

Background

Chronic stress among older adults is associated with increased risk of depression, anxiety, cardiovascular disease, and cognitive decline.¹ As individuals age, they may experience additional stressors such as declining health, social isolation, and loss of social support.¹ Identifying effective strategies to promote mental well-being is important for supporting healthy aging. Nature-based interventions, including activities such as gardening, forest bathing, and outdoor movement, have been shown to improve mood and reduce stress.² Exposure to natural environments may also enhance feelings of connection to nature, which is associated with improved psychological well-being.² However, most studies examining these benefits are short-term, and fewer studies have evaluated the effects of structured nature-based programs over time among older adults.¹ This study examined whether participation in a structured six-week nature-based intervention could improve mood, well-being and connectedness to nature while reducing physiological stress in adults aged 65 years and older.

Objective

To evaluate the effects of a six-week nature-based intervention on mood, well-being, nature-relatedness, physiological stress (cortisol), and physical strength among older adults.

Methods

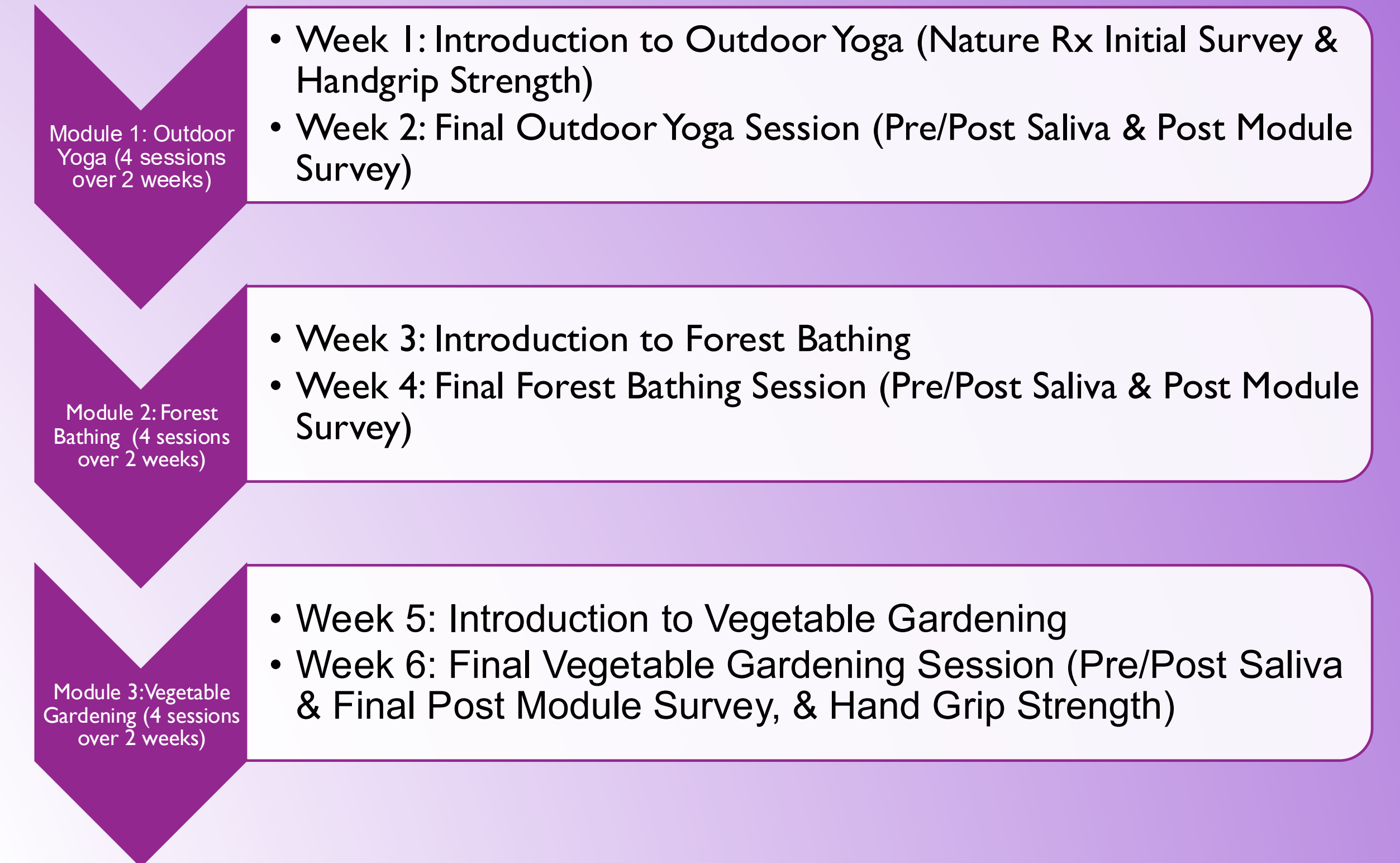
This pilot study used a repeated-measures design with a convenience sample of older adults (N=21; mean age = 74.1 ± 4.6 years; range 65-85). Following IRB approval, participants provided informed consent and completed a six-week nature-based intervention conducted in partnership with the Fort Worth Botanic Garden and Texas Christian University. The program consisted of three two-week modules meeting twice weekly focused on outdoor yoga, forest bathing, and vegetable gardening. Psychosocial measures (Well-Being/Personal Health Index, positive and negative affect, nature-relatedness, and outdoor activity minutes) were collected at baseline and every two weeks for three additional follow-up time points. Physiological measures included handgrip strength (HGS) and salivary cortisol (SC) measured using saliva samples. HGS was measured at weeks 1 and 6. SC was measured pre- and post-intervention at the end of each two-week focused session. Friedman tests with Bonferroni-adjusted post hoc comparisons evaluated psychosocial outcomes, while paired-samples t-tests and repeated-measures ANOVA assessed physiological outcomes.

Results

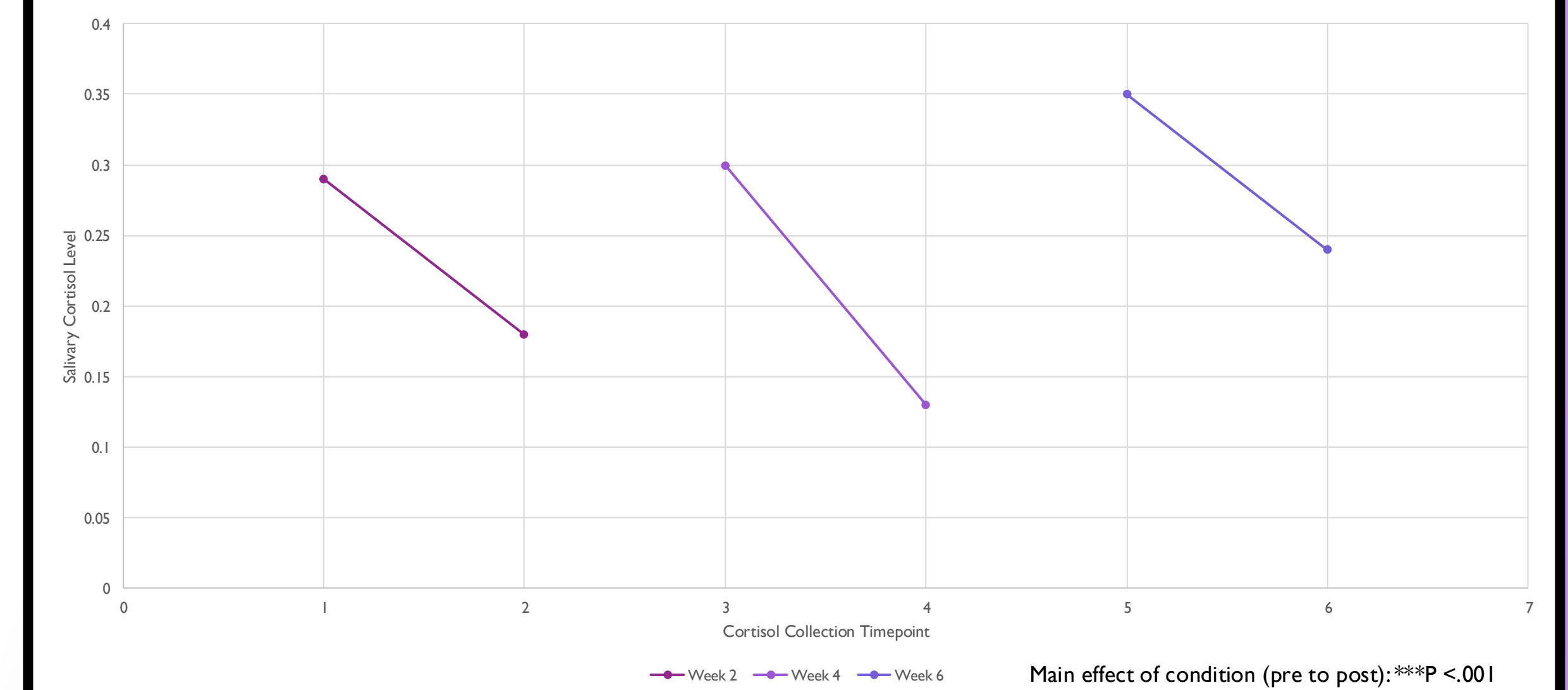
A Friedman test showed significant effect of time on positive affect, significantly increased across the intervention period ($X^2(3, N=18) = 13.437, p = .004$), with the largest improvements observed at the final assessment relative to baseline. Negative affect demonstrated a significant overall time effect ($X^2(3, N=18) = 11.131, p = .011$), though pairwise comparisons were not statistically significant. No significant changes were observed for global well-being as measured by the WPHI ($X^2(3, N=18) = 1.886, p = .596$), nature-relatedness, or self-reported outdoor activity minutes (all $p > .05$). Handgrip strength remained stable from pre- to post-intervention, and strength classification categories did not significantly change (Wilcoxon $W=3.00, p = .157$). Salivary cortisol levels significantly decreased from pre- to post-intervention ($t(21) = 7.653, p < .001$) where the mean difference was 0.127 (95 CI [0.092, 0.161]), indicating that post-intervention values were lower than pre-intervention levels. Repeated-measures ANOVA further confirmed a significant condition effect. The magnitude of salivary cortisol reduction was large (Cohen's $d=1.63$; Hedges' $g=1.57$).

Participant Demographics

Characteristic	Category	n (%)	Characteristic	Category	n (%)
Sex	Female	18 (85.7%)	Employment Status	Retired	17 (81.0%)
	Male	3 (14.3%)		Part-time	4 (19.0%)
Race/Ethnicity	White	20 (95.2%)	Religion	Protestant	10 (47.6%)
	Two or more races	1 (4.8%)		Roman Catholic	7 (33.3%)
	Non-Hispanic	0 (0.0%)		Agnostic	3 (14.3%)
Hispanic	0 (0.0%)	Jewish	1 (4.8%)		
	Other		0 (0.0%)	Household Income	<\$20,000
Education Level	High school or less	1 (4.8%)	\$20,000–\$40,000	2 (9.5%)	
	Some college	3 (14.3%)	\$40,000–\$60,000	2 (9.5%)	
	Associate degree	2 (9.5%)	\$60,000–\$80,000	2 (9.5%)	
	Bachelor degree	8 (38.1%)	\$80,000–\$100,000	2 (9.5%)	
	Graduate degree	7 (33.3%)	\$100,000+	8 (38.1%)	
			Prefer not to disclose	1 (4.8%)	



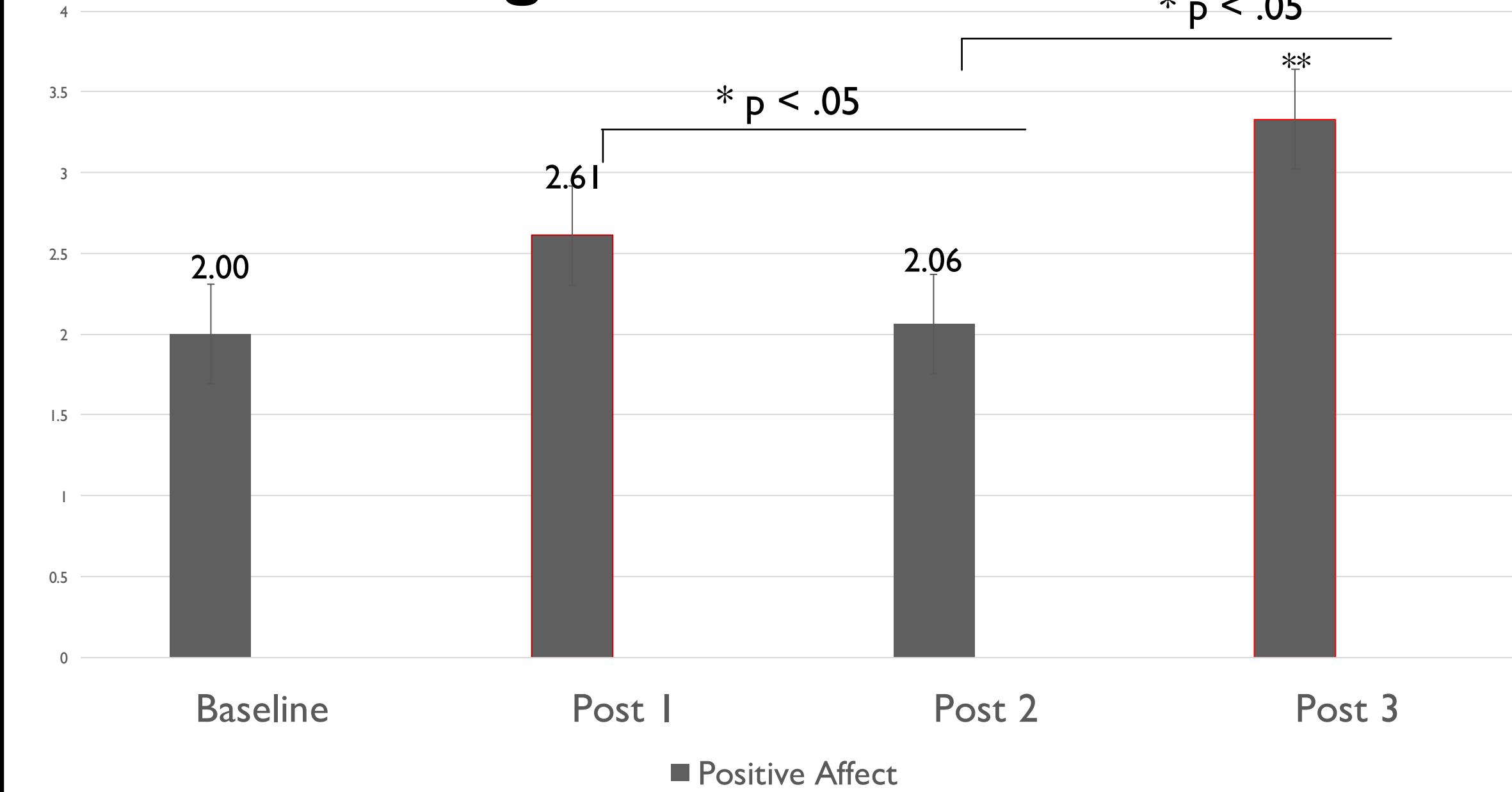
Salivary Cortisol Levels Across Assessment Points



Handgrip Strength Distribution at Week 1 and Week 6

Category	Week 1 n (%)	Week 6 n (%)
Weak	0 (0.0%)	0 (0.0%)
Normal	16 (72.7%)	13 (68.4%)
Strong	6 (27.3%)	6 (31.6%)

Changes in Positive Affect



Conclusion

Findings from this pilot study suggest that participation in a short-term nature-based intervention may improve positive affect and reduce physiological stress among older adults. Positive affect improved over time, with changes becoming more evident at later stages of assessment, suggesting a delayed or cumulative benefit. The significant reduction in salivary cortisol indicates meaningful changes in biological stress responses, while hand grip strength remained unchanged, suggesting no measurable improvement in muscular performance within the six-week period. Limitations include a small, relatively homogenous convenience sample and potential selection bias due to healthier baseline participants. Future research should include larger randomized controlled trials with longer follow-up periods. These findings have practical implications for nutrition professionals, as incorporating nature-based or lifestyle interventions may help reduce stress-related physiological burden in older adults, potentially supporting overall wellness.

References

- Tong K, Thompson CW, Carin-Levy G, Liddle J, Morton S, Mead GE. Nature-based interventions for older adults: a systematic review of intervention types and methods, health effects and pathways. *Age Ageing*. 2025;54(4):afaf084. doi:10.1093/ageing/afaf084
- Sia A., Tam, VV.S., Fogel, A. et al. Nature-based activities improve the well-being of older adults. *Sci Rep* 10, 18178 (2020). <https://doi.org/10.1038/s41598-020-74828-w>