

Heart Rate Variability Biofeedback Affects Cardiovascular Psychophysiology in Older Adults

Dylan J. Jester, B.S.¹, Ross Andel, Ph.D.¹, Ellen Rozek, Ph.D.², Ryan McKelley, Ph.D.², & Brent Small, Ph.D.¹

¹School of Aging Studies, University of South Florida, Tampa, FL
²Department of Psychology, University of Wisconsin – La Crosse, La Crosse, WI

Introduction

Rationale (Jester et al., 2018):

- Decrease in depression and anxiety
- Increase in attentional skills

Goals:

- Identify cardiac changes that accompanied the affective/cognitive improvements

Hypotheses:

- Increase global HRV (SDNN)
- Increase vagal tone (RMSSD, LnHF)
- Decrease chaotic beating (SampEn)

Methods

Participants

- 20 older adults (M : 78.15, SD : 9.18)
- 70% Female
- 35% Psychiatric Diagnosis
- 45% Cardiac Issues
- 95% No cognitive impairment (MMSE)

Study Design

- Pre-Post Intervention; Six Sessions
- 30-minute HRV Biofeedback

Measurement

- Time Domain: SDNN, RMSSD
- Frequency Domain: LnHF
- Nonlinear Domain: SampEn

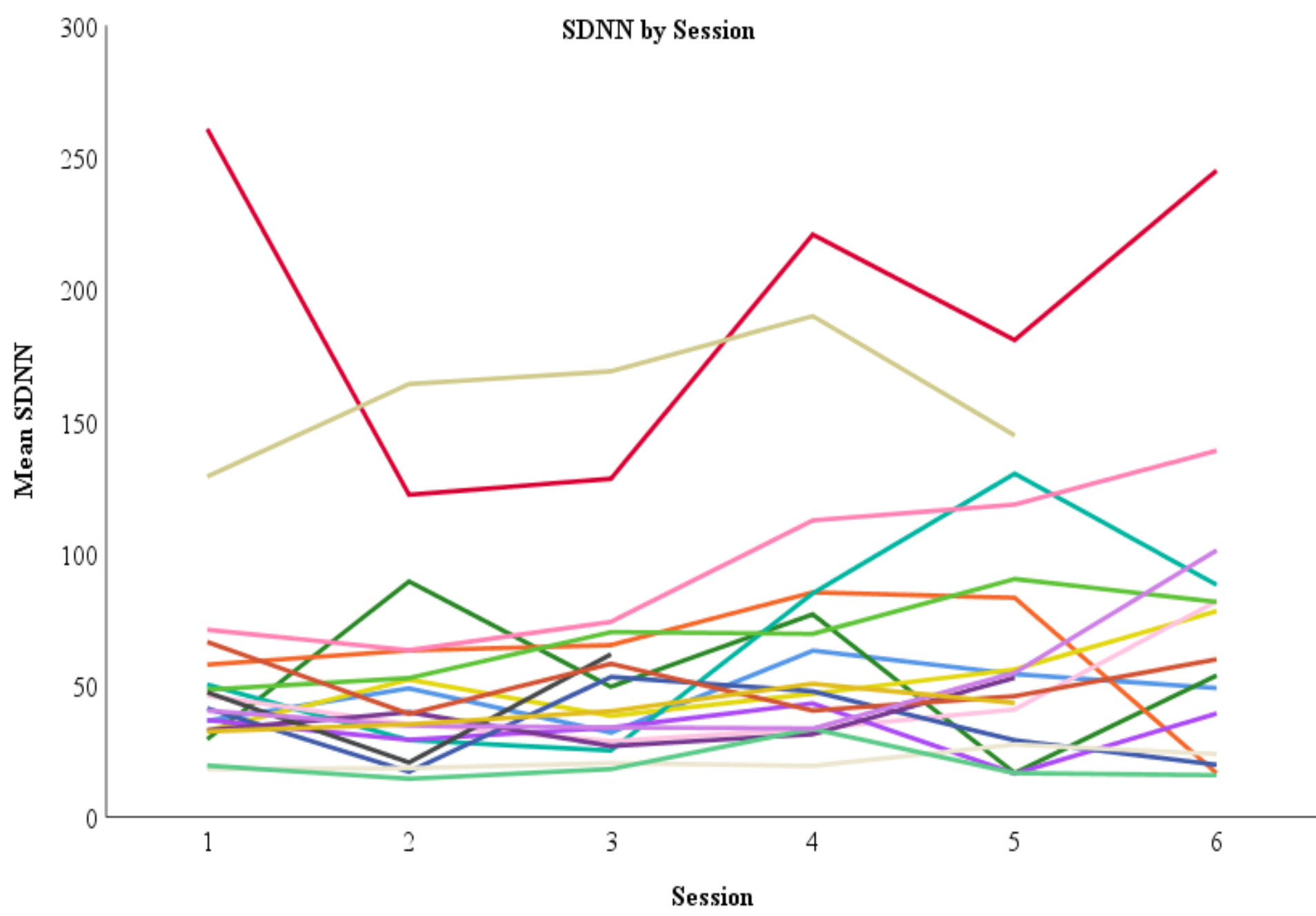
Statistical Analysis

- Growth curve models
- Covariates: Age, Sex, Psychiatric Diagnosis, Cardiac Issues, Global Cognition

Results

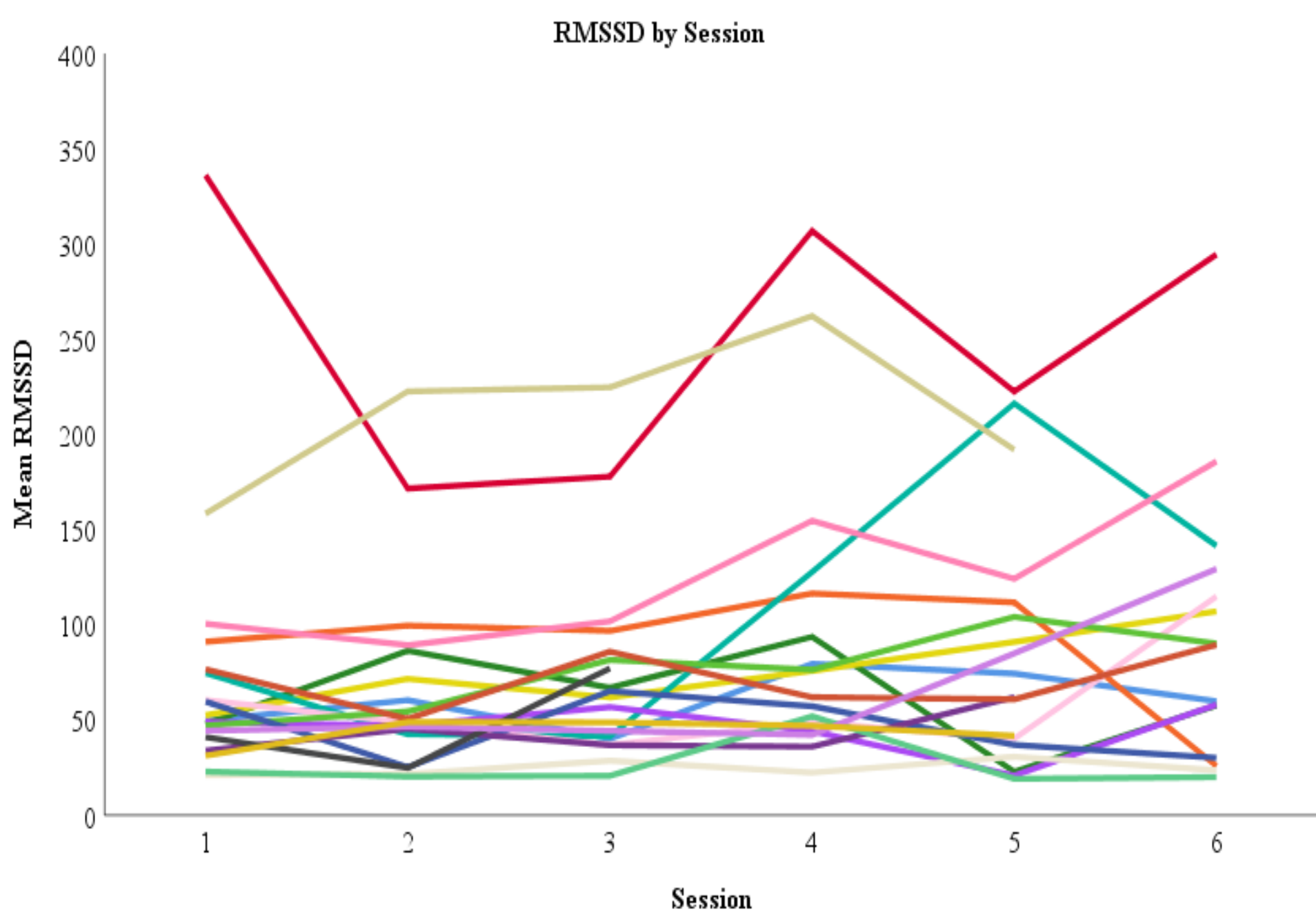
SDNN

Time: 5.20 (1.54) units per session
Cardiac Issues: 42.84 (16.40)
Intraclass Correlation: 74%; pseudo- R^2 : 21%



RMSSD

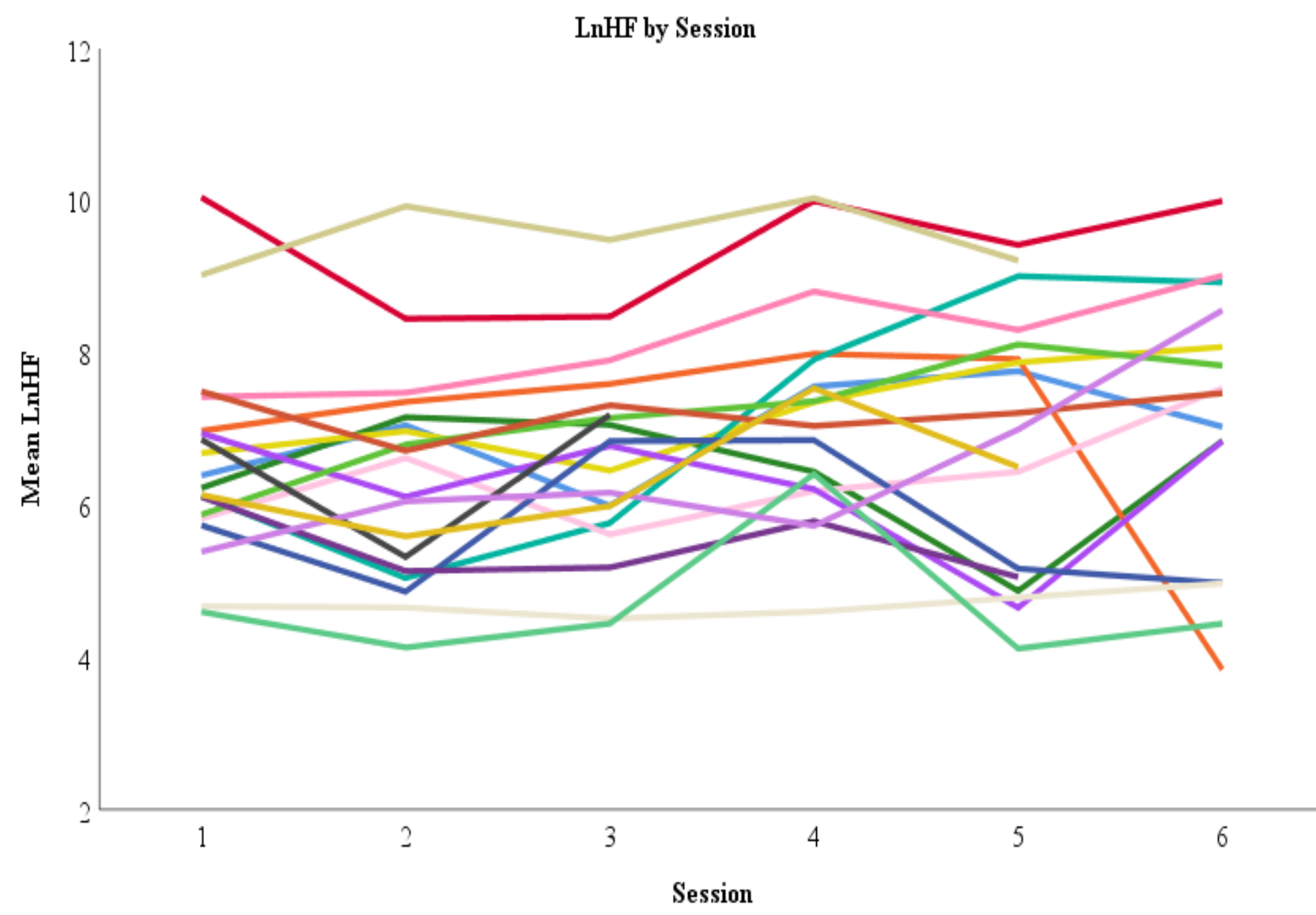
Time: 6.75 (2.29) units per session
Cardiac Issues: 57.11 (22.51)
Intraclass Correlation: 72%; pseudo- R^2 : 23%



Results (cont.)

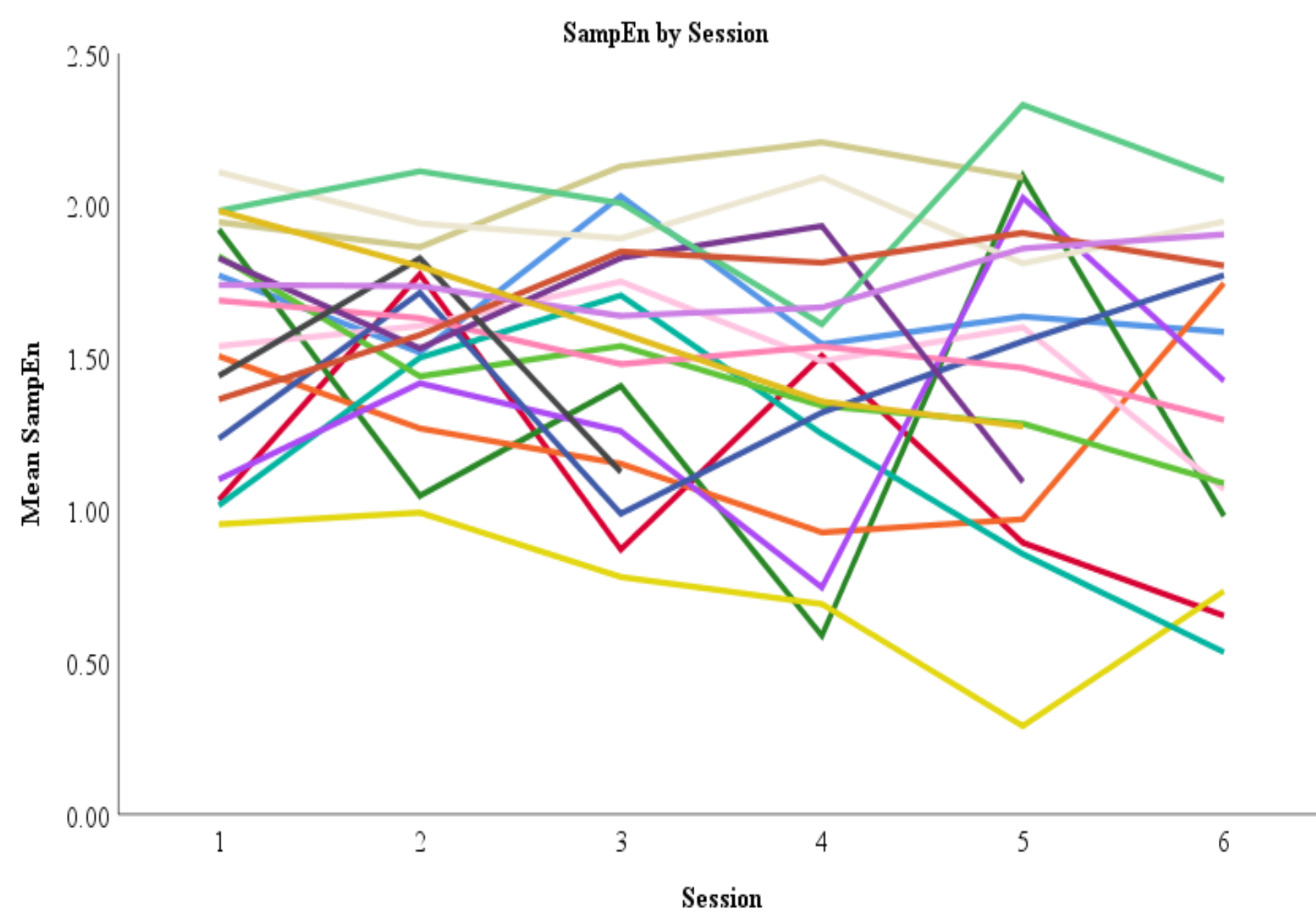
LnHF

Time: 0.17 (0.07) units per session
Cardiac Issues: 1.17 (0.52)
Intraclass Correlation: 61%; pseudo- R^2 : 24%



SampEn

Time: -0.04 (0.01) units per session
Age: -0.02 (0.01)
Psychiatric Issues: -0.39 (0.16)
Intraclass Correlation: 46%; pseudo- R^2 : 3%



Theoretical Support

- **Neurovisceral Integration Model:**
Sympathetic activation promotes perseveration and disrupts goal-directed behavior, thus affecting aspects of emotional and cognitive functioning.
- **Polyvagal Theory:**
Vagally modulated HRV affects social disengagement by inhibition of the sympathetic nervous system.

Conclusion

- Global HRV and vagal tone increased while chaotic beating patterns decreased.
- This study lends support to the theoretical basis of HRV biofeedback.
- Future research must further identify the roles of cardiac issues, psychiatric disorders, and medications in HRV biofeedback in older adults.

References

•Jester DJ, Rozek EK, McKelley RA. Heart rate variability biofeedback: implications for cognitive and psychiatric effects in older adults. *Aging & Mental Health*. 2018;1-7.

•Porges SW. Emotion: an evolutionary by-product of the neural regulation of the autonomic nervous system. *Annals of the New York Academy of Sciences*. 1997;807(1):62-77.

•Porges SW. Orienting in a defensive world: Mammalian modifications of our evolutionary heritage. A polyvagal theory. *Psychophysiology*. 1995;32(4):301-318.

•Thayer JF, Lane RD. A model of neurovisceral integration in emotion regulation and dysregulation. *Journal of Affective Disorders*. 2000;61(3):201-216.

Variable	Session 1 $M \pm SD$	Session 2 $M \pm SD$	Session 3 $M \pm SD$	Session 4 $M \pm SD$	Session 5 $M \pm SD$	Session 6 $M \pm SD$
SDNN (ms)	58.22 \pm 54.26	45.69 \pm 30.33	54.11 \pm 34.15	67.55 \pm 51.72	74.27 \pm 50.69	68.06 \pm 55.41
RMSSD (ms)	73.51 \pm 70.49	60.11 \pm 40.67	73.08 \pm 47.34	90.22 \pm 74.07	95.43 \pm 67.94	88.96 \pm 69.56
LnHF (ms ²)	6.60 \pm 1.37	6.26 \pm 1.33	6.69 \pm 1.25	7.10 \pm 1.42	7.04 \pm 1.74	6.94 \pm 1.82
SampEn	1.61 \pm 0.36	1.56 \pm 0.31	1.48 \pm 0.42	1.45 \pm 0.41	1.41 \pm 0.52	1.49 \pm 0.51