INVESTIGATING HEART RATE VARIATION AND ITS CORRELATION WITH CONTINUOUSLY SELF-REPORTED EMOTIONS AND ITS CLINICAL APPLICATIONS IN PSYCHIATRY

Durham University

Authors: Dr Jonathon Mcphetres, Eleanor James

Introduction

-Heart Rate Variability (HRV) is the variation in time between your heart beats.
-HRV patterns can provide much insight into the health status of the heart and emotional state of the individual.
-The SNS and PNS work together to activate the flight or fight response when needed, such as in a threatening situation that requires fight or flight to survive.
-In individuals experiencing mental disorders characterised by high states of stress and anxiety, the balance between SNS and PNS processes often dysregulated causing emotional crisis
-My endeavour for these research findings is to combine the physiological and psychological aspects of HRV, and continuous emotion reporting to consider the potential of developing a system that can predict emotional crises in psychiatric patients

Methods

-Recruited 20 participants from the wider Durham University community, 5 males and 15 females age range from 19 to 42 (M = 24, SD = 5.92).
-Participants watched 9 videos and self-reported their emotions using an app (SentiZent)
-The X axis represents the valance of the emotion, and the Y axis represents how active the emotion is.
-The participants were connected to an ECG Biopack MP160 with a wireless ECG module and a Polar HR band, and the EliteHRV app began recording their HRV, and the SentiZent app began recording their self-reported emotions.

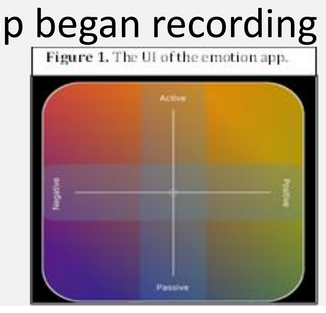

Figure 2.2.
Image displaying the UI of the SentiZent app.

.

Results

Table 4.1) Pearson's correlations between raw heart rate and emotion-location scores.

Variable	X1	X2	X3	X4	X5
1.ECG IBI	-				
2. PHRB IBI	.66**	-			
3. Morton Code	.05**	.03**	-		
4. Index Score	.03**	.03**	.06**	-	
5. X coordinate	.01	.02*	.05**	1.00**	-
6. Y coordinate	.14**	.13**	.07**	-.11**	-.20**

Figure 3.1.
Pearson's correlations between raw heart rate and emotion-location scores

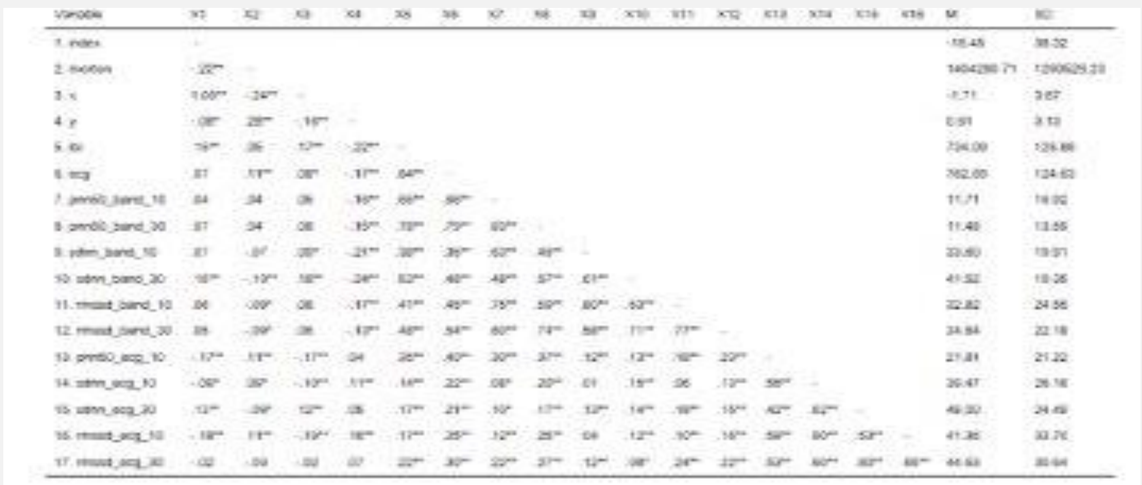

Figure 3.2.
Correlations for mom video.

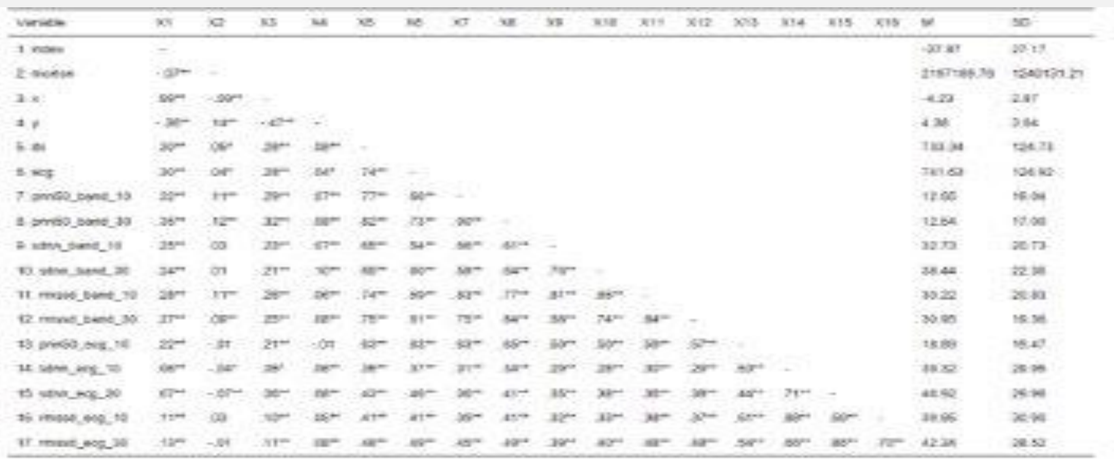

Figure 3.3.
Correlations for Sandy video.

Figure 3.4
Correlations for conjuring video.

Discussion

the raw HRV and IBI scores correlate weakly with the raw or indexed emotion scores, and further research is required to examine further treatment to the data. The results indicate that there is a correlation between HRV and self-reported emotions, but in order to demonstrate that relationship and generate results that display a stronger correlation, the data collected and the way in which it is collected needs to be refined. There was additionally a correlation of r= 0.66, p< 0.001 between the ECG and the Polar HR Band ("PHRB") which demonstrates that both methods of measuring HRV produce agreeable results, indicating that both are suitable methods of measuring HRV in the context of self-reported emotions.

Discussion (cont.)

Therefore, by continuing to utilise HRV metrics such as pNN50 and developing an algorithm to treat the data, and refining the procedure, the correlation between HRV and self-reported emotions can be illustrated more clearly, and can then be utilised to develop applications within psychiatry.

References

Abai, B. (2019). *StatPearls*. Treasure Island, FL: StatPearls Publishing LLC.
•Agorastos Agorastos, Mansueto, A.C., Hager, T., Pappi, E., Angeliki Gardikioti and Stiedl, O. (2023). Heart Rate Variability as a Translational Dynamic Biomarker of Altered Autonomic Function in Health and Psychiatric Disease. *Biomedicines*, 11(6), pp.1591–1591. doi:https://doi.org/10.3390/biomedicines11061591.
•Kim, H.-G., Cheon, E.-J., Bai, D.-S., Lee, Y.H. and Koo, B.-H. (2018). Stress and Heart Rate Variability: A Meta-Analysis and Review of the Literature. *Psychiatry Investigation*, [online] 15(3), pp.235–245. doi:https://doi.org/10.30773/pi.2017.08.17.
•Martin, C., Preedy, V. and Patel, V.B. (2015). *Comprehensive Guide to Post-Traumatic Stress Disorder*. Springer, pp.1–15.