

Cerebral metabolic changes in men after chiropractic spinal manipulation for neck pain

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KEY POINTS FROM THIS STUDY:

- 1) "Chiropractic spinal manipulation is an alternative treatment for back pain."
- 2) "Research on chiropractic spinal manipulation has been extensively performed worldwide, and its efficacy on musculoskeletal symptoms has been well documented."
- 3) "For >100 years, chiropractors have asserted that overall health can be improved through spinal manipulative therapy."
- 4) Spinal dysfunction affects the autonomic nervous system. "Studies have documented a potential relationship between the vertebral subluxation complex and the function of the autonomic nervous system." [9 references][**Key Point**]
- 5) The PET (positron emission tomography) scan is a powerful neuroimaging technique to investigate neuronal activity in the human brain.
- 6) FDG = ¹⁸F-labeled flurodeoxyglucose, is a radioactive analogue of glucose, and is an excellent imaging marker of brain glucose consumption (brain metabolic activity).
- 7) Using PET and FDG, the authors evaluated brain regions associated with autonomic functions before and after chiropractic spinal adjusting.
- 8) This study used 12 men aged 20-40 with neck pain and shoulder stiffness. The chiropractic adjustments were done with an Activator.
- 9) The evaluations included:
 - Stress Response Scale = SRS-18.
 - European Organization for Research and Treatment of Cancer Quality of Life Questionnaire Core 30 = EORTC QLQ-C30.
 - Cervical muscle tone measured at the superior trapezius.

- "Salivary amylase was determined as a measure of changes in autonomic nervous system function."
- 10) This is the first chiropractic study to examine regional cerebral metabolism using positron emission tomography (PET).
 - 11) Results from this study include:
 - A)) Questionnaires indicated lower stress levels and better quality of life following chiropractic spinal manipulation.
 - B)) A significantly lower VAS was noted after chiropractic spinal manipulation.
 - C)) Cervical muscle tone and salivary amylase were decreased after CSM.
 - D)) "The results of this study suggest that CSM affects regional cerebral glucose metabolism related to sympathetic relaxation [inhibition] and pain reduction."
 - 12) "Psychological stress may be a cause of cervical pain."
 - 13) "Psychological stress causes sympathetic activation."
 - 14) "In the present PET investigation, the most significant change was detected in the cerebellar vermis, which was deactivated [inhibited]" following chiropractic spinal adjusting.
 - 15) Studies have shown that pain activates the cerebellum, and the "cerebellar vermis may be important in pain perception."
 - 16) "All the participants had neck pain at the time of the experiment, and the results of VAS indicated a significantly lower value after CSM." Thus, inhibition of the cerebellar vermis "may be related to pain reduction in the participants."
 - 17) "The cerebellar vermis is also concerned with mental stress."
 - 18) "In addition, the cerebellar vermis is involved with the autonomic nervous system."
 - 19) "Deactivation [inhibition] of the cerebellar vermis in the present study may have been related to a decrease in sympathetic tone." **[Key Point]**
 - 20) "Mental stress causes sympathetic activation, and stress-related disorders are frequently accompanied by increased sympathetic activity and muscle tone."
 - 21) Chronic activation of the sympathetic nervous system "facilitates chronic tonic and painful muscle contraction."

- 22) "In the present study, measurement of muscle tone indicated a significantly lower value after CSM at which point the cerebellar vermis was deactivated [inhibited]."
- 23) These authors argue that cerebellar vermis inhibition, decreased sympathetic tone, decreased muscle tone, and decreased pain are all neurophysiologically inter-related and initiated by chiropractic spinal manipulation.
- 24) "The results of the present study suggest that activation of the anterior cingulate cortex and inferior prefrontal cortex may arise from sympathetic relaxation [inhibition]." [sympathetic inhibition improves blood flow which improves glucose metabolism, increasing brain activation]
- 25) Salivary amylase increases during stress, and is "increasingly important in psychoneuroendocrinological research on stress." Measurement of salivary amylase in the present study revealed "significantly lower values after CSM" which "may be related to sympathetic relaxation [inhibition]."
- 26) "In summary, the present study demonstrated sympathetic relaxation [inhibition] and corresponding regional brain metabolic changes, as well as reduced muscle tone and decreased pain intensity following a chiropractic spinal manipulation."

COMMENTS FROM DAN MURPHY:

Studies from Winsor (1921) through Korr (1979) have claimed that the problem with compromised spinal function is increased sustained sympathetic tone. Increased sustained sympathetic tone is linked to immune system dysfunction, pain, vascular compromise with subsequent additional neurological dysfunction, and reduced systemic health. Many studies have suggested or shown that spinal adjusting works in part because of inhibition of increased sympathetic tone. This study, using the best technology available to date, supports this model.

In addition, this study also supports a link between spinal function, chiropractic spinal adjusting, and limbic emotional function. In the last few weeks I have posted on my web page the Judge Ponath briefs pertaining to chiropractic and the management of "insanity." They are under the Free Stuff button.

Lastly, this study continues to support the perspective of the Chiropractic Neurology group, led by Ted Carrick, DC: spinal adjusting significantly influences the human brain.

And, it is interesting that this National Library of Medicine PubMed article used the words "vertebral subluxation complex."

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Assessment	After Chiropractic Spinal Adjustment	Interpretation
Stress Response Scale = SRS-18	"Significantly Lower"	Significantly reduced stress secondary to sympathetic inhibition
EORTC QLQ-C30	"Significantly Lower"	Significantly improved quality of life
Visual Analog Scale = VAS	"Significantly Improved" [reduced]	Significantly reduced stress secondary to sympathetic inhibition
Cervical (Trapezius) Muscle Tone	"Significantly Improved" [reduced]	Secondary to sympathetic inhibition (Hubbard study, Spine, 1993)
Salivary Amylase	"Significant Decrease"	Secondary to sympathetic inhibition
Inferior Prefrontal Cortex	Increased Glucose Metabolism	Secondary to sympathetic inhibition
Middle Temporal Gyrus [limbic system]	Increased Glucose Metabolism	Secondary to sympathetic inhibition
Anterior Cingulate Cortex [limbic system]	Increased Glucose Metabolism	Secondary to sympathetic inhibition
Cerebellar Vermis	Decreased Glucose Metabolism	[Secondary to improved midline spinal mechanical afferentation]

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