

The Effect of Infra-Slow Fluctuation Neurofeedback Training on a Cohort of Insomnia Participants

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Introduction

Neurofeedback has gained great interest as a non-invasive treatment for various neurophysiological disorders. However, there is still a lack in literature regarding infra-slow fluctuation (ISF) neurofeedback training. ISF neurofeedback training is aimed at the lowest brainwave oscillations and attempts to balance dysregulated brainwave activity by inducing shifts in the parasympathetic and sympathetic response.

The aim of this study was to determine whether ISF neurofeedback training has a significant effect in participants with insomnia by using standardised techniques such as quantitative electroencephalography (QEEG), Central Nervous System Vital Signs (CNS VS), and by measuring the effects of physiological vitals in pre- and post- measurements.

Methods

ISF neurofeedback training was provided in a 5-week intervention that consisted of 10 sessions for 40 participants separated equally into two groups, the control and experimental group. QEEG and CNS VS assessments were completed pre- and post- of the ISF neurofeedback training intervention. ANS vital functions such as core- and finger temperature, heart rate and blood pressure were measured before and after each ISF neurofeedback training session.



Pre- & post- intervention (eyes open and closed): z-scores, deviant voxels, amplitude, coherence



Pre- & post- intervention: neurocognition index, pain, anxiety, depression, Epworth Sleepiness Scale, Pittsburgh Sleep Quality Index



Pre- & post- each ISF session: finger temperature (°C), core temperature (°C)



Pre- & post- each ISF session: systolic blood pressure (mmHg), diastolic blood pressure (mmHg), heart rate (bpm)

ISF Neurofeedback Intervention

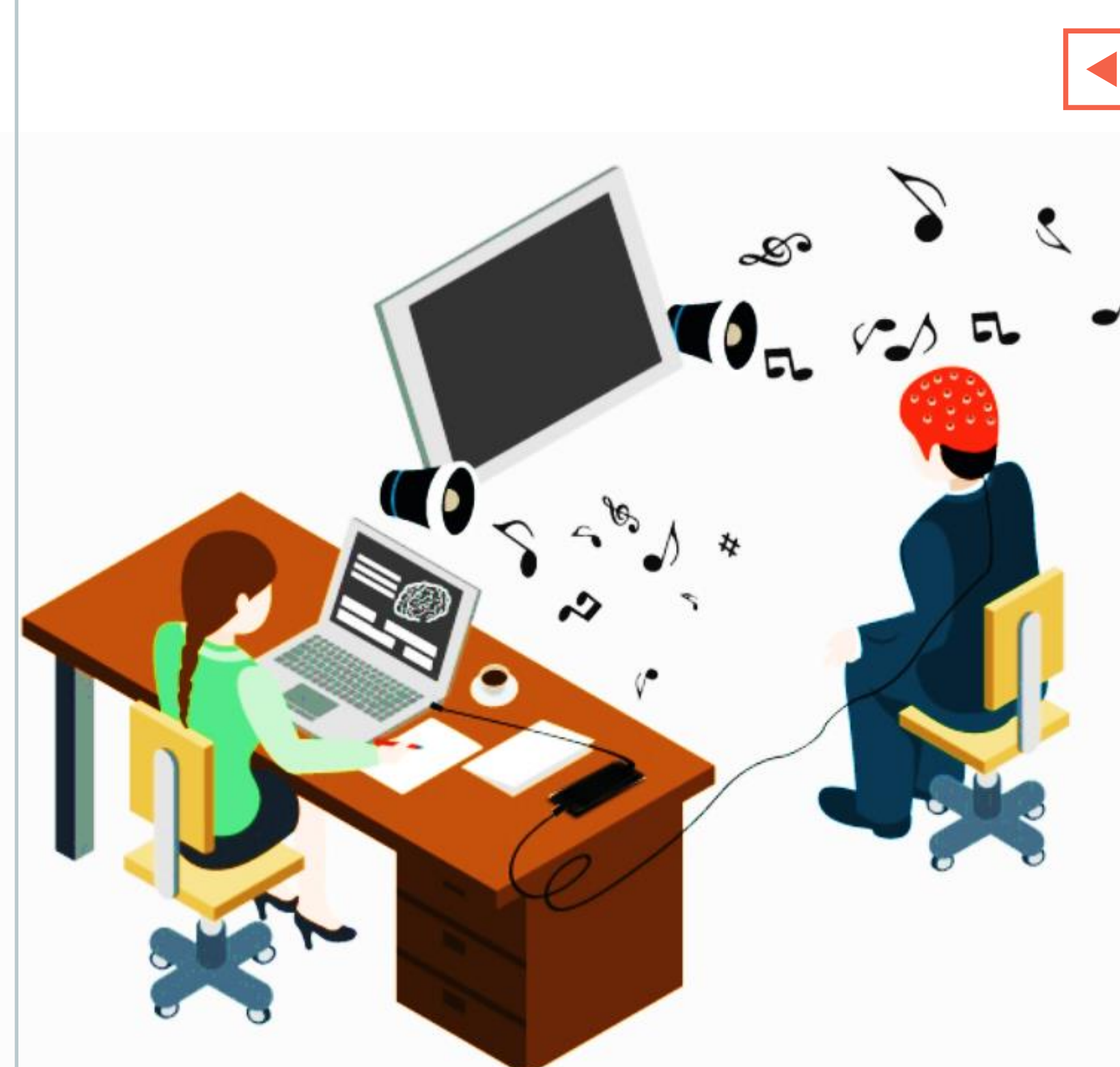


FIGURE 1: This figure illustrates a neurofeedback session set-up¹. During an ISF neurofeedback session five AgCl/Cl electrodes are placed on the scalp of the participant. The electrodes are connected to an amplifier which gives feedback of the brainwave oscillations to the neurofeedback software. A high or low pitch sound is reflected to the participant to stimulate training of the brainwaves into specific thresholds for 30 minutes.

Physiological Vitals Results

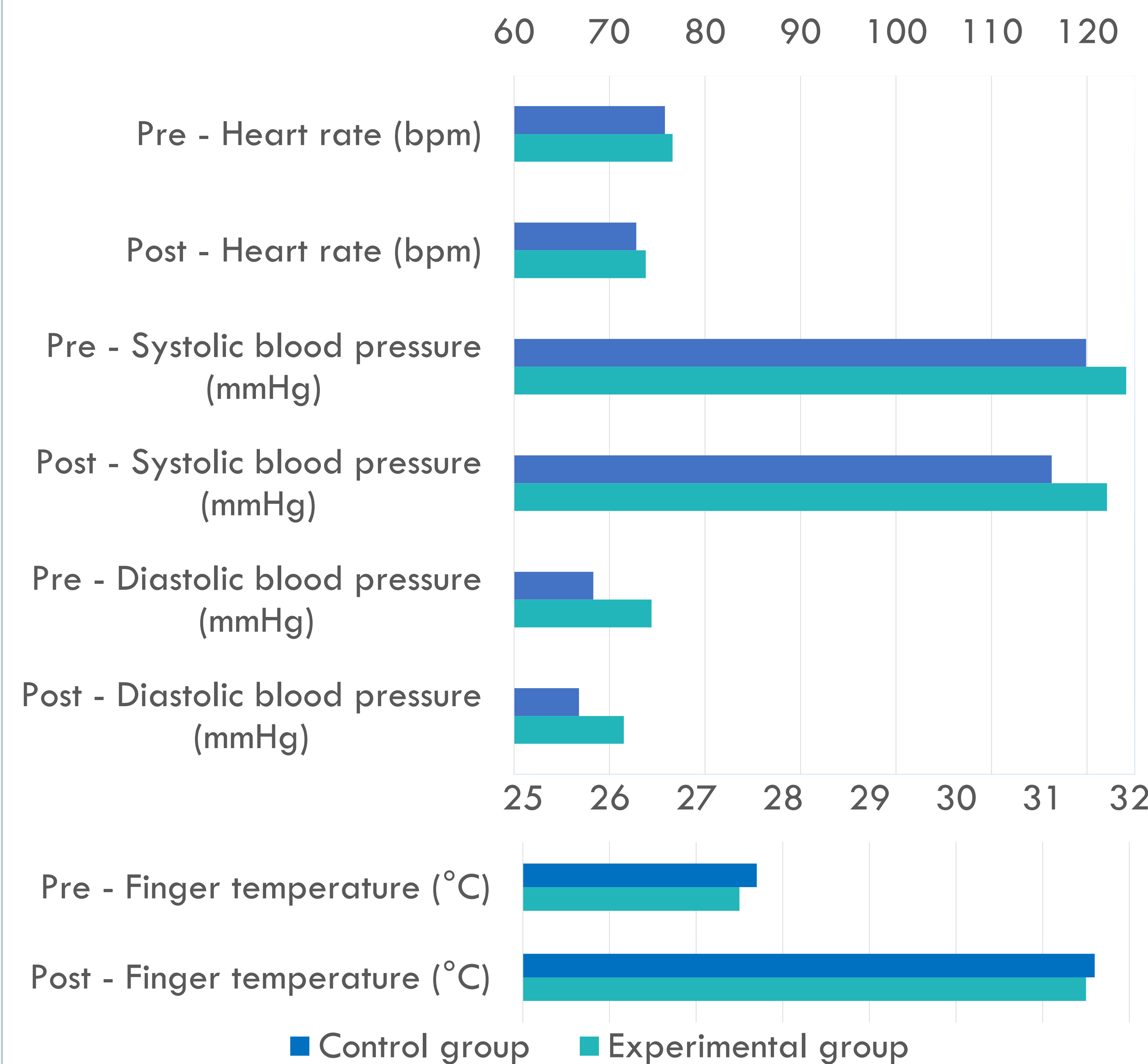


FIGURE 2: Significant results were achieved in both groups with improved core temperature (p=0.002), finger temperature (p<0.001), lower heart rate (p=0.002), systolic blood pressure (p=0.003) and diastolic blood pressure (p=0.001).

CNS Vital Signs & QEEG Results

TABLE 1: Significant results were achieved in both groups for the CNS Vital Signs and QEEG component analysis.

| CNS Vital Signs Component | Control Group (p-value) | Experimental Group (p-value) |
|---------------------------|-------------------------|------------------------------|
| Neurocognition Index (NI) | 0.002 | 0.005 |
| PSQI Total Score | 0.032 | <0.001 |
| Depression | 0.007 | 0.003 |
| Anxiety | 0.005 | <0.001 |
| Stress | 0.027 | <0.001 |

| QEEG | Control group | | Experimental group | |
|-----------------|---------------|------------|--------------------|------------|
| | p-value EO | p-value EC | p-value EO | p-value EC |
| Deviant voxels: | <0,001 | 0,14 | <0,001 | 0,023 |
| Amplitude | <0,001 | <0,001 | 0,002 | <0,001 |
| Coherence | <0,001 | <0,001 | 0,019 | 0,01 |
| Z-score: Delta | 0,001 | 0,881 | <0,001 | 0,331 |
| Z-score: Theta | <0,001 | 0,232 | <0,001 | 0,219 |
| Z-score: Alpha | 0,011 | 0,499 | 0,005 | 0,103 |
| Z-score: Beta | <0,001 | 0,017 | 0,005 | 0,121 |

Conclusion

This study demonstrated that ISF neurofeedback training should be considered as a viable alternative that can be used concurrently with other insomnia treatment methods that can reduce the need for pharmacological treatments.

References

1. [Internet] Neuro balance. Thailand [17 November 2020]. Available from: <https://neurobalanceasia.com/?lang=en>



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