result reflect a change you have noticed?
- Which everyday task has become easier?
- Has this helped you do something important to you?
- Would you consider this improvement worthwhile?

Using ADEXI with PROMIS 29 and the brain posters

1. Use PROMIS 29 to identify the broader pattern of physical function, sleep, fatigue, mood, social participation and pain.
2. Use ADEXI when concentration, planning, working memory, task initiation or inhibition appear clinically relevant.
3. After reviewing the patient's answers, use the prefrontal cortex poster to explain that executive functions depend on distributed brain networks in which the prefrontal cortex makes an important contribution.
4. Use the cerebellum poster when movement prediction, coordination, motor learning, body awareness or confidence in movement are relevant to the patient's experience.
5. Ask the patient which functions on the posters feel most affected and which change would matter most to them.

The questionnaires should come before the explanation. This reduces the risk of leading the patient towards answers suggested by the posters.

How the findings can change clinical care

When executive difficulties are prominent, the chiropractor can:

- Give one or two clear instructions at a time
- Provide short written reminders
- Ask the patient to explain the plan back in their own words
- Choose one meaningful goal rather than several competing goals
- Keep home activities simple and easy to begin
- Use routines, prompts or reminders
- Create a calm and predictable clinical environment
- Recognise that difficulty following a plan may reflect cognitive load rather than lack of motivation

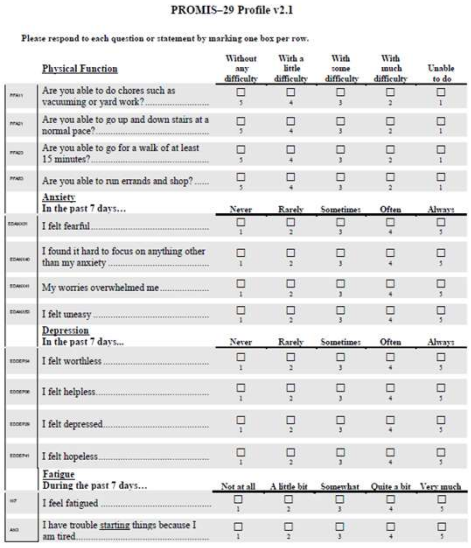
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PROMIS-29

- Check email for information sheet with simple scoring, clinical interpretation, appropriate uses and limitations.
- Measures QOL in all your patients



PROMIS–29 Profile v2.1

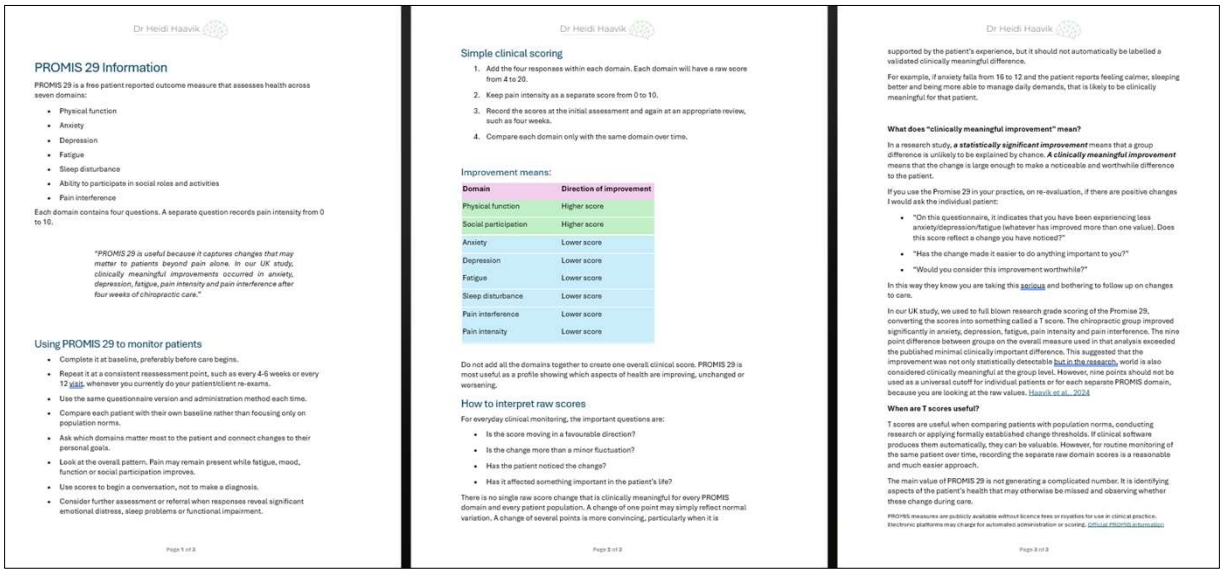
Please respond to each question or statement by marking one box per row.

	Physical Function	Without any difficulty	With a little difficulty	With some difficulty	With much difficulty	Unable to do
	Are you able to do chores such as vacuuming or yard work?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
	Are you able to go up and down stairs at a normal pace?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
	Are you able to go for a walk of at least 15 minutes?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
	Are you able to run errands and shop?	☐ 5	☐ 4	☐ 3	☐ 2	☐ 1
	Anxiety In the past 7 days…	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
	I felt fearful	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	I found it hard to focus on anything other than my anxiety	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	My worries overwhelmed me	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	I felt uneasy	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	Depression In the past 7 days…	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
	I felt worthless	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	I felt helpless	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	I felt depressed	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	I felt hopeless	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	Fatigue During the past 7 days…	**Not at all**	**A little bit**	**Somewhat**	**Quite a bit**	**Very much**
	I feel fatigued	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
	I have trouble starting things because I am tired	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

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PROMIS-29



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PROMIS 29 Information

PROMIS 29 is a free patient reported outcome measure that assesses health across seven domains:

- Physical function
- Anxiety
- Depression
- Fatigue
- Sleep disturbance
- Ability to participate in social roles and activities
- Pain interference

Each domain contains four questions. A separate question records pain intensity from 0 to 10.

"PROMIS 29 is useful because it captures changes that may matter to patients beyond pain alone. In our UK study, clinically meaningful improvements occurred in anxiety, depression, fatigue, pain intensity and pain interference after four weeks of chiropractic care."

Using PROMIS 29 to monitor patients

- Complete it at baseline, preferably before care begins.
- Repeat it at a consistent reassessment point, such as every 4-6 weeks or every 12 visit, whenever you currently do your patient/client re-exams.
- Use the same questionnaire version and administration method each time.
- Compare each patient with their own baseline rather than focusing only on population norms.
- Ask which domains matter most to the patient and connect changes to their personal goals.
- Look at the overall pattern. Pain may remain present while fatigue, mood, function or social participation improves.
- Use scores to begin a conversation, not to make a diagnosis.
- Consider further assessment or referral when responses reveal significant emotional distress, sleep problems or functional impairment.

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Simple clinical scoring

1. Add the four responses within each domain. Each domain will have a raw score from 4 to 20.
2. Keep pain intensity as a separate score from 0 to 10.
3. Record the scores at the initial assessment and again at an appropriate review, such as four weeks.
4. Compare each domain only with the same domain over time.

Improvement means:

Domain	Direction of improvement
Physical function	Higher score
Social participation	Higher score
Anxiety	Lower score
Depression	Lower score
Fatigue	Lower score
Sleep disturbance	Lower score
Pain interference	Lower score
Pain intensity	Lower score

Do not add all the domains together to create one overall clinical score. PROMIS 29 is most useful as a profile showing which aspects of health are improving, unchanged or worsening.

How to interpret raw scores

For everyday clinical monitoring, the important questions are:

- Is the score moving in a favourable direction?
- Is the change more than a minor fluctuation?
- Has the patient noticed the change?
- Has it affected something important in the patient's life?

There is no single raw score change that is clinically meaningful for every PROMIS domain and every patient population. A change of one point may simply reflect normal variation. A change of several points is more convincing, particularly when it is

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supported by the patient's experience, but it should not automatically be labelled a validated clinically meaningful difference.

For example, if anxiety falls from 16 to 12 and the patient reports feeling calmer, sleeping better and being more able to manage daily demands, that is likely to be clinically meaningful for that patient.

What does "clinically meaningful improvement" mean?

In a research study, ***a statistically significant improvement*** means that a group difference is unlikely to be explained by chance. ***A clinically meaningful improvement*** means that the change is large enough to make a noticeable and worthwhile difference to the patient.

If you use the Promise 29 in your practice, on re-evaluation, if there are positive changes I would ask the individual patient:

- "On this questionnaire, it indicates that you have been experiencing less anxiety/depression/fatigue (whatever has improved more than one value). Does this score reflect a change you have noticed?"
- "Has the change made it easier to do anything important to you?"
- "Would you consider this improvement worthwhile?"

In this way they know you are taking this serious and bothering to follow up on changes to care.

In our UK study, we used to full blown research grade scoring of the Promise 29, converting the scores into something called a T score. The chiropractic group improved significantly in anxiety, depression, fatigue, pain intensity and pain interference. The nine point difference between groups on the overall measure used in that analysis exceeded the published minimal clinically important difference. This suggested that the improvement was not only statistically detectable but in the research, world is also considered clinically meaningful at the group level. However, nine points should not be used as a universal cutoff for individual patients or for each separate PROMIS domain, because you are looking at the raw values. Haavik et al., 2024

When are T scores useful?

T scores are useful when comparing patients with population norms, conducting research or applying formally established change thresholds. If clinical software produces them automatically, they can be valuable. However, for routine monitoring of the same patient over time, recording the separate raw domain scores is a reasonable and much easier approach.

The main value of PROMIS 29 is not generating a complicated number. It is identifying aspects of the patient's health that may otherwise be missed and observing whether these change during care.

PROMIS measures are publicly available without licence fees or royalties for use in clinical practice. Electronic platforms may charge for automated administration or scoring. Official PROMIS information

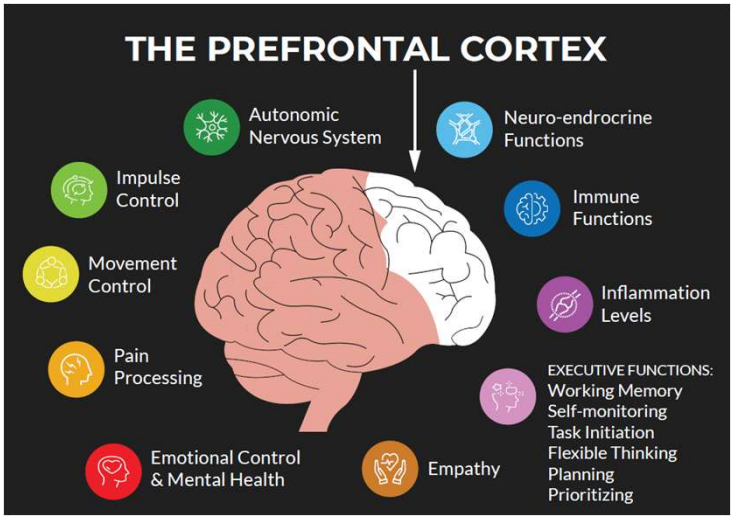
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PFC Poster

- Have in practice, on wall or laminated
- Refer to this as a key brain region affected by spinal function
- This is why you are monitoring executive function and quality of life
- You do NOT need to overclaim!!

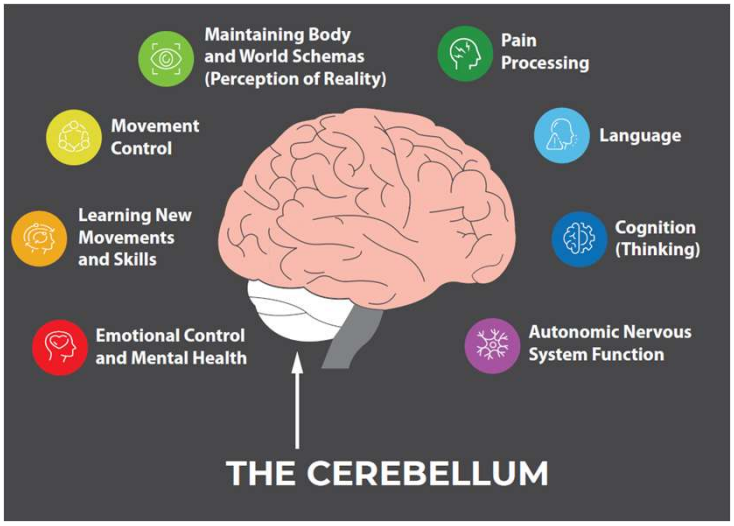


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Cerebellum Poster

- Have in practice, on wall or laminated
- Refer to this as a key brain region affected by spinal function
- This is why you are monitoring executive function and quality of life
- Again, you do NOT need to overclaim



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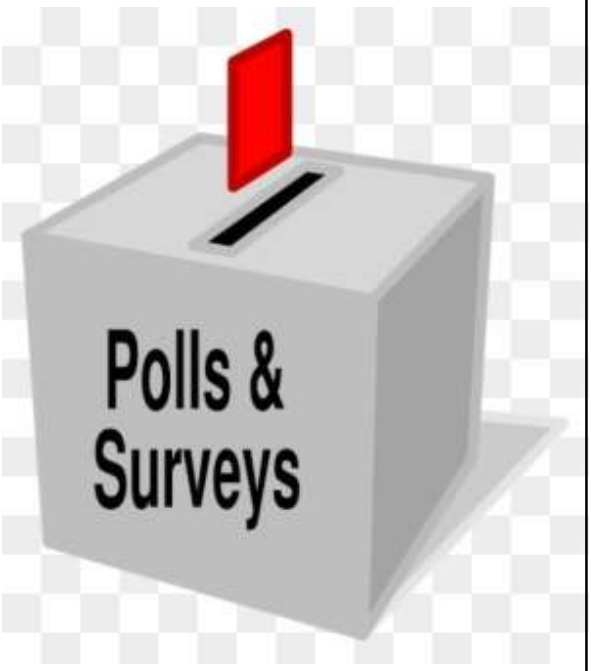


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Do you need a catchup session?

I am very conscious that I'm covering a lot of information and I'm wondering if you would like a catchup session to go deeper into any of the content I'm covering.

If yes, what topics would you like to go deeper on?



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Heidi's Hypothesis

- Adjustments engage the Salience Network, prompting the brain to re-evaluate what is happening both inside the body and in the external environment
- Brain 'resets' its interpretation of what is happening inside and outside it
- This updated interpretation may influence both the Default Mode Network (how we perceive ourselves) and the Central Executive Network (how we think, plan and interact with the world)
- If the brain updates its internal model, many downstream functions have the potential to change, Including:
  - how we feel (our perception of the body, symptoms and pain)
  - how we think (attention, cognitive flexibility and decision making)
  - how we regulate ourselves (autonomic function and stress responses)
  - how we move (motor control and behaviour)
  - what we prioritise (motivation and goal-directed behaviour)

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Do you have a brain model in your practice?



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Homework to complete before the live session

From Sensation to Movement: Output Matters

ChriosAcademy Classes:

- **NS1.11 The Somatosensory System and Tracts**
- **NS1.13 Motor Control and the Corticospinal Tract**
- **NS1.14 The Muscle Fiber and Neuromuscular Junction**
- **NS1.15 Proprioception and Reflexes**

Readings:

- Haavik, Heidi, Nitika Kumari, Kelly Holt, Imran Khan Niazi, Imran Amjad, Amit N. Pujari, Kemal Sitki Türker, and Bernadette Murphy. "The contemporary model of vertebral column joint dysfunction and impact of high-velocity, low-amplitude controlled vertebral thrusts on neuromuscular function." *European Journal of Applied Physiology* 121, no. 10 (2021): 2675-2720.
  - https://link.springer.com/content/pdf/10.1007/s00421-021-04727-z.pdf

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Alternative Next Live Session

- One ChirosAcademy class as homework
  - *RM1.06 Patient Reported Outcome Measures*
- Read about PROMIS-29 and ADEXI (practice on each other)
- Other topics we agree?
- Live session be about how to integrate the Brain Model in practice using a real life patient example, and I go through
  - Day 1: how I explain chiropractic
  - Day 2: ROF
  - Use of Patient reported outcome measures (PROMs) such as PROMIS-29 and ADEXI
  - Including topics such as:
    - frequency of care plan recommended,
    - when to increase/decrease care,
    - initial care vs maintenance care,
    - re-evaluations, etc.

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Questions



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