

Measuring Physiological Variables in Student Pharmacists after Conducting Relaxation and Non-Relaxation Techniques

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Background

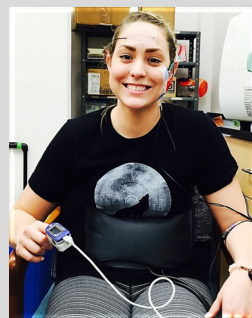
- ❖ The positive effects of conducting relaxation techniques on reducing stress, increasing focus, and improving mindfulness is well-documented via self-reported responses to survey questions^{1,2,3}.
- ❖ Recently, Tang, Holzel, and Posner (2015) reviewed meditation studies which used the hormone cortisol to indicate the physiological reduction of stress⁴.
- ❖ This study investigates the acute impact of relaxation techniques on student physiological measures to gain another, more objective view of their effects.

Objectives

- ❖ **Primary outcomes:** To compare physiological measures (body temperature, muscle tension, respiration rate, and heart rate) between intervention (relaxation) and control (non-relaxation) techniques.
- ❖ **Secondary outcomes:** To compare the effect of each treatment on these measures.

Methods

- ❖ **Population:** 86 Student Pharmacists were recruited via convenience sampling from P1, P2, and P3 years from the SWOSU College of Pharmacy.
- ❖ **Subjects were randomly assigned to and taught one of the following techniques:**
 - Three relaxation interventions (n = 48)
 - **Body Scan Meditation (n = 16)** – Systematically relaxing muscles
 - **Mindfulness Meditation (n = 16)** – Focusing on the sound of a bell
 - **4 x 4 Meditation (n = 16)** – Counting breaths
 - Two non-relaxation controls (n = 38):
 - **Power Posing⁵ (n = 19)** – Holding an open pose
 - **Mental Stimulation (n = 19)** – Playing Word Streak App
- ❖ **Measures recorded utilizing Vernier® LoggerPro 3.10.1 and SPO2 Review v1.5 software while conducting techniques:**
 - **Respiration Rate** – Secured respiration belt around diaphragm, and then inflated belt to increase pressure ~ 5 mmHg.
 - **Body Temperature** – Taped probe onto forehead.
 - **Muscle Tension** – Stuck electromyography (EMG) electrodes on dominant arm (ground), cheekbone, and jawbone.
 - **Heart Rate** – Put monitor on index finger of opposite arm.
- ❖ **Preliminary Analysis:**
 - The recording of each measure was manually evaluated as follows:
 - Selected a representative time period (i.e., between 60 seconds after recording started and 60 seconds before student had obviously taken off equipment)
 - Recorded resulting descriptive statistics (i.e., mean, median, standard deviation, and minimum and maximum values)
 - Evaluated overall trend by recording linear fit (i.e., slope) of the data
 - Preliminary analysis of physiological measures included t tests and simple ANOVA to compare mean data responses (IBM SPSS Advanced Statistics, version 21).
 - We expect relaxation techniques to lower body temperature, respiration rate, and muscle tension more than controls.



Results

- ❖ **Primary outcomes:** Maximum muscle tension in the face was found to be lower ($P < 0.05$) in subjects while conducting relaxation versus non-relaxation techniques in comparing the mean maximum EMG values (see **Figure 1** below).
- ❖ **Secondary outcomes:**
 - **Respiration Rate** – Average respiration rate of at least one technique was different ($P < 0.05$) in evaluating mean and median respiration rates. Post-hoc results suggest Word streak increased respiration rate, whereas 4x4 meditation reduced it (see **Figure 2** for median respiration rate results).

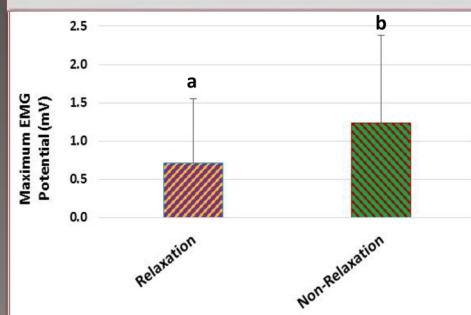


Figure 1. Maximum facial muscle tension during relaxation and non-relaxation techniques (n = 37 and 29, respectively). ^{ab}Techniques with different superscripts are different ($P < 0.05$).

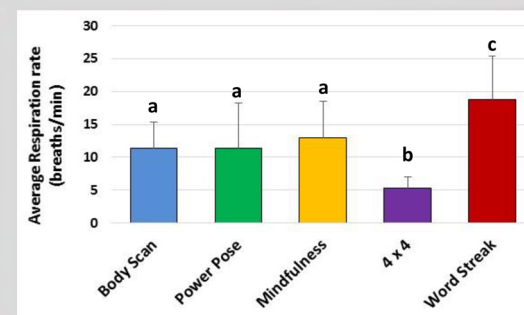


Figure 2. Median respiration rates among the five techniques (n = 14, 17, 14, 16, 17, respectively). ^{abc}Techniques with different superscripts are different ($P < 0.05$).

- **Body Temperature and Muscle Tension** – No differences ($P > 0.05$) in physiological measures among techniques were detected.
- **Heart Rate:** Time did not permit analysis of this variable.

Challenges & Future Directions

- ❖ The following are challenges in conducting physiological measures on human subjects:
 - A few subjects continued to chew gum after salivary collections.
 - Default setting of Vernier software to ECG accidentally preventing recording of EMG.
 - Medical tape did not always stick, causing the body temperature probe or EMG electrodes to detach during recording.
 - Medical tape did not stick to beards, requiring EMG measures to be taken from different facial positions.
 - Respiration belt did not fit all students – either being too small or too large.
 - Minimum and maximum values for respiration rate were not measured yet.
 - Overall, it took a lot of time and labor to individually collect measures on 86 students, as well as to manually evaluate each recorded measure for each student.
- ❖ Aside from heart rate and remaining respiratory measures, pre- and post-technique salivary samples need to be analyzed for cortisol, testosterone, and alpha-amylase.
- ❖ Correlations will be evaluated between physiological and survey measures in studying the impact of relaxation and non-relaxation techniques on student well-being.

References

- ¹Rasmussen, M.K., and A. M. Pidgeon. 2011. The direct and indirect benefits of dispositional mindfulness on self-esteem and social anxiety. *Anxiety, Stress and Coping*. 24(2): 227-233.
- ²Rubia, K. 2009. The neurobiology of meditation and its clinical effectiveness in psychiatric disorders. *Biological Psychology*. 82(1): 1-11.
- ³Brown, K. W., and R.M. Ryan. 2003. The benefits of being present: The role of mindfulness in psychological well-being. *Journal of Personality and Social Psychology*. 84: 822-848.
- ⁴Tang, Yi-Yuan, B.K. Holzel, and M.J. Posner. 2015. The neuroscience of mindfulness meditation. *Nature Reviews Neuroscience*. 16: 213-225.
- ⁵Carney, D.R., A. J. C. Cuddy, and A. J. Yap. 2010. Power posing: Brief nonverbal displays affect neuroendocrine levels and risk tolerance. *Psychological Science*. 21 (10): 1363-1368. doi: 10.1177/0956797610383437.