College of Saint Benedict and Saint John's University

DigitalCommons@CSB/SJU

Celebrating Scholarship and Creativity Day   Undergraduate Research

4-26-2018

Heart Rate Variability and Empathy

Suntina Spehar
College of Saint Benedict/Saint John's University, SSPEHAR001@CSBSJU.EDU

Elizabeth Walter
College of Saint Benedict/Saint John's University, EWALTER001@CSBSJU.EDU

Andrea Molus
College of Saint Benedict/Saint John's University, AMOLUS001@CSBSJU.EDU

Katarina Sulzle
College of Saint Benedict/Saint John's University, KPSULZLE@CSBSJU.EDU

Follow this and additional works at: https://digitalcommons.csbsju.edu/ur_cscday

Part of the Psychology Commons

Recommended Citation

Heart Rate Variability and Empathy

Suntina Spehar, Elizabeth Walter, Andrea Molus, Kate Sulzle

College of Saint Benedict and Saint John's University

Abstract

This study sought to determine if there is a correlation between an individual's heart rate variability (HRV) and reading. This experiment was designed as an ABAB model, where a baseline was collected, the participant read aloud from an article, another baseline was collected, and then they read aloud from another article. Half of the participants read an emotionally triggering excerpt from Browning's *Reflection on a Massacre* first and half read a neutral excerpt from Research Methods in Psychology - *Evaluating a World of Information* by Beth Morling first. Researchers observed and calculated any differences between a participant's HRV during the baseline testing and the manipulation period of the two readings, then evaluated these differences. The design of our study is a two by two factorial design. Our hypothesis was that HRV would be lower when the participants were reading, compared to when baseline was being collected. The emotional triggering article would be correlated with an even lower HRV than the neutral article. The root mean squared standard deviation (RMSSD) was statistically significant, $F(3,42) = 4.60$, $p < .01$. The sympathetic activation (SYMP) was statistically significant as well, $F(3,42) = 3.67$, $p < .05$.

Introduction

Empathy is a hard term to operationally define. Emotional Empathy is defined as the ability to feel similar emotions that another individual is experiencing (Hatfield, Cacioppo, & Rapson, 1994). While cognitive empathy is defined as the ability to understand another individual's perspective (Davis, 1980). However, when both these types of empathy (affective empathy and cognitive empathy) are combined it is now considered empathic reactions (Koopman, 2017). Finally, narrative feeling is the state where the reader feels empathy and sympathy with the characters (Coplan,2004). When a reader is imagining themselves as the characters in the book this be a type of role playing. Mar and Oatley (2008) suggest that when individuals are experiencing this type of role playing the individual is empathizing and sympathizing with the characters in the text. This phenomenon has also been coined as transportation of the reader into the text.

In the study presented here we wanted to gather quantitative measurements to see if participants physiological state would change upon reading an emotionally triggering excerpt. We were interested in looking at participants heart rate variability (HRV). In the past it was believed that having a steady heart rate indicated that an individual is healthy. On the contrary, a healthy individual's heart beat is highly irregular (Shaffer, McCraty, Zeer, 2014). If the mean of an individual's heart rate (average beats over time) is steady or consistent that is a predictor of stress or prolonged exposer to negative emotions. A healthy heart would have some heart rate variability.

In this experiment we are interested in seeing whether an individual's heart rate variability will be altered by reading an emotionally triggering excerpt compared to a neutral reading. We predicted that all the participants that read the emotionally triggering excerpt will show lower HRV and that participant's HRV will increase when they read the neural excerpt.

Method

Participants
- 20 undergraduate students enrolled in PSYC 111 at CSB|SJU
- Participants were obtained by a requirement set in the PSYC 111 lab curriculum

Materials
- **Bio Pac Machine**
- **Electrode Gel**
- **Electrodes**
- **Control Reading**
- **Emotionally Provocative Reading**

Procedure
An ABAB experimental design was conducted. First, a baseline measurement of HRV was taken on the participant. Next, either the control or experimental independent variable was introduced and a baseline was taken. After the first treatment, another baseline was taken, then the opposing article was read and a baseline of that treatment was taken.

Each participant was asked to read aloud, and to sit as still as possible, as not to interfere with HRV data collection. Participants were assured that their reading skills were not to be assessed; therefore, there was no pressure put on their reading performance ability.

Results
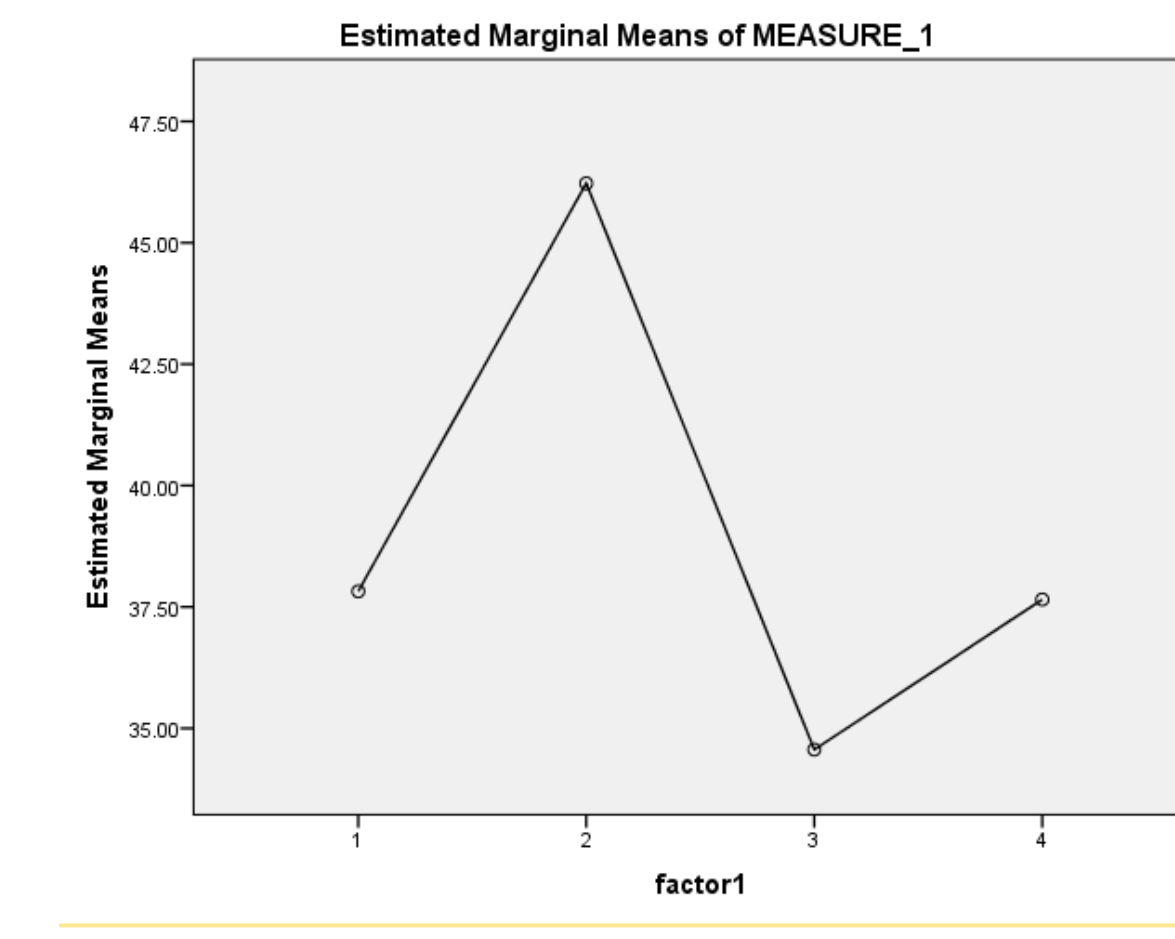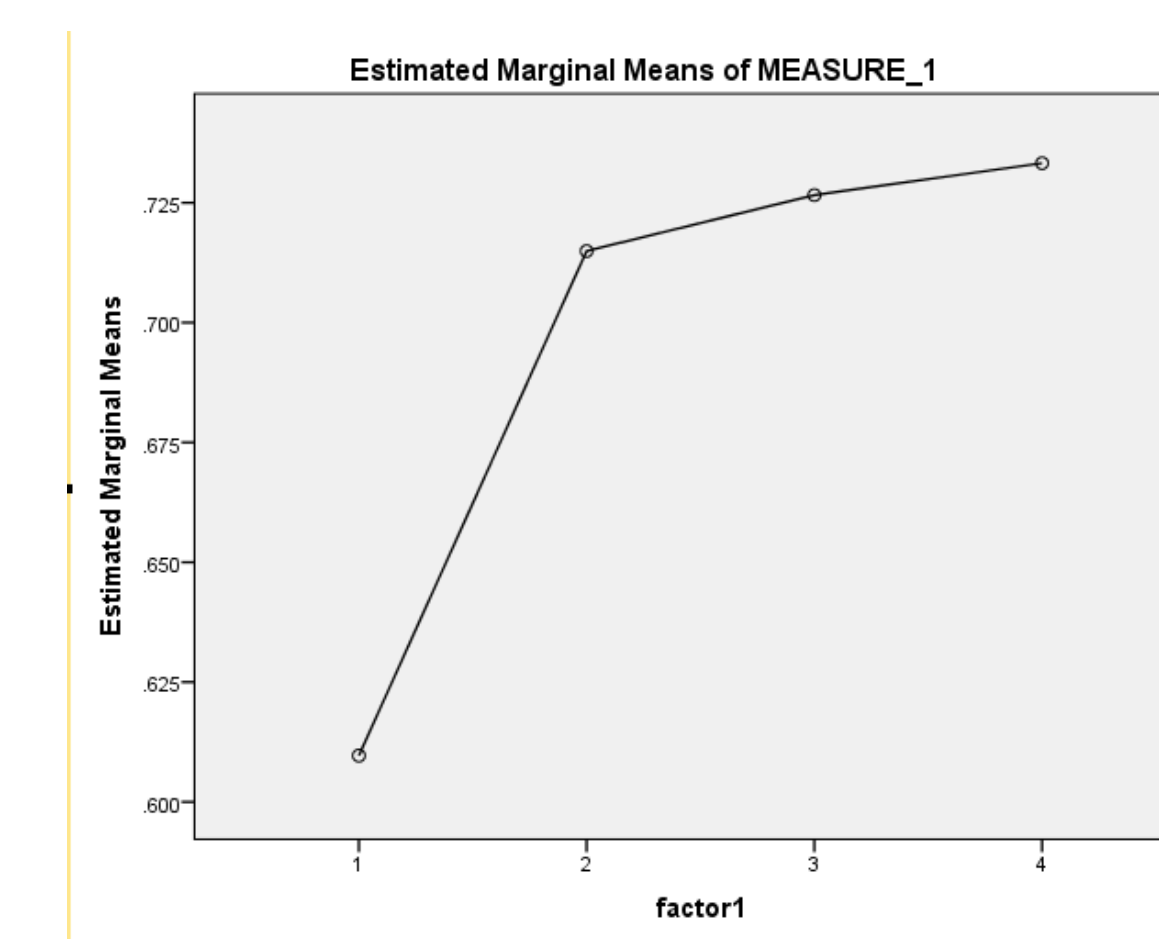
The data were analyzed using SBSS.
The root mean squared standard deviation (RMSSD) was statistically significant, $F(3,42) = 4.60$, $p < .01$. A t-test was ran to determine whether the different conditions differed from each other, $t(14) = -2.75$, $p < .05$ (comparing baseline 1 and baseline 2), $t(14) = 2.483$, $p < .05$ (baseline 2 and control reading), $t(14) = 2.947$, $p < .05$ (baseline 2 and emotional reading). Baseline 2 was significantly different than all other portions (baseline 1, the emotionally triggering article, and the neutral article).
The sympathetic activation (SYMP) was statistically significant as well, $F(3,42) = 3.67$, $p < .05$. A t-test was ran to determine whether the different conditions differed from each other, $t(14) = -3.244$, $p < .01$ (comparing baseline 1 and baseline 2), $t(14) = -2.078$, $p < .05$ (baseline 1 and control reading), $t(14) = -2.420$, $p < .05$ (baseline 1 and emotional reading).

Discussion

The results from the RMSSD show statistically significant differences between baseline one and baseline two, baseline two and control, and baseline two and empathy groups. This suggests that heartrate variability increased after the participants read the first reading and it did not matter which reading they read first. The results from the SYMP showed statistically significant differences between baseline one and baseline two, baseline one and control, and baseline one and empathy. This suggests that sympathetic activation increased during baseline one and stayed increased for the rest of the data collection.

The construct validity was high because the data was collected from the BioPac machine and they were measured through a computer. The statistical validity was high because the results were accurate and reasonable because the results showed that participants needed a cool down period between readings which increased their heartrate variability. External validity was low because participants were only from CSB/SJU and were in Introduction to Psychology course, so this is not generalizable to the general population. Internal validity was low because there are multiple confounds that could explain the results the researcher got, so another study would have to be performed in a better environment in order to rule out the said confounds. Some limitations of this study could be the environment of this study was not constant throughout all the participants and introduction of the study was not scripted so each participant got a little different speech before they started.

References

Coplan, A. (2004). Empathic engagement with narrative fictions. *The Journal of Aesthetics and Art Criticism. 62*, 141-152. Doi: 10.1111/j.1540-594X.2004.00147.

Davis, M.H. (1980). A multidimensional approach to individual differences in empathy. *Catalog of selected Documents in Psychology, 10.* 85-104.

Hartfield, E., Cacioppo, J.T., & Rapson, R.L. (1994). Emotional contagion. New York, NY: Cambridge University

PShaffer, F., McCraty, R., & Zeer, L.C. (2014). A healthy heart is not metronome: an integrative review of the heart's anatomy and heart rate variability. *Frontiers in Psychology 5(104)*, 1-19. Doi: 10,3389/fpsyg.2014.01040.