

# Heart rate variability biofeedback, executive functioning and chronic brain injury

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*Primary objective:* To determine if individuals with brain injury can modify heart rate variability (HRV) through biofeedback and, if so, enhance its pattern to improve emotional regulation and problem-solving ability.

*Design:* A quasi-experimental design with repeated measures was employed. Thirteen individuals aged 23–63 years with severe brain injury (13–40 years post-onset) participating in a community-based programme were enrolled.

*Main outcomes:* Response-to-treatment was measured with HRV indices, Behavior Rating Inventory of Executive Function (BRIEF-A-Informant) and attention/problem-solving tests.

*Results:* At post-treatment, HRV indices (Low Frequency/High Frequency [LF/HF] and coherence ratio) increased significantly. Increased LF/HF values during the second-half of a 10-minute session were associated with higher attention scores. Participants who scored better (by scoring lower) in informant ratings at pre-treatment had highest HRV scores at post-treatment. Accordingly, at post-treatment, families' ratings of participants' emotional control correlated with HRV indices; staffs' ratings of participants' working memory correlated with participants' HRV indices. Self-ratings of the BRIEF-A Task Monitoring scale at post-treatment correlated with family ratings at pre-treatment and post-treatment.

*Conclusions:* Results demonstrate an association between regulation of emotions/cognition and HRV training. Individuals with severe, chronic brain injury can modify HRV through biofeedback. Future research should evaluate the efficacy of this approach for modifying behavioural problems.

## **Keywords**

Heart rate variability (HRV) biofeedback, executive functioning, brain injury