Quantitative Assessment of Changes in Brain Activity After a Chiropractic Adjustment

Dan Tuttle, LCSW; Jerry Hochman, DC; Stephanie Sullivan DC; Ronald Hosek DC, PhD, MPH
Life University, Marietta, GA

Background / Introduction

- Despite the abundance of theories concerning the effects of chiropractic adjustment on brain function, this topic remains an understudied area of the profession.
- This may be due to the limited availability of cost effective, objective measures representing changes in brain function.
- Quantitative electroencephalography (qEEG) is a technique that allows for an in-depth analysis of brain activity, and may provide a cost-effective method for studying the effects of chiropractic intervention on the brain.
- qEEG allows for real-time analysis of brain activity which cannot be achieved with any other brain imaging technology.
- As with all source imaging methods, care must be taken to prevent distortion in and production of artifacts.

Methods / Procedures

Schedule of events

<table>
<thead>
<tr>
<th>qEEG assessment</th>
<th>Chiropractic adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td></td>
</tr>
<tr>
<td>Day 2 (1 week later)</td>
<td></td>
</tr>
</tbody>
</table>

Overall description of case study

- A 33-year-old female patient received a preliminary qEEG assessment with no intervention on 3/10/14 (Day 1)
- One week later (3/17/14, Day 8), a follow up qEEG was conducted before and after receiving a chiropractic adjustment

qEEG methodology

- A Cadet® EASY II system on 19-channels using the 10/20 system with a linked-ears montage was used
- Neural functioning was evaluated via qEEG using Neurogauge®
- Surface qEEG was analyzed using raw qEEG values Low Resolution Electromagnetic Tomography (LORETA) and connectivity measures were compared with a normative database
- Eyes-closed data was collected on Day 1 and Day 8
- Approximately 120 seconds of data was analyzed for each recording

Chiropractic methodology

- Analysis and intervention was based on Sacro Occipital Technique®
- An Activator® II instrument was used for adjusting non-pelvic segments

Results

Chiropractic evaluation (Day 8)

Findings

- Right leg short Category II
- PS occiput right
- Left sacroiliac joint involvement

Adjustments given

- First: PS occiput right with Activator® II instrument
- Supine Category II blocking, right leg short position

Comparison of raw qEEG values at each electrode site

- A vs. B: No adjustment
  - Minimal change on Day 1 vs Day 8 baseline
- B vs. C: Adjustment given
  - Widespread change on Day 8 before vs after adjustment

LORETA: Area in red is where most change was seen after adjustment

- Areas of red indicate significant (P < 0.001) change between the 2 time points being compared

Discussion / Conclusion

- Three types of measures statistically significantly changed after a chiropractic adjustment, but not in a control scenario
- Surface qEEG measures using raw values
  - Source localized measures using LORETA and a normative database
- Connectivity measures using a normative database
- Source localization of the greatest change was on the same side of the brain as the short leg and occiput listing; left sacroiliac involvement was contralateral to said source localization
- Connectivity measures demonstrated changes both intra- and inter-hemispherically
- The chiropractic adjustment resulted in changes in phase lock, which is a measure of EEG synchronization. Synchronization and desynchronization in the brain is found in function and dysfunction including epilepsy, dementia, traumatic brain injury, cognitive function, working memory, sensory-motor interactions, hippocampal long term potentiation, intelligence, autism and consciousness.
- qEEG appears to be a viable method to document chiropractic effects, or absence thereof, on brain function.
- A study using a larger sample size, active, sham and control groups is currently underway: Effects of chiropractic adjustments on brain function using quantitative electroencephalography, NCT01993614

Connectivity significantly changed after chiropractic adjustment

- A: Day 1 baseline
- B: Day 8 before adjustment
- C: Day 8 after adjustment

Statistically Significant Change

A vs. B: No adjustment

<table>
<thead>
<tr>
<th>Statistically Significant Change</th>
<th>A vs. B</th>
<th>B vs. C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0/177 measures</td>
<td></td>
<td>41/177 measures</td>
</tr>
</tbody>
</table>

Connectivity in the delta band (1-4 Hz) was measured in phase lock duration

Bibliography


Link to Additional Information

Scan this QR code to visit the web at: http://www.life.edu/research-resources