

The Impact of Age and Exercise on Blood Melatonin Levels

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Motivation

“It is still unclear whether human melatonin concentrations increase, decrease or remain unaffected by single bouts of exercise” (Atkinson et al.)



Further Motivation:

“Although most studies show that plasma melatonin levels increase shortly and transiently after exercise ... a decrease or no change in melatonin secretion after exercise have been also reported” (Escames et al.)

“... it appears that both the acute and delayed effects of exercise on the 24-h profile of plasma melatonin levels may be dependent on time of day” (Buxton et al.)

“Melatonin levels decline gradually over the life-span and may be related to lowered sleep efficacy, very often associated with advancing age, as well as to deterioration of many circadian rhythms. Melatonin exhibits immunomodulatory properties, and a remodeling of immune system function is an integral part of aging” (Karasek)

Research Questions

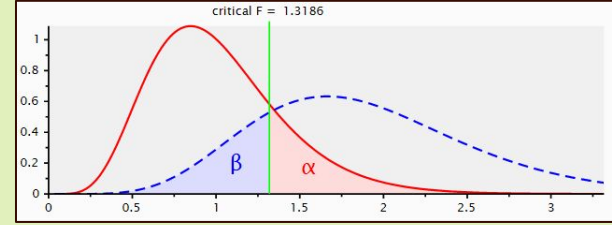
- Does daytime exercise impact blood melatonin levels?
- Does age group impact blood melatonin levels?
- Is there any interaction between daytime exercise and age group on blood melatonin levels?

Experiment Overview



Repeated Measures Experiment

		Age Group			
		< 18	18-45	45-65	> 65
Treatment	Exercise	30 minute brisk walk	30 minute brisk walk	30 minute brisk walk	30 minute brisk walk
	No Exercise	Nothing	Nothing	Nothing	Nothing

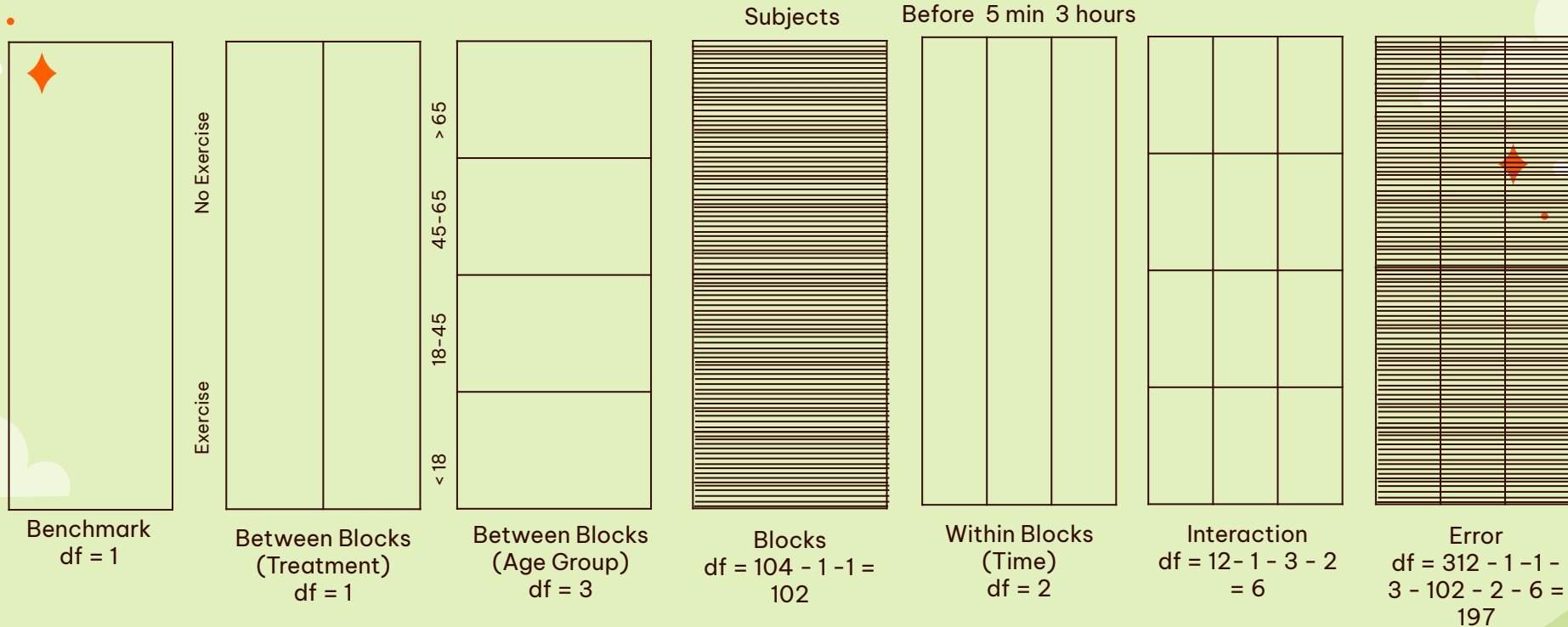


Sample Size Determination

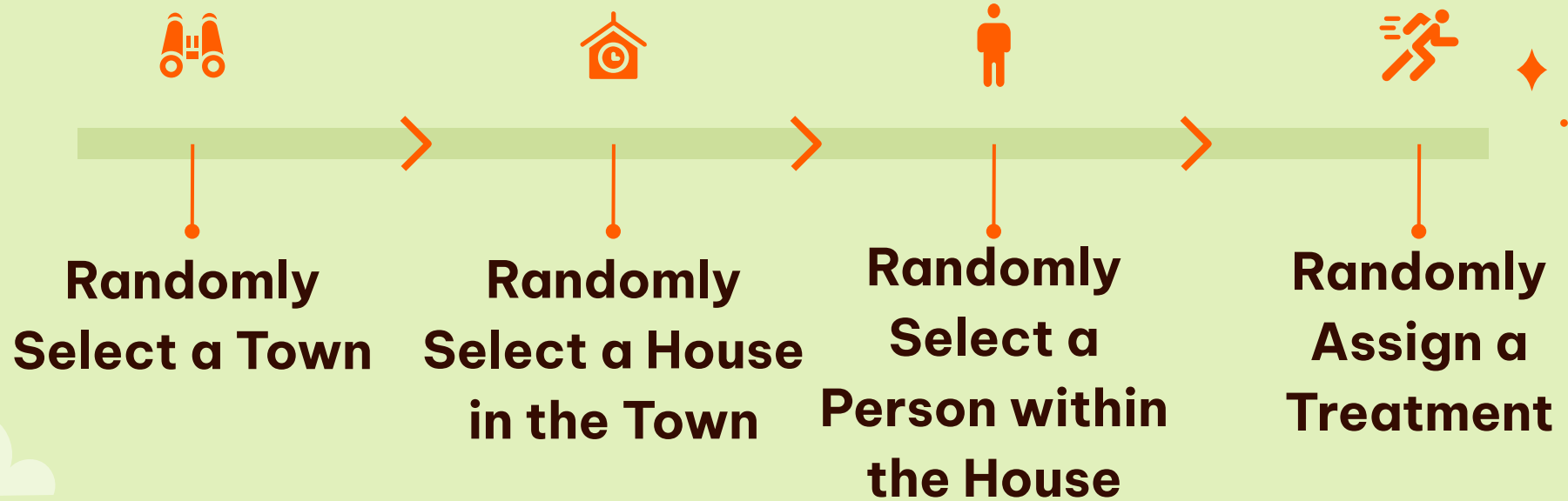
Sample Size Determination:

- Effect Size: 0.25
- Power: 0.8
- Groups: 8
- Measurements: 3
 - Sample Size: 104

Experiment Overview



“Random” Sampling Method



Steps

01

**Measure Pre-Exercise
Melatonin Levels**

03

**Measure Melatonin
Five Minutes After
Treatment Completion**

“In normal volunteers, it was found that melatonin level increased immediately after exercise and returned to preexercise levels 1 hr after physical exertion” (Escames et al.)

02

**Assign and have the
Islander Complete
their Treatment**

04

**Measure Again
Three Hours Later**

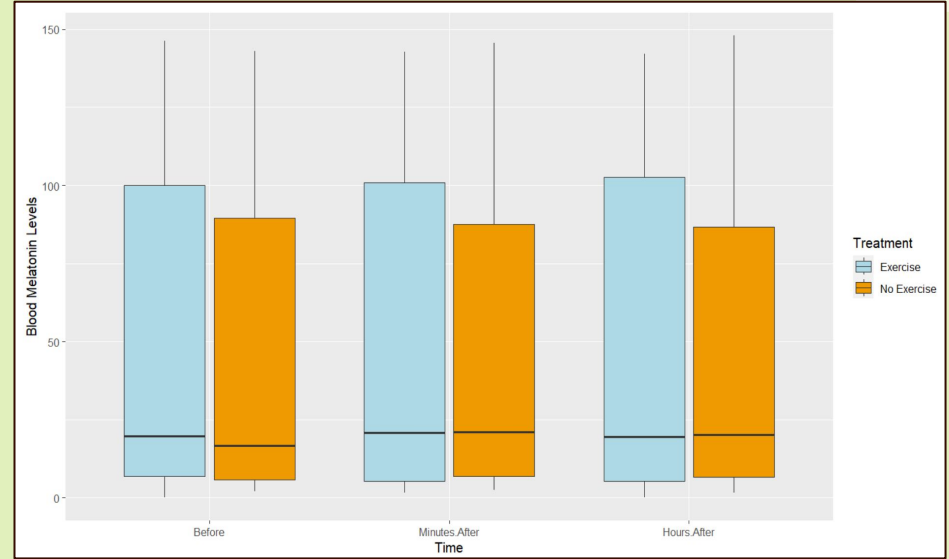
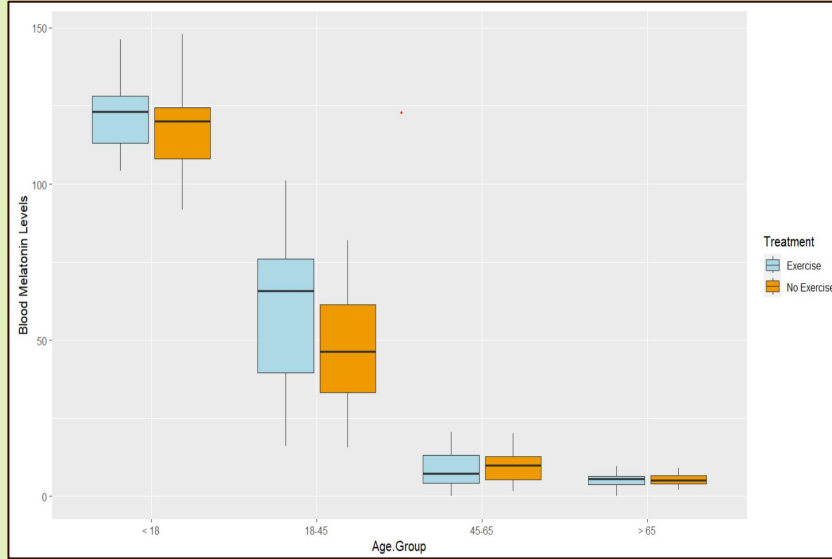
“Montelone, et al. found that evening exercise led to significantly lower melatonin levels 3 hours after exercise” (Pobocik et al.)



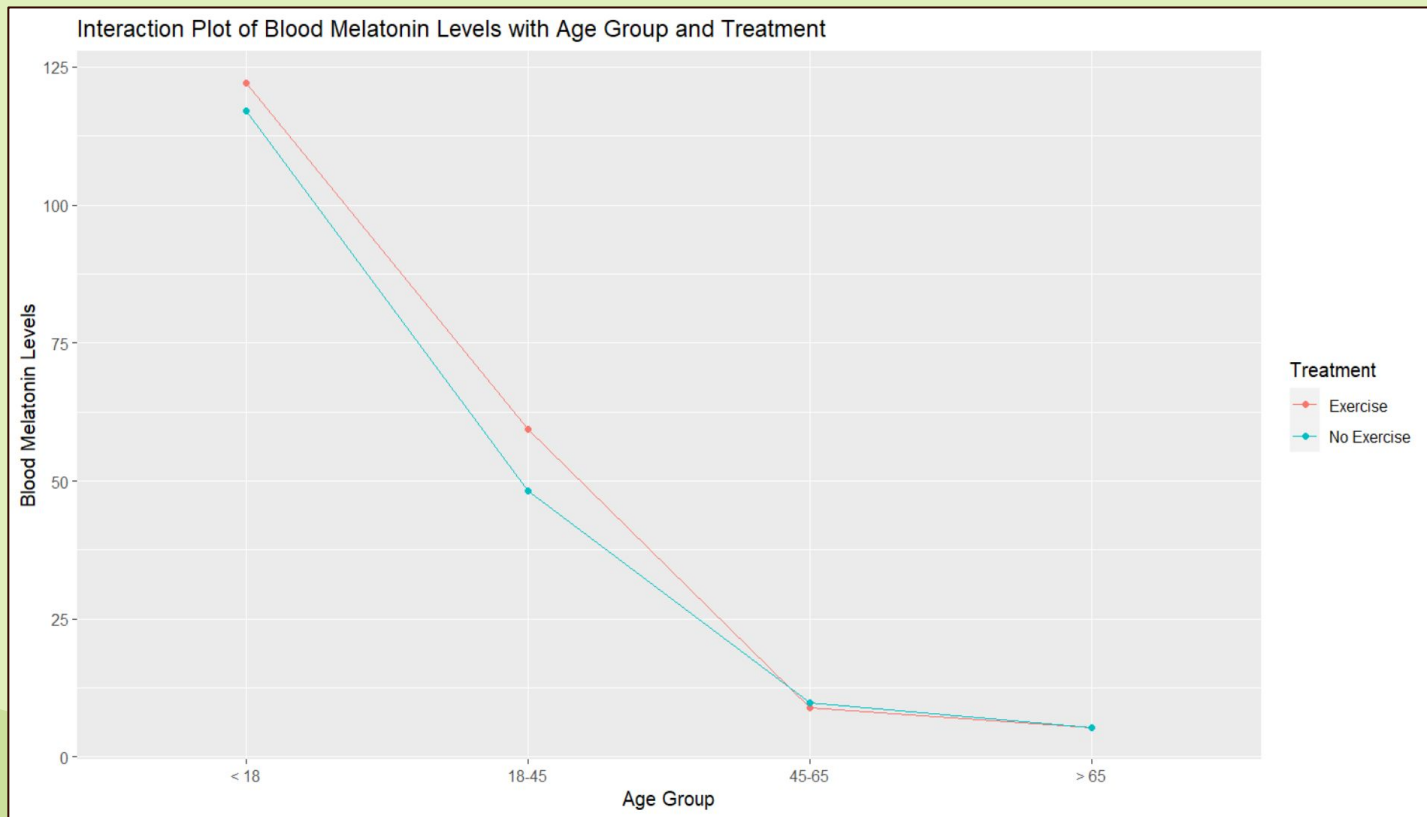


The Data & Results

Box Plots



Interaction Plot



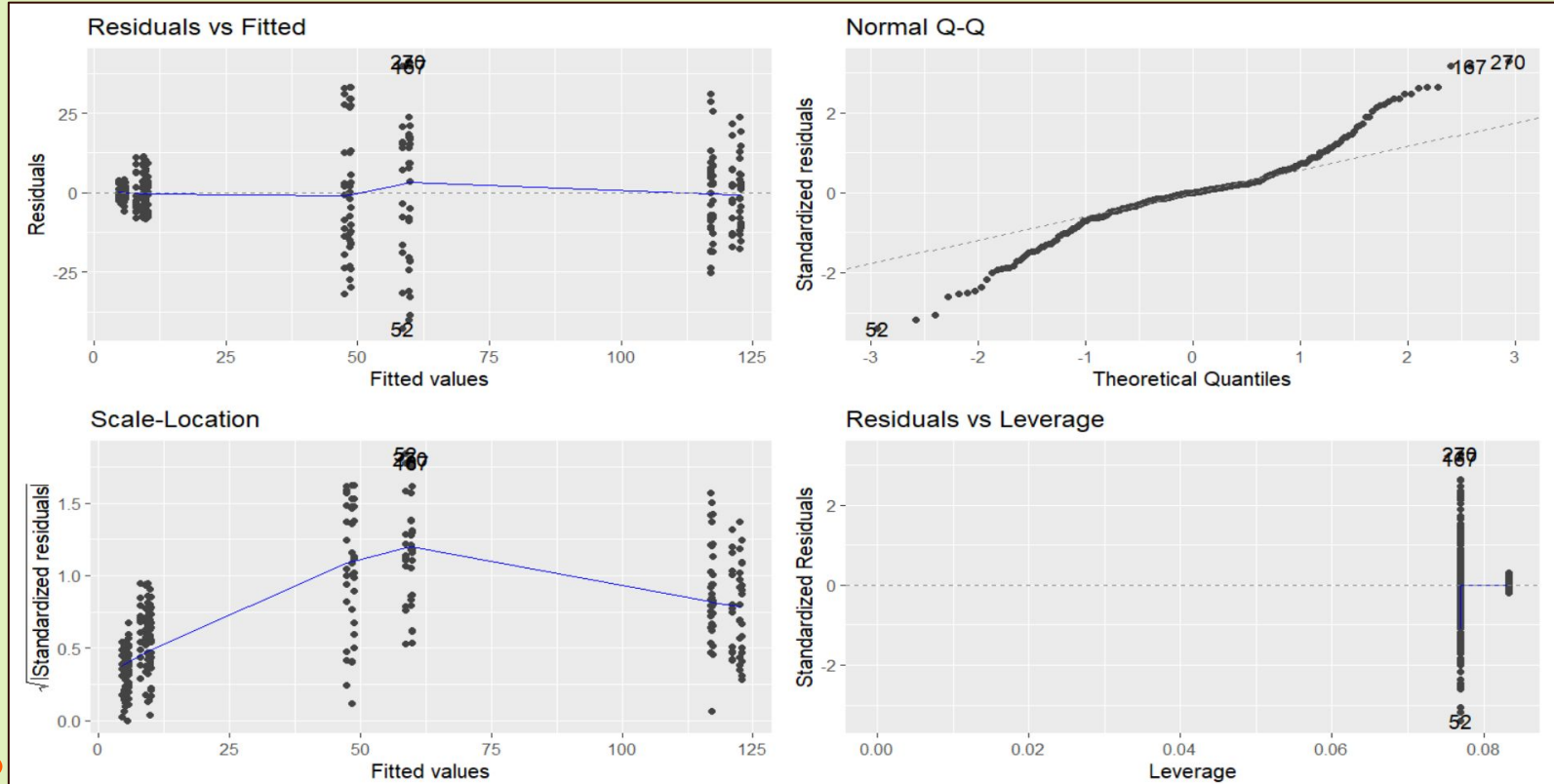
ANOVA Results: Between

Error Between					
	df	Sum Squares	Mean Squares	F Value	P-Value
Treatment	1	696	696	1.373	0.244
Age Group	3	656198	218733	431.778	<2e-16
Treatment : Age Group	3	1831	610	1.205	0.312
Residuals	95	48126	507		

ANOVA Results: Within

Error Between					
	df	Sum Squares	Mean Squares	F Value	P-Value
Time	2	1.9	0.961	0.245	0.7833
Time : Treatment	2	9.6	4.822	1.227	0.2956
Time : Age Group	6	45.9	7.655	1.947	0.0753
Time : Treatment : Age Group	6	23.9	3.991	1.015	0.4167
Residuals	190	747.0	3.931		

Model Validity



TukeyHSD

Age Group	
18-45 - < 18	0.00
45-65 - > 65	0.00
> 65 - < 18	0.00
45-65 - 18-45	0.00
> 65 - 18-45	0.00
> 65 - 45-65	0.194

Conclusions

- Daytime exercise does not have a significant effect on one's blood melatonin
- However, one's age group does
- Future Directions:
 - Repeating the experiment but on a longer scale
 - Emphasis on just the effect of the treatment
 - Repeating the experiment while looking at other potential factors (ie: sex, diet, height & weight)



References

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- Kaylee M, Pobocik, et al. "Influence of aerobic exercise on sleep and salivary melatonin in men." International Journal of Sports and Exercise Medicine, vol. 6, no. 2, 16 Apr. 2020, <https://doi.org/10.23937/2469-5718/1510161>.

Thank you!

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