Introducing and Illustrating Biofeedback to Young People with Autism Spectrum Disorder

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Background

People with Autism Spectrum Disorder (ASD) exhibit:
- Persistent deficits in social communication and interaction across contexts
- Restricted, repetitive patterns of behavior, interests, or activities
- Impairment in social, occupational, or other important areas of current functioning.

Autonomic dysregulation characterized by increased sympathetic arousal and decreased vagal tone is posited to be a unifying factor. Biofeedback-based autonomic regulation training may be beneficial.

Biofeedback Training

- A strategy to gain and improve control of physiological functions: a physiological mirror
- The user is connected to multiple sensors that signal physiological functions
- Signals are processed and displayed (fed back) to the user as a way to learn to discern and control physiologic processes
- With practice, the user is able to generalize self-regulation without biofeedback

Autonomic Regulation Training (ART) for ASD

- Biofeedback training using proxies for autonomic functions may help people with ASD self-regulate their symptoms
- People with ASD have diverse autonomic “fingerprints.”
- ART for ASD must factor in autonomic diversity

DyFSS

- These signals are dynamically and differentially weighted to determine the user’s overall comfort level and reinforce their autonomic balance
- Includes an array of graphical interfaces to display data in a more engaging way
- Non-Provisional patent applied for 14,740,980

How It Works

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<tr>
<th>SCL and RSP</th>
<th>TMP and HRV</th>
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Weighting Algorithm

- For each signal, relative value determined
- Signals weighted based upon their contribution to the total comfort level
- Signals moving in desired direction enhanced, reinforcing user control
- Weighted signals summed, transferred to “Comfort Level” bar graph
- Combined signals sum to idealized max of 100%

Our Improvements

Usability

- Fixed algorithm and incorrect readings, added timeline and displaying player name, and screen resolution compatibility
- Focus Panel

Functionality

- Added data retrieval, user-determined partitioning of graphs, altering of graph perspective, and improvements to log files (fast-forwarding, timeline, markers)

Interactivity

Stress Destroyer Game

- Updated graphics and animations, added difficulty modes, sounds effects, music, and powerups

Future Applications

- Clinical research trials, further testing and refining with clinical integration, packaging software for standalone, portable DyFSS algorithm may be used in other settings

References