



Comparing Active and Passive Recumbent Cycling: Impacts on State Anxiety, Tension, and Calmness in Healthy Adults

Noah Adams¹, Kathryn M. Rougeau, Ph.D.²

¹William Beaumont School of Medicine, Oakland University, Rochester MI

²Department of Public & Environmental Wellness, School of Health Sciences, Oakland University, Rochester MI



Background:

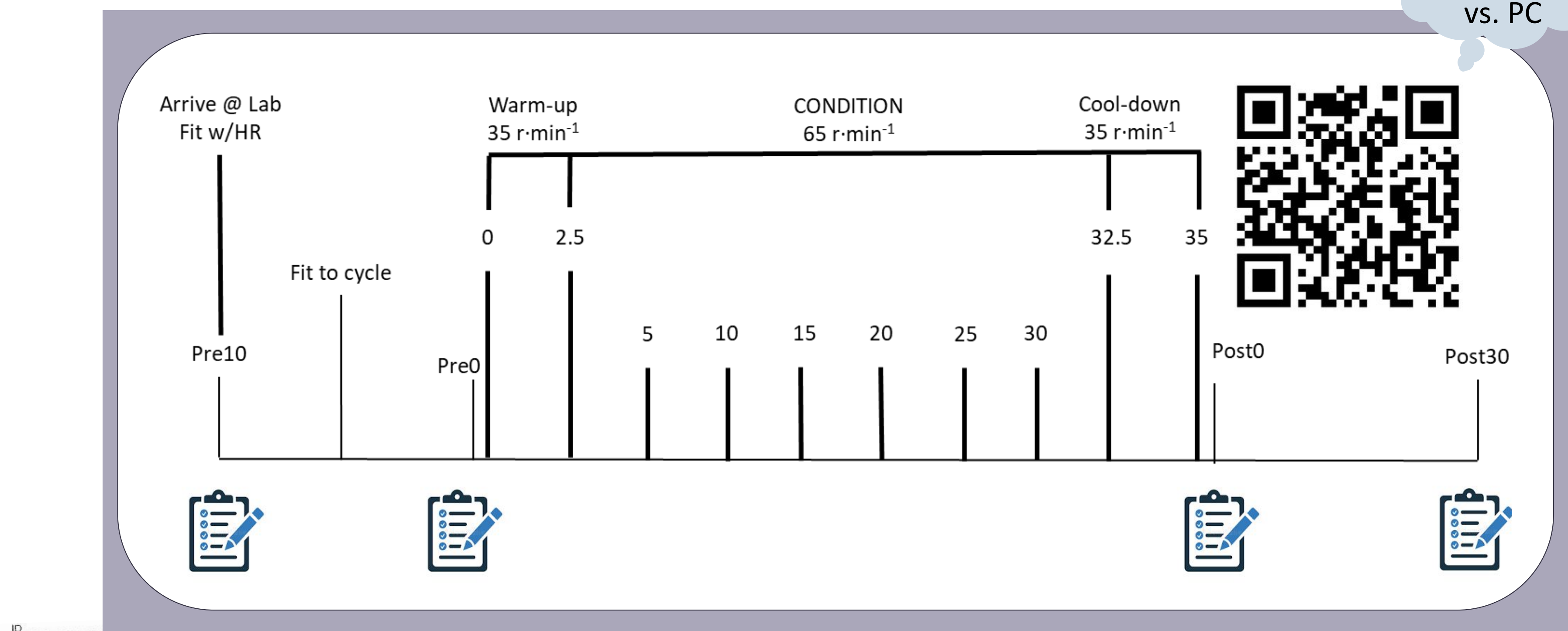
- Anxiety involves a complex interplay between psychological and physiological responses driven by the sympathetic nervous system; while adaptive, dysregulated anxiety can impair coping and daily function.¹
- Prior studies have shown that affective responses to exercise influence future physical activity, and some studies have also shown that non runners experience a greater negative affect during exercise; however, research is limited by small samples and inconsistent intensities.²
- Passive cycling has shown to improve peripheral circulation and offers benefits for individuals unable to exercise actively, but its *psychological* effects remain understudied.³

Methods:

Demographics: N =73 (n= 29 male; $M_{age} = 20.51 \pm 3.19$ years; $M_{height} = 1.65 \pm 0.16$ m; $M_{weight} = 71.09 \pm 17.39$ kgs) healthy college-aged adults participated in two randomized and counterbalanced conditions.

Conditions: Active Cycling (AC; traditional volitional); Passive Cycling(PC; motor-driven) all performed at at RPE of 15 (Hard).

Activation Deactivation Checklist (AD ACL/SAI)⁴:A validated questionnaire used to measure momentary affective and arousal states. Used to assess tension, calmness, and situational (state) anxiety.



Self-Assessment Inventory

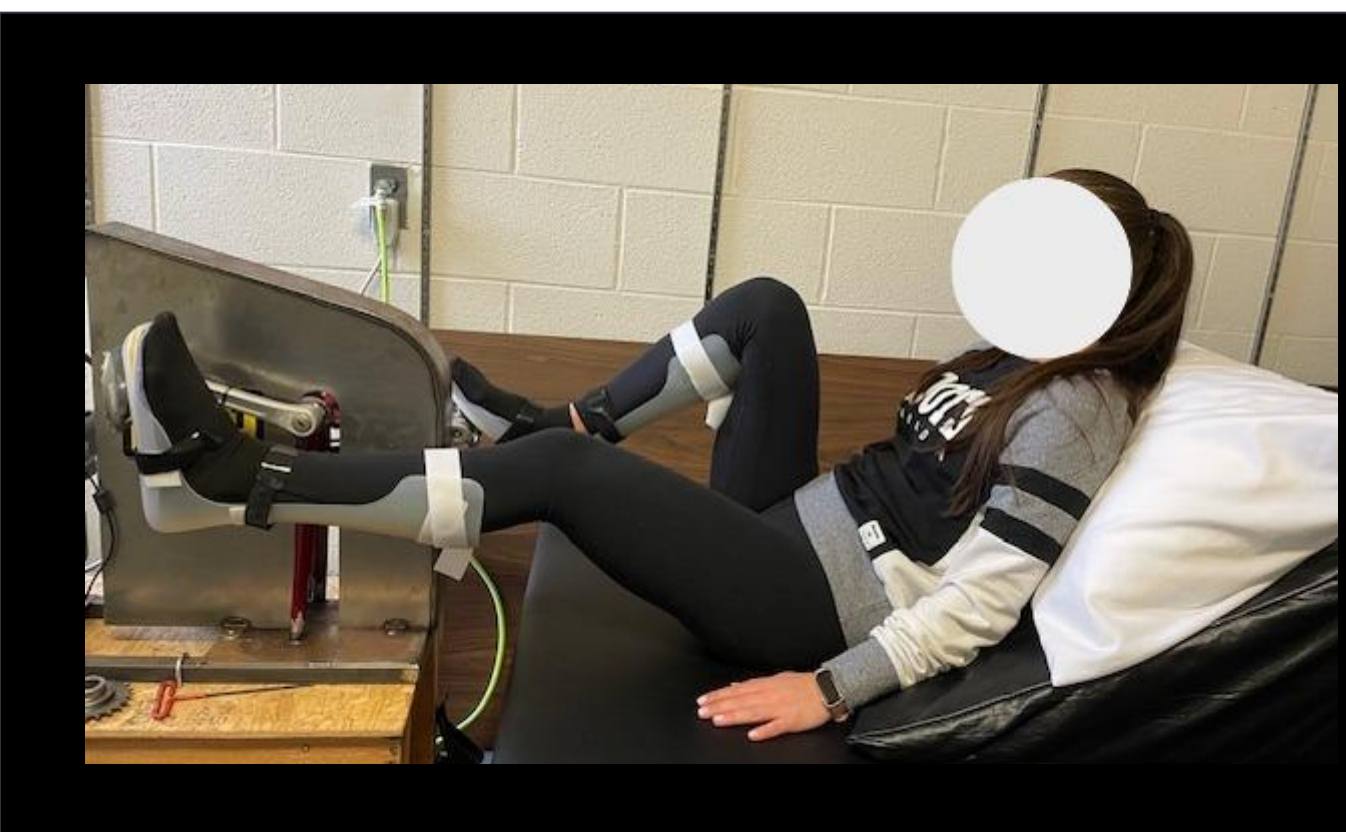
Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then use the rating scale to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer that seems to describe your present state best. This should only take a minute or two.

⊖ = Not at All
⊙ = Moderately So
⊕ = Somewhat
⊗ = Very Much So

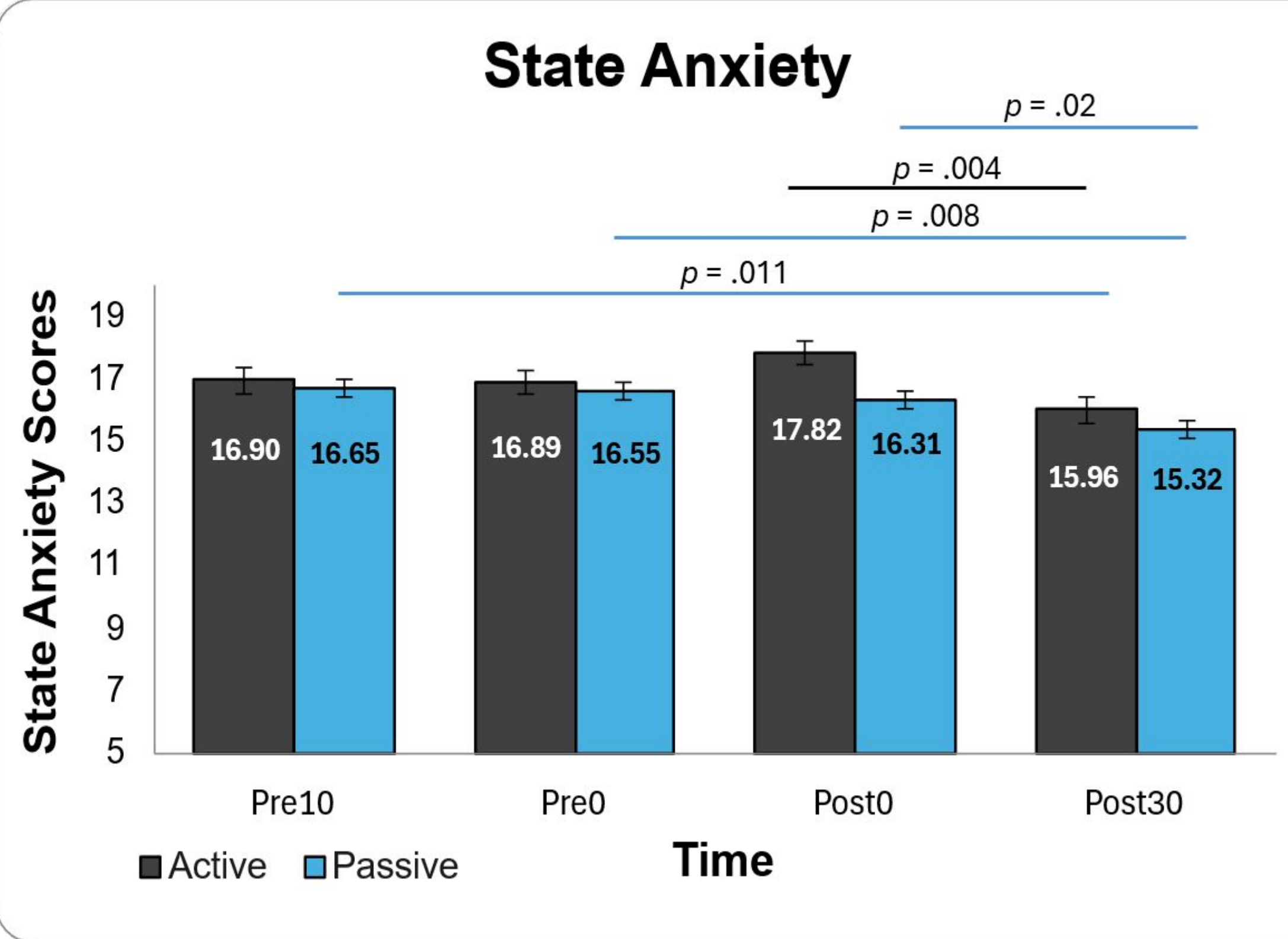
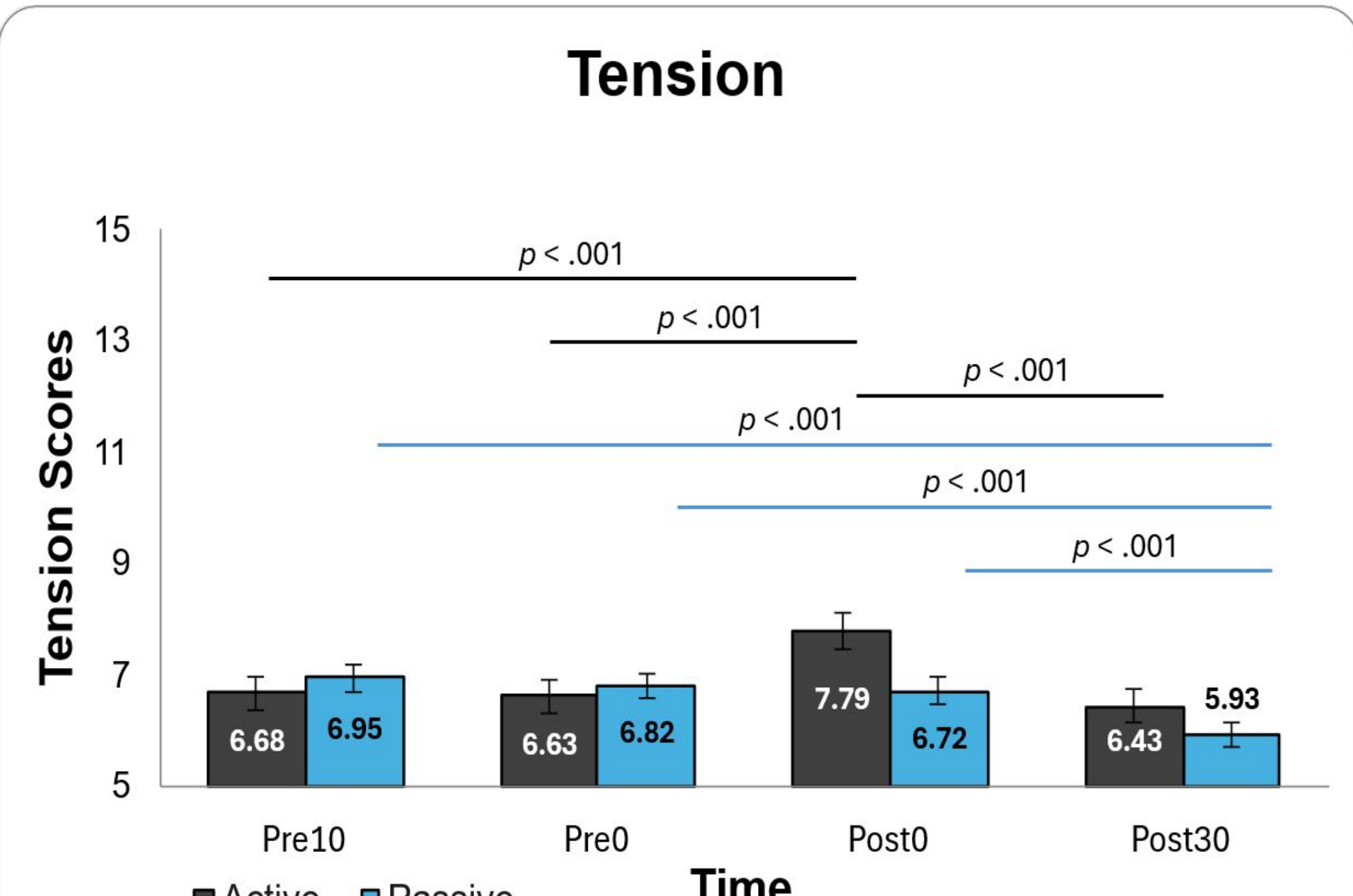
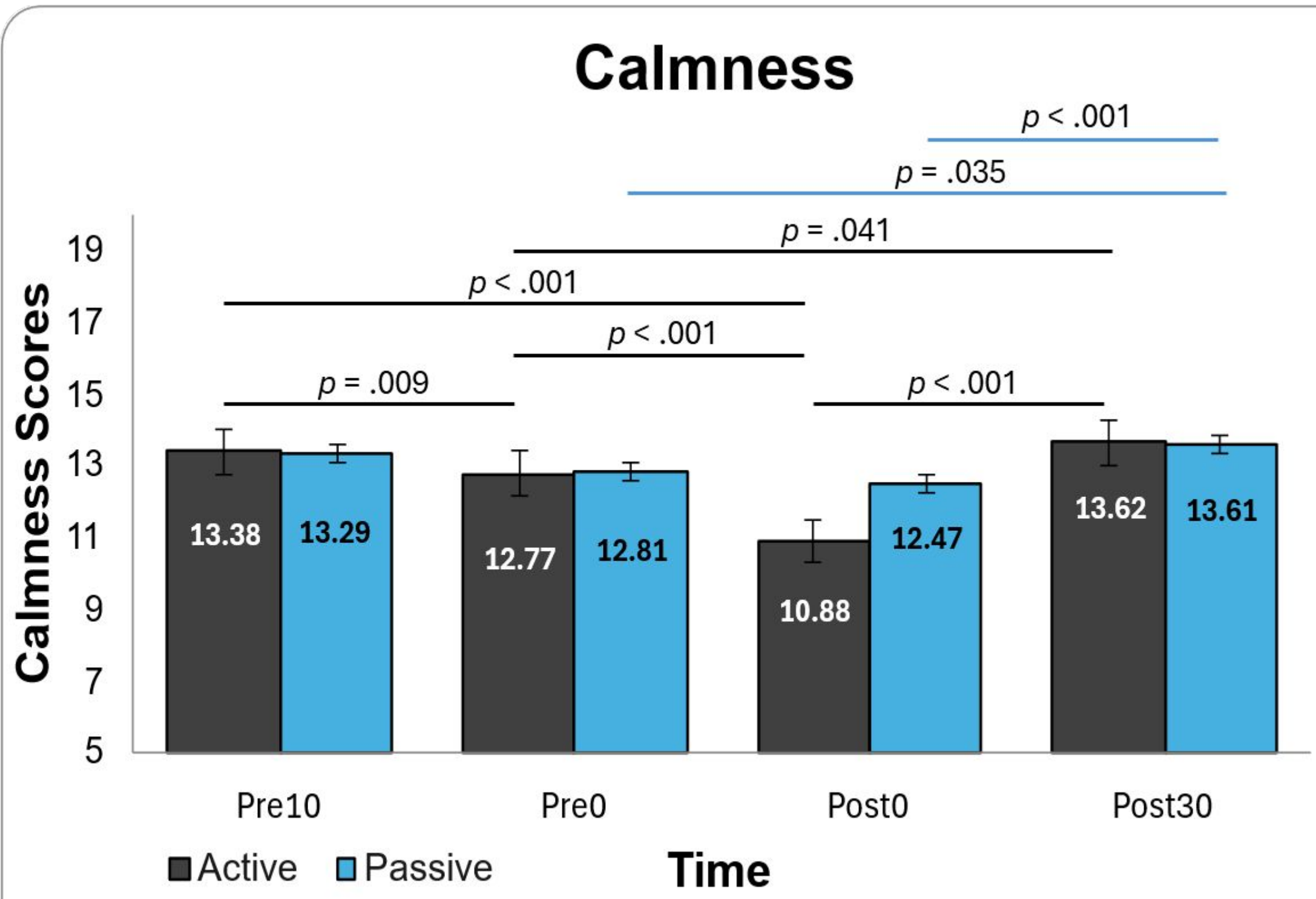
Right Now I Feel:			
1. Active	⊖ ⊙ ⊕ ⊗	15. Drowsy	⊖ ⊙ ⊕ ⊗
2. Placid	⊖ ⊙ ⊕ ⊗	16. Fearful	⊖ ⊙ ⊕ ⊗
3. At ease	⊖ ⊙ ⊕ ⊗	17. Nervous	⊖ ⊙ ⊕ ⊗
4. Sleepy	⊖ ⊙ ⊕ ⊗	18. Lively	⊖ ⊙ ⊕ ⊗
5. Jittery	⊖ ⊙ ⊕ ⊗	19. Still	⊖ ⊙ ⊕ ⊗
6. Frightened	⊖ ⊙ ⊕ ⊗	20. Relaxed	⊖ ⊙ ⊕ ⊗
7. Energetic	⊖ ⊙ ⊕ ⊗	21. Wide-awake	⊖ ⊙ ⊕ ⊗
8. Intense	⊖ ⊙ ⊕ ⊗	22. Clutched-up	⊖ ⊙ ⊕ ⊗
9. Worried	⊖ ⊙ ⊕ ⊗	23. Steady	⊖ ⊙ ⊕ ⊗
10. Calm	⊖ ⊙ ⊕ ⊗	24. Quiet	⊖ ⊙ ⊕ ⊗
11. Tired	⊖ ⊙ ⊕ ⊗	25. Full-of-pep	⊖ ⊙ ⊕ ⊗
12. Vigorous	⊖ ⊙ ⊕ ⊗	26. Tense	⊖ ⊙ ⊕ ⊗
13. At-rest	⊖ ⊙ ⊕ ⊗	27. Wakeful	⊖ ⊙ ⊕ ⊗
14. Stressed	⊖ ⊙ ⊕ ⊗		
28. Presently worrying over possible misfortunes ⊖ ⊙ ⊕ ⊗			



Indicates when AD ACL/SAI were collected



Results:



Key Findings:

Calmness - Significantly decreased during AC, and returned to baseline levels 30-mins post PA. No significant changes in calmness were observed during PC, but there were significant improvements post PA.

Tension - Significantly increased during AC, and returned to baseline levels 30-mins post PA. No significant changes in tension were observed during PC, but there were significant improvements post PA.

State Anxiety - No significant changes in state anxiety during AC, but levels returned to baseline 30-mins post PA. No significant changes in state anxiety were observed during PC, however there were significant improvements post PA.

Clinical Implications:

- Given the results, passive cycling demonstrates meaningful reductions in state anxiety, tension while increasing calmness post activity. Future studies should evaluate its utility in patients with spinal cord injury, stroke, neuromuscular disorders, or musculoskeletal limitations.
- Passive cycling could be explored as an supplemental therapy in inpatient rehabilitation, subacute rehabilitation facilities, or psychiatric settings where active exercise isn't available.

Acknowledgements & Funding:

- The researchers want to thank the undergraduate research assistants for their data collection assistance, and the participants for their time and dedication to this project.
- We are grateful to Dr. Lisa L. M. Welling and the OU Department of Psychology for generously providing laboratory space and access to the SONA participant recruitment pool.
- This study was made possible by the Oakland University William Beaumont School of Medicine EMBARK research grant and the Oakland University School of Health Sciences Faculty Seed Grant.

References:

- 1) Cashin-Garbutt A. *What is epinephrine (adrenaline)?* News-Medical. Published July 18, 2023. Accessed March 2, 2026. [https://www.news-medical.net/health/What-is-Epinephrine-\(Adrenaline\).aspx](https://www.news-medical.net/health/What-is-Epinephrine-(Adrenaline).aspx)
- 2) Rudolph DL, McAuley E. Cortisol and affective responses to exercise. *J Sports Sci.* 1998;16(2):121-128. doi:10.1080/026404198366830
- 3) Fuse S, Kime R, Osada T, Murase N, Katsumura T. The effects of passive cycling exercise for 30 min on cardiorespiratory dynamics in healthy men. In: *Advances in Experimental Medicine and Biology*. Springer; 2016:263-268. doi:10.1007/978-3-319-38810-6_35
- 4) Thayer RE. *Activation-Deactivation Adjective Checklist (AD ACL)* [database record]. APA PsycTests; 1967. doi:10.1037/t05942-000