The Impact of Neurohacks (Micro-Breaks) on Stress Reduction and Cognitive Performance: ***A Groundbreaking Study***

By ***Dr. Izzy Justice and David Voran, MD***

March 12, 2025

Executive Summary

This seminal study explored the impact of neurohacks, a form of micro cognitive breaks, on stress reduction and cognitive performance. While prior research has established that breaks improve cognitive function, reduce stress, and prevent burnout, traditional breaks often necessitate time and logistical effort, making them impractical for professionals with demanding workloads and rigorous schedules. This study specifically examined the role of brief self-induced, personalized neurohacks as an alternative to traditional workplace breaks, particularly in high-stress environments such as medicine. Ten medical doctors were tracked continuously during their shifts, performing their normal duties over three consecutive days using the Muse S (Gen 2) Headband. The study tracked key biomarkers pre and post neurohacks. Physicians accessed neurohacks via the mobile app, Neuro580. Using the Muse Headband, pre- and post-biomarkers of EEG, Heart Rate and MIND Score were matched against specific points in time of accessing neurohacks from the Neuro580 App. By analyzing brain wave activity in this manner, the study demonstrated that these neurohacks can quickly reduce stress and enhance cognitive performance, offering a practical and science-backed solution for workplace stress management in high-pressure professions.

Introduction

The role of breaks in mitigating workplace stress and enhancing performance has been widely documented in scientific literature. Prior research has shown that taking breaks during the workday can improve cognitive function, decrease stress levels, and prevent burnout (Albulescu et al., 2022; Kim et al., 2017; Lyubykh et al., 2022; Trougakos et al., 2014). In 2021, Microsoft via their Human Factor Lab, tracked 14 participants attending four consecutive half-hour meetings over two separate days. Expanding on this research, our study addressed the challenges that traditional breaks often require time and logistical planning, making them impractical for professionals in high-stakes environments such as medicine. This study explored an innovative alternative: brief, personalized neurohacks accessed via the Neuro580 App. By capturing real-time continuous EEG, Heart Rate (HR) and MIND data from medical doctors wearing the Muse Headband during their shifts, a preliminary conclusion can be made that these micro-breaks can rapidly modulate brain wave activity, effectively reducing stress and improving cognitive performance. As such, neurohacks could revolutionize how high-stress events can be managed in the workplace and beyond.

Background

The Science of Breaks and Stress Reduction

Extensive research supports the notion that periodic breaks can enhance workplace performance and overall well-being. Studies on cognitive rest have demonstrated that breaks improve attention, reduce fatigue, and enhance focus, thereby preventing declines in productivity and decision-making accuracy (Amen Clinics, 2024; Scholz et al., 2019; Schuman et al., 2022; Wendsche et al., 2016). Techniques such as mindfulness, deep breathing, and brief physical movement have been linked to lower cortisol levels and improved heart rate variability, markers of reduced physiological stress (Kabat-Zinn, 1990; Sahlin et al., 2014). Additionally, research by Zacher et al. (2016) suggests that microbreaks, even as short as a few minutes, can lower cortisol levels, the hormone associated with stress.

Wharton research underscores the importance of taking breaks during the workday to maintain productivity and well-being (Milkman et al. 2014). The study analyzed over 13.7 million hand hygiene opportunities among 4,157 caregivers across 35 hospitals. It found that compliance with hand hygiene protocols declined by 8.7 percentage points over a typical 12-hour shift. However, taking breaks between shifts helped reset compliance rates, particularly after more intense work periods. This suggests that fatigue accumulates during work hours, leading to decreased attention to critical secondary tasks, and that breaks can mitigate this decline.

In a 2021 Microsoft study, 14 participants attended four consecutive half-hour virtual meetings on one day without breaks, and on another day with 10-minute breaks between each meeting, during which they meditated using a wellness app. Findings showed that without breaks, stress levels, indicated by beta wave activity, increased over time. Conversely, breaks helped maintain steady stress levels and improved participants' ability to focus and engage during meetings.

These findings highlight the importance of strategic pauses in mitigating workplace stress and enhancing long-term efficiency. As such, traditional breaks have been widely utilized as stress reduction strategies in various work environments. Common breaks include physical activity (e.g., short walks, stretching, light exercise), mindfulness techniques (e.g., deep breathing, meditation), and social engagement (e.g., casual conversations with colleagues, listening to music, or consuming beverages like coffee or tea) (Nisbet & Zelenski, 2011; Thoma et al., 2013; Zeidan et al., 2010).

However, these traditional break strategies typically require an interruption of workflow, varying in duration from a few minutes to an hour, and may be structured (e.g., scheduled lunch breaks) or unstructured (e.g., self-initiated microbreaks). While previous studies demonstrate their effectiveness in reducing cortisol levels, alleviating mental fatigue, and enhancing overall well-being, their implementation remains challenging in high-stakes work environments where time constraints and unpredictable demands limit access to, or options for, such breaks, even for 5-10 minutes (Microsoft, 2021; Milkman et al., 2014; Trougakos et al., 2014; Zacher et al., 2016). **This limitation highlights the need for alternative, time-efficient stress management strategies, such as brief neurofeedback-based breaks, which was explored in this study.**

Neuroscience

This study leveraged existing neuroscience understanding of both Stress States and High-Performance States to explore additional ways to manage both.

1. High-performance states are described anecdotally as states of calmness, focus, relaxed, confident, and "in-the-zone." These cognitive states are usually associated with lower brain frequencies–alpha & theta waves. An additional biomarker associated with high cognitive performance is low Heart Rate (bpm).
2. Stress states are described as fast, anxious, noisy, agitated. These cognitive states are associated with higher brain frequencies–beta and gamma. An additional biomarker associated with high cognitive stress is high Heart Rate (bpm).
3. The fundamental language of the brain is electricity, which is measurable.
4. Electricity is measured in Volts. Ohm's Law in Physics' basic equation of $V = IR$ implies that Voltage is a function of Current (I) against Resistance (R). The higher the resistance, the lower the voltage.
5. An 'action potential' is the electrical response of a neuron to a stimulus.
6. If stress is associated with high voltage, a question worth exploring is, what could R (Resistance) be?

Neuro580 posits that R can be induced stimuli to the Parasympathetic Nervous System that carries lower levels of electricity or activates the Vagus Nerve System to impact (Hyperpolarize) the 'action potential' towards a calmer more focused state. These induced stimuli (R) are called Neurohacks. This study explored whether these neurohacks can provide cognitive breaks that have a stress reduction and a high performing impact, even for a brief period of time, in a real high-stress environment, such as a hospital with live patients.

Neurohacks

The brain responds to all stimuli. Positive stimuli often result in increased levels of calmness and focus, whereas negative stimuli result in increased levels of stress. A neurohack is a curated positive stimulus given to the brain to consume. A recollection of a positive thought or memory is a positive stimulus. An image or video of a positive experience is a positive stimulus. A physical sensory activity that stimulates the Vagus Nerve and the Parasympathetic Nervous System (Neurotransmitter: Acetylcholine (ACh) is a positive stimulus. The Neuro580 App provided all three to physicians on one screen via their mobile devices. Neuro580's own functional research showed that all three stimuli (neurohacks) take seconds to activate stress-reducing biomarkers in the brain and nervous system, and as such, it is more practical to integrate into the workday. Neurohacks can include methods such as guided breathing exercises, visual or auditory stimulation, neurofeedback, or cognitive reframing techniques – all of which are backed by research in neuroscience and psychology (Amen Clinics, 2024; Albulescu et al., 2022; Ginns et al., 2023; Kim et al., 2017). Unlike traditional breaks, neurohacks are brief, efficient, and personalized, making them particularly useful for high-performance professionals who require rapid cognitive and emotional resets without significant time investment.

Thus, a neurohack is a brief, science-based intervention designed to quickly optimize brain function by reducing stress and enhancing focus. Using techniques like breathing exercises, sensory stimulation, or neurofeedback, neurohacks work by modulating brain activity in real time. They provide rapid cognitive resets without requiring long breaks, making them ideal for high-performance professionals.

What is the Neuro580 App?

The Neuro580 mobile app is an innovative neuroscience-driven tool designed to help professionals in high-pressure environments manage stress and enhance cognitive performance. The process of using the app is quick:

- **Screen 1 (1 second): App asked user: "How are you feeling?"**
  - User was given only 3 options: Red, Yellow or Green. (Red is defined as high stress, Yellow as Normal, and Green as high calmness/focus).
- **Screen 2 (1 second): App asked user: "Where are you?"**
  - User was given 5 options: Work, Home, Commute, Other, and Sleep. These generated Machine Learning personalized neurohacks.
- **Screen 3: After 1 second, 3 neurohacks appeared on 1 screen.**
  - Stimuli to act as R (low frequency inducing) was provided to Physician.

The short-written positive thought/memory took about 3 seconds to read, thus a 3 second positive stimulus. The sensory neurohacks varied from 5-20 seconds. The positive visual image (either a picture or a video from the user's photo album) also took seconds to cognitively consume. Collectively, all three neurohacks were personalized to the cognitive state selected by the user and took under 60 seconds to consume by the user's brain.

In the algorithms of the Neuro580 App, if the Physician chose Red as their brain state, neurohacks that would have a more powerful (Higher R) impact, such as images of family members or quicker sensory neurohacks, were provided. If a Yellow brain state was chosen, the neurohacks were of a lower efficacy, such as images of events or sensory neurohacks that may take longer than 5 seconds. For a Green brain state, landscape images such as peaceful waterfalls or low-level 10-second breathing sensory neurohacks were provided. In the others, the self-selected brain state determined the grade of neurohack provided. Red brain states were given shorter neurohacks and more personalized in sentiment value. Yellow brain states were given slightly longer (in seconds) neurohacks and slightly lower in sentiment value.

What is the MUSE S (Gen 2) Headband?

Muse® is a registered trademark of the Muse Company. The Muse S (Gen 2) Headband is a soft fabric headband with the following attributes:

- **EEG, PPG, accelerometer, and gyroscope sensors and tech**
- **Overnight sleep tracking and insights, smart-fade technology**
- **10-hour continuous battery life**
- **Tracks cognitive performance via its proprietary app**

In collaboration with Muse, research functionality of the Muse App was used to record, track and store data from the Physicians.

Purpose of the Study

While extensive research has been done on stress reduction with traditional methods, we came across no study to date that examined the concept of neurohacks, **micro-breaks in seconds,** on stress reduction and cognitive performance using real-time EEG readings. This study aims to address this gap. Specifically, the purpose of this study was to examine the impact of micro-interventions on stress reduction and cognitive performance in physicians.

Premise of Study:

1. Stress is a normal state of the human condition.
2. The brain is the central 'Port of Entry' of all stimuli, including stress stimuli.
3. Factors triggering stress vary from outside the workplace to inside the workplace, but all impact brain response in Neuroelectricity, Neurobiology, Neurochemistry, and Neuroanatomy.

Hypothesis of Study:

1. Neurohacks reduce stress biomarkers at points of stress.
2. Because they take seconds, neurohacks could be included in stress-management toolkits in and outside the workplace.

Study Design and Methodology

The study was conducted at the University of Missouri Kansas City (UMKC) from May 15-17, 2024. Collaboration protocols were established and followed between UMKC, Muse, and Neuro580, including IRB approval, communications, and project management.

The 10 Physicians volunteered for the study. They were each provided with:

1. **Muse S (Gen 2) Headband**
2. **Access to the MUSE App**
3. **Access to the Neuro580 App**
4. **1-hour Virtual Training 1 week before project start**
5. **1-hour live Training onsite 2 days before project start**
6. **Training included, but not limited to:**
   a. How to charge the Muse S (Gen 2) Headband each night
   b. Start/Stop of the Muse App upon start/finish of the shift for data collection
   c. Use of the Neuro580 App
   d. Instructions to use the recommended neurohacks from the Neuro580 App at times of high stress during their shift
7. **Surgeon's caps were worn to cover the Muse S (Gen 2) device to avoid reactions from patients/staff.**

Each Muse headband was assigned a User ID ranging from 1-10 for each participant. This ID was matched to a unique ID in the Neuro580 App, which allowed data to be captured without attribution to a participant by name. The anonymity of physicians was essential to ensure participants could not be tracked either by name or neurohack.

Each time a physician launched the Neuro580 App, a unique time stamp was automatically created and matched to the headband of the physician. Authors were then able to analyze key data points pre and post that timestamp per physician.

The validity of this study and data were enhanced by:

1. **Usage of 3rd Party Device and Data**
2. **Real high stress working environment**
3. **Continuous 6+ hour measurements over 3 consecutive days of 10 physicians**
4. **Time-stamped point of an intervention (Neuro580 Neurohacks) allowing for pre and post data analysis**

Data Analysis

Thirty-two unique data points per second were collected from 10 physicians over three consecutive days through an average of an 8-hour shift per day. This resulted in over 11 million data points for this study.

The authors acknowledge that the data was initially overwhelming to process by the study team. As such, three specific data sets were selected to analyze in this study. Over time, authors plan to process more. The three data sets analyzed pre and post neurohack are:

1. **EEG (mVolts -DB)**
2. **Heart Rate (BPM)**
3. **MIND Score (0.0-1.0)**

MIND Score is a collective metric unique to the MUSE ® technology, where the higher this metric (towards 1.0) the better the cognitive state.

Brain wave activity was measured at three key points: (1) baseline during shift of physicians, (2) immediately before the neurohack (stress moment), and (3) immediately after the neurohack. For EEG, our analysis focused on beta and gamma waves, associated with heightened stress and cognitive overload, as well as alpha and theta waves, which correlate with relaxation and focus (Klimesch, 1999; Anguera et al., 2013).

Software & Process

The analysis was conducted using SAS with a mixed model approach to account for the correlation introduced by repeated measures. A linear mixed-effects model was implemented, incorporating both fixed effects (e.g., indicator of pre/post) and random effects to capture within-subject variability. This model structure allowed for the proper handling of intra-subject correlation across time points. The primary focus was on assessing the pre- and post-intervention differences, evaluated through an indicator variable. Statistical significance was determined using appropriate hypothesis testing, with model assumptions checked to ensure validity.

In addition, using MS Excel's built in Power BI functionality, we used a multi-step process to look up epoch times within each of the original data sets from MUSE composed of the 5 minutes before and after the times of Neuro580 App usage.

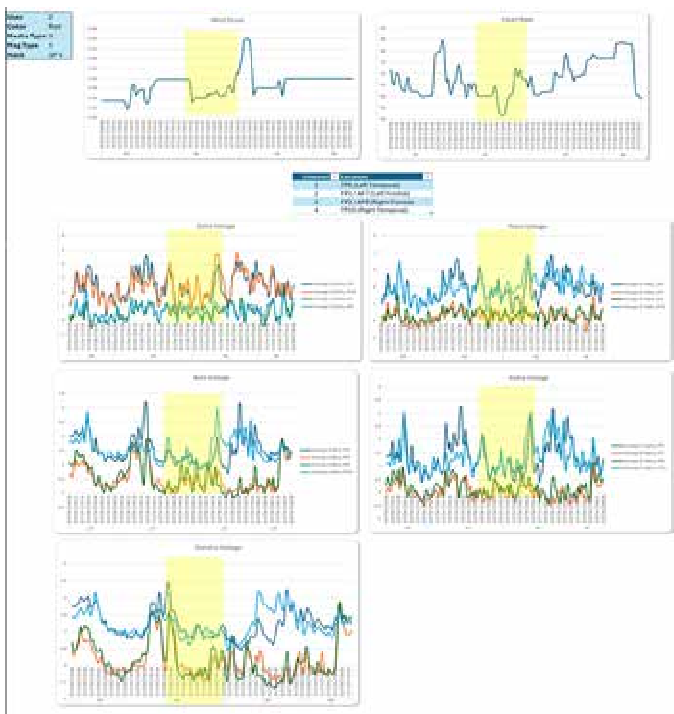
From there, data was (1) extracted 60 seconds before and 120 seconds after the time stamp, (2) averaged on each of the wave forms from the five zones, and (3) generated as graphs for each Neuro580 App use for that individual.

Results

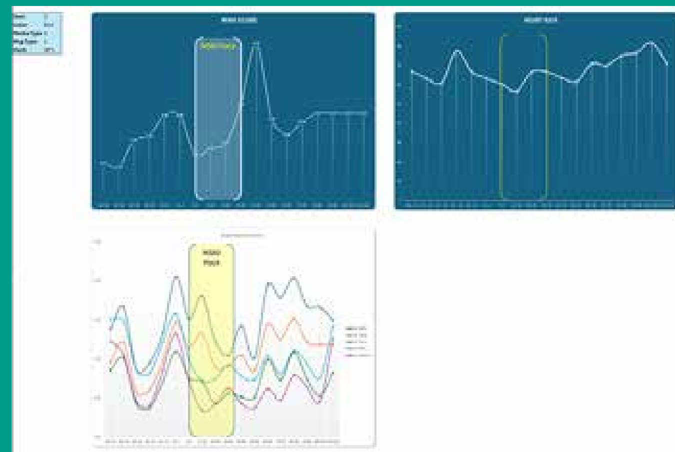
For the purposes of this report, four sets of data are presented. Two from when participants self-identified as Red (high stress), and two when participants identified as Yellow (normal stress). Appendix A shows the legend for the Muse S Headband.

Sample Data 1: Red Instance (Participant 2)

The initial sets of graphs display both the detail as well the complexity of the data pre and post timestamps of the neurohacks. The first two graphs show Mind Score (0.0 - 1.0) and Heart Rate (BPM), whilst the five subsequent graphs show EEG Brain Activity Bands (Delta, Alpha, Theta, Beta & Gamma) in millivolts from the different temporal sensors (channels) of the MUSE S (Gen 2) device (TP9, FP1/AF7, FP2/AF8, TP10). The top left box has elements of the Neuro580 App. In this case, the participant self-reported their brain state as Red. In addition to an inspiring quote and a positive visual image from their photo album to consume, the neurohack recommended was 3Ps.



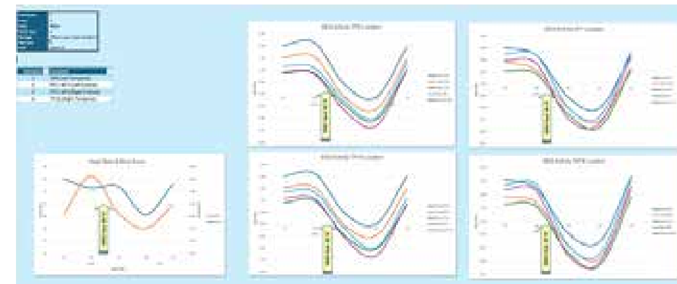
The three graphs below are a summary of the data above. In this user case, the data shows an increase in the MIND Score, an initial drop in the Heart Rate as well as overall lower EEG in all five brain wave bands.



Sample Data 2: Red Instance (Participant 5)

For Participant 5 above, in this instant of use, we can see no change in MIND SCORE but a reduction in Heart Rate from several seconds before using the Neuro580 App to 60 seconds post neurohack. Data shows Heart Rate pre neurohack at about 116 BPM (10-20 seconds before time stamp of opening the Neuro580 App) and lowered to 82 BPM until about 60 seconds post neurohack. In addition, overall EEG post neurohack lowers until about 40 seconds post neurohack.

Sample Data 3: Yellow Instance (Participant 1)



Similar to the previous samples, Participant 1 here self-identified their brain state as Yellow. The three neurohacks presented to the participant were (1) the answer to the question: "What was your favorite vacation?" (Questions were answered during the onboarding process of the app), (2) a positive visual image from their photo album, and (3) the sensory neurohack Lobe 5-5 (rubbing of the lobes in the ears for 5 seconds fast and 5 seconds slower).

The combo graph (Heart Rate and MIND Score) shows lower heart rate and slight temporary increase in MIND Score, but the EEG graphs show significant reduction for several minutes post neurohack.

To showcase the breadth of the data/study, next we show the same Participant 1 using the Neuro580 App and the recommended neurohacks at a different point in time.

Sample Data 4: Yellow Instance (Participant 1)

In this second use case by Participant 1, a fairly substantial increase in MIND Score (0.2 to 0.6), a modest reduction in the Heart Rate (110 to 95 BPM), and a sustained reduction in overall EEG are noted.

It should be noted that this is preliminary data. The volume of data available for the study is enormous. Authors will continue to process and share results in future reports of the same study.

Qualitative Data from Participants

A pulse survey (Appendix B) was sent to all participants a week after the study. Here are the results:

Direct Quotes from Participants:

- "My awareness of even my stress levels definitely improved."
- "I felt my mood changing with the neurohacks."
- "I never realized how easy and quickly I could impact my stress."
- "I used several on my patients."
- "I love the sleep (411) neurohack - I saw a change in falling asleep which I had been struggling with."

Findings

The preliminary data suggests that neurohacks impact all three measured cognitive biomarkers - EGG, Heart Rate and MIND Score. The data also suggests two additional possible (and surprise) areas of further study:

1. It appears that several seconds before the time-stamp of the Neuro580 App (when the participant actually opens the app on their mobile device), there are positive impacts on the three biomarkers suggesting that the awareness of stress and initiation of an intervention to address (before the actual intervention) itself has positive benefits.
2. Brain activity did vary significantly during the 30 seconds after the neurohacks use (the time estimated it took to use the app and perform the hack), but returned to pre neuro-hack states after a minute or so. The possible reasons and future areas of study could be:
   a. The stress stimuli are still present post neurohack given the nature of the hospital workflow.
   b. Is there value in that time post neurohack to access higher levels of cognition, knowing they have an initial surge in focus/calmness?
   c. Is there a cumulative benefit to continuous "spike downs" of the neurohacks at the end of the shift? Possibly impacting post shift states and sleep?
   d. How long is the efficacy of traditional stress-relieving activities and breaks (such as taking a walk, yoga, meditation, etc.) post activity within the workday flow?
   e. Are there roles or job functions where 30 seconds of low stress and high cognitive function are extremely valuable? (Such as a golfer just before hitting a critical putt)

These results align with previous literature supporting the efficacy of breaks in workplace environments (Microsoft, 2021; Lyubykh et al., 2022; Scholz et al., 2019; Schumann et al., 2022; Zijlstra et al., 2014). However, unlike traditional breaks that require minutes to hours for recovery, the Neuro580 neurohacks achieved comparable benefits in a matter of seconds. This innovation eliminates the logistical and time constraints associated with conventional workplace breaks, providing an efficient solution for high-pressure professions.

Limitations of the Study

1. The sample size was very small with only 10 physicians. We encourage further study with larger sample sizes.
2. There were gaps of missing data at some instances of Neuro580 App usage presumably because of a loss in connection between the MUSE headband and data being recorded for that long a period of time. We encourage similar studies for shorter periods like four hours.
3. The EEG device recorded 32 data points per second. This resulted in over 11 million data points – thus it took a very long time for the data analysis process. Initial and traditional software could not handle this sheer volume. The authors continue to process this data.
4. The premise of continuous tracking of biomarkers could be leveraged for studying many types of health interventions as a pre and post assessment could be made if the timestamp of the intervention is captured and correlated to the continuous data.
5. Units of measurements are key for long term efficacy. Different EEG devices have their own metrics (MUSE S had MIND Score) which is proprietary to them. Future studies should consider traditional metrics such as Hertz and the like.
6. The overall hypothesis should be studied further. For instance, whether or not micro cognitive breaks such as neurohacks can be integrated seamlessly into existing infrastructure such as calendar systems, IM messaging, and the like, where stress can be managed proactively for predictable high stress events.

Implications and Future Research

The findings of this seminal study introduce a new paradigm in workplace performance optimization. Given the immediate and measurable impact of neurohacks on stress modulation, these breaks hold great promise for industries where mental acuity and resilience are paramount. Future research should aim to replicate this study with larger sample sizes and diverse professional populations to validate and refine the efficacy of personalized neurohacks. Moreover, longitudinal studies could explore the long-term benefits of sustained neurohack use on burnout prevention and overall well-being.

Areas of study where neurohacks could be explored include:

1. Teachers between classes or during class when students' stress occurs.
2. Students in managing in-the-moment stresses pre and during exam/test.
3. Athletes at key points of a game/event.
4. Pilots are key points of stress.
5. Call center or other high volume human interactions.
6. Hospitality industry where customer experiences are changing.
7. Law Enforcement and First responders where surprise events require quick cognitive function in extremely high stress states.
8. Integration into wearables to provide interventions as trackable biomarkers (like lack of sleep or high HR) are triggered.
9. Prior to and during brainstorming sessions requiring high levels of innovation or creativity.
10. Possible tool for coaches, counselors and other providers of wellness for their own wellness.

Conclusion

The results of this study provide compelling evidence that rapid, personalized neurohacks can offer the same stress reduction and performance enhancement benefits as traditional breaks, without the time constraints and logistical burdens. The study challenges traditional approaches to stress and performance by suggesting that recognition of both stress and events requiring high performance can be better navigated by shorter periods of cognitive stimulation in a personalized manner. In lieu of the stereotype that mental wellness, resilience and high states of focus are long term skills required for an entire day, the study suggests that identifying key points of stress or high performance and using quick cognitive stimuli to 'spike down' high levels of anxiety long enough to perform the next task at hand might be a more practical approach within the confines of a workday, where traditional approaches might not be pragmatic. This has the possibility of simplifying how work and performance is managed in the workplace.

As neuroscience continues to uncover the mechanisms underlying cognitive resilience, we encourage researchers, neuroscientists, and performance experts to build upon these findings. By further exploring the potential of neurohacks, we can revolutionize the way professionals manage stress and sustain peak performance in high-demand environments.

Call for Collaboration

We invite researchers, clinicians, and industry experts to collaborate on advancing the study of neurohacks as a stress-reduction tool in high-stakes professions. Our preliminary findings demonstrate the potential of micro-breaks to enhance cognitive performance and reduce stress, but further research is needed to refine these techniques, explore long-term benefits, and expand their applicability across diverse work environments. We seek partners with expertise in neuroscience, cognitive psychology, workplace wellness, and digital health technology to contribute to study design, data analysis, and implementation. If you are interested in joining this effort, please contact www.neuro580.com to explore potential collaboration opportunities.

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APPENDIX A *MUSE DATA LEGEND*

Column Name	Description
Mind_score_pre/post	Score reflecting a person's calmness relative to the first minute of calibration. Range: 0-1, unitless.
Heart_score_pre/post	Heart Rate in Beats Per Minute.
_ts_pre/post	Timestamps for each provided value (row).
Delta_TP9_pre/post	Power of the Delta Band (1-4Hz), measured in decibels (dB) for the left temporal electrode.
Theta_TP9_pre/post	Power of the Theta Band (4-8Hz), measured in decibels (dB) for the left temporal electrode.
Alpha_TP9_pre/post	Power of the Alpha Band (8-13Hz), measured in decibels (dB) for the left temporal electrode.
Beta_TP9_pre	Power of the Beta Band (13-30Hz), measured in decibels (dB) for the left temporal electrode.
Gamma_TP9_pre	Power of the Gamma Band (30-44Hz), measured in decibels (dB) for the left temporal electrode.
Delta_AF7_pre/post	Power of the Delta Band (1-4Hz), measured in decibels (dB) for the left frontal electrode.
Theta_AF7_pre/post	Power of the Theta Band (4-8Hz), measured in decibels (dB) for the left frontal electrode.
Alpha_AF7_pre/post	Power of the Alpha Band (8-13Hz), measured in decibels (dB) for the left frontal electrode.
Beta_AF7_pre	Power of the Beta Band (13-30Hz), measured in decibels (dB) for the left frontal electrode.
Gamma_AF7_pre	Power of the Gamma Band (30-44Hz), measured in decibels (dB) for the left frontal electrode.
Delta_AF8_pre/post	Power of the Delta Band (1-4Hz), measured in decibels (dB) for the right frontal electrode.
Theta_AF8_pre/post	Power of the Theta Band (4-8Hz), measured in decibels (dB) for the right frontal electrode.
Alpha_AF8_pre/post	Power of the Alpha Band (8-13Hz), measured in decibels (dB) for the right frontal electrode.
Beta_AF8_pre	Power of the Beta Band (13-30Hz), measured in decibels (dB) for the right frontal electrode.
Gamma_AF8_pre	Power of the Gamma Band (30-44Hz), measured in decibels (dB) for the right frontal electrode.
Delta_TP10_pre/post	Power of the Delta Band (1-4Hz), measured in decibels (dB) for the right temporal electrode.
Theta_TP10_pre/post	Power of the Theta Band (4-8Hz), measured in decibels (dB) for the right temporal electrode.
Alpha_TP10_pre/post	Power of the Alpha Band (8-13Hz), measured in decibels (dB) for the right temporal electrode.
Beta_TP10_pre	Power of the Beta Band (13-30Hz), measured in decibels (dB) for the right temporal electrode.
Gamma_TP10_pre	Power of the Gamma Band (30-44Hz), measured in decibels (dB) for the right temporal electrode.

APPENDIX B *PULSE SURVEY QUESTIONS AND RESPONSES*

Survey Question	Response: 1-5	Percentage of Participants
Neurohacks are easy to do during my workday	5	100%
Neurohacks have provided me new skills to manage my workday stress	5	100%
Neurohacks have helped me reduce my end-of-workday stress	5	70%
	4	20%
	3	10%
I like the physical neurohacks	5	60%
	4	20%
	3	20%
I like the visual (pics/vids) neurohacks	5	80%
	4	20%

Note: Response scale is: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree