Innovations in cancer recovery care: Neurofeedback protocol feasible and improved self-reported cognition and fatigue symptoms

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Background

- Cancer-related fatigue and postcancer cognitive impairment (PCCI) or “chemobrain” are distressing symptoms that linger post-treatment. EEG biofeedback or neurofeedback brain training is a non-invasive, drug-free Complementary and Alternative Medicine (CAM) therapy reported to help with a variety of conditions including fatigue and cognitive decline.
- Neurofeedback is a scientifically-based technique that can allow the brain to learn self-regulation skills. These skills have clinical relevance and changes in brain regulation will be manifested in subjective and symptomatic changes.
- During neurofeedback, brain activity is monitored through electrodes placed on the scalp and fed back to the participant through auditory and/or visual stimuli generated through computer software without introducing anything intrusive into the brain. As participants become aware of their own brain activity, the brain self-regulates that activity to achieve a calmer, more focused mental state.

Purpose

- This study aims to determine feasibility of a randomized controlled trial investigating the effect of neurofeedback on PCCI and fatigue in post-treatment cancer survivors.

Specific Objectives:

- To test feasibility of recruitment strategies, study protocols, outcome measures & data analysis plan
- To provide preliminary data to establish effect size for calculation of sample size for a larger trial

Methods

Mixed methods wait-list control design:

- Subjective & objective assessments
- Qualitative interviews
- Sample: 20 post-treatment breast cancer survivors
- Intervention: 20 NeuroOptimalTM neurofeedback sessions over a ten-week period

Study Outcomes

- Feasibility: Recruitment & withdrawal rates, costs
- Primary outcome: cognitive impairment
- objective neurocognitive assessment: CNS Vital Signs
- standardized patient-reported outcome (PRO) measure: FACT-Cognition Scale.
- Secondary outcomes:
  - fatigue (PRO): FACIT-Fatigue
  - sleep quality (PRO): PSQI (sleep)
  - psychological symptoms (PRO): BSI-18 (symptoms)
- Data analysis: From the “Tests of Within-Subjects Effects” table, we discovered the F value for the “test time” factor, its associated significance level and effect size (“Partial Eta Squared”). As our data violated the assumption of sphericity, we looked at the values in the “Greenhouse-Geisser row.

Results

- 16 women enrolled in the study and completed 20 sessions of neurofeedback, 5 did not complete the follow-up survey
- Mean scores for the Total FACT-Cog Score increased significantly \( F(1, 346, 18.845) = 6.192, p = .006 \) with a medium effect size (partial eta squared = .030)
- Mean scores for the FACT-Fatigue increased significantly \( F(2, 28) = 10.953, p = 0.001 \) with a medium effect size (partial eta squared = .439)
- Results of the CNS Neurocognition Index were not significantly different following neurofeedback \( F(1, 021, 10.213) = .554, p = .477 \) with a small effect size (partial eta squared = .052)
- Qualitative data analysis is ongoing but preliminary analysis supports the positive benefits of neurofeedback for cancer survivors

Conclusions

- Feasibility:
  - Neurofeedback protocol was acceptable to cancer survivors
  - Newspaper ads most effective but expensive recruitment strategy
- Retention:
  - Positive despite intense protocol
  - All participants completed neurofeedback intervention
  - 5 did not complete follow-up survey
- Effectiveness:
  - Statistically significant improvements in perceived cognition and fatigue levels support the need for further trials of neurofeedback in cancer survivors

Implications

- Results of this pilot study have identified challenges to patient recruitment that will inform development of an RCT protocol.
- Statistically significant improvements in perceived cognition and fatigue levels support the need for trials of neurofeedback in cancer survivors to manage debilitating symptoms.

Next Steps

- Revise study protocols as needed and implement a larger, multi-site clinical trial with survivors of several types of cancer
- Conduct studies with other types of neurofeedback
- Investigate who would benefit, optimal timing, optimal protocols

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