Biological Clock and Physical Exercise: The impact on Human Health

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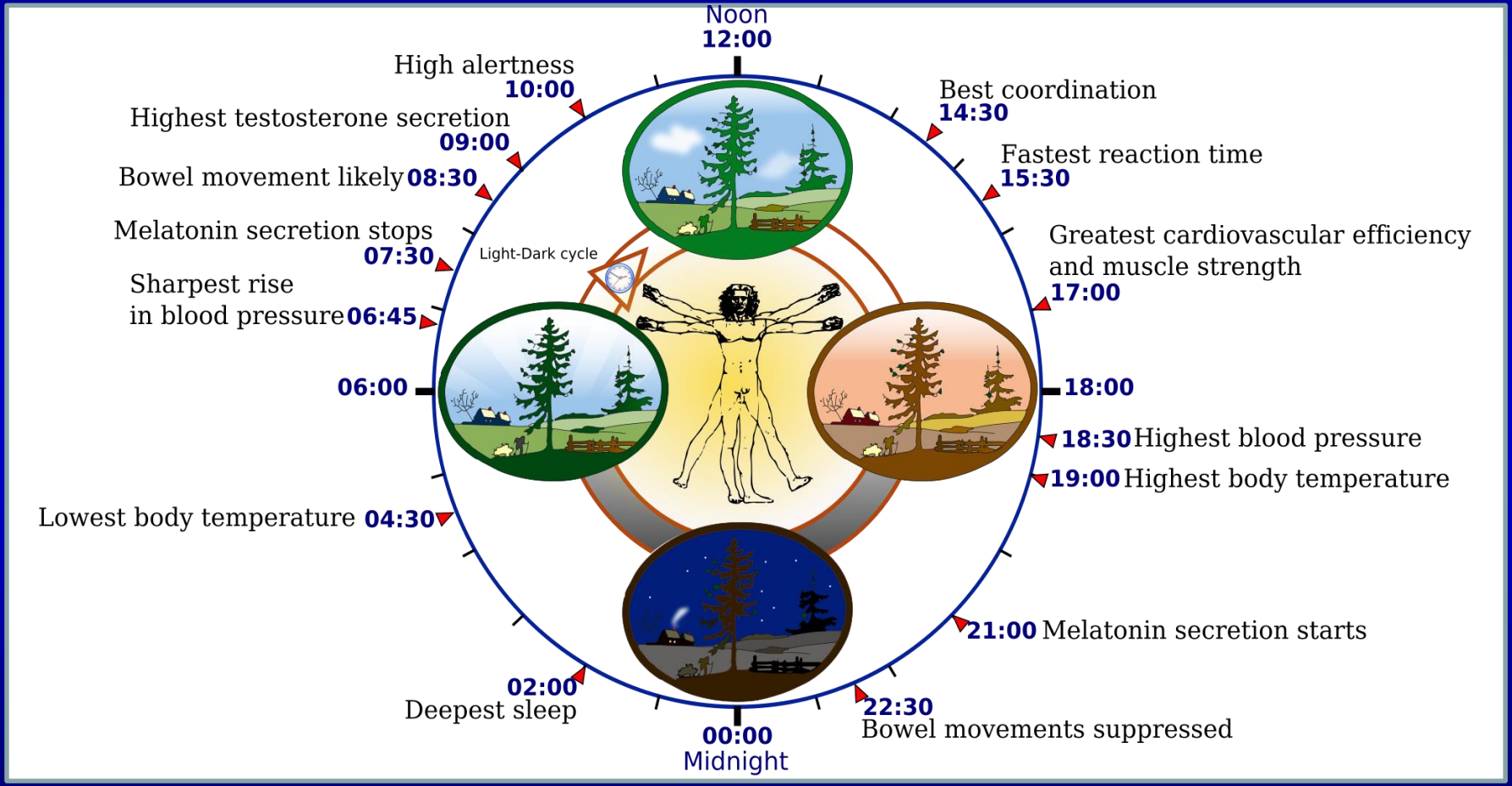
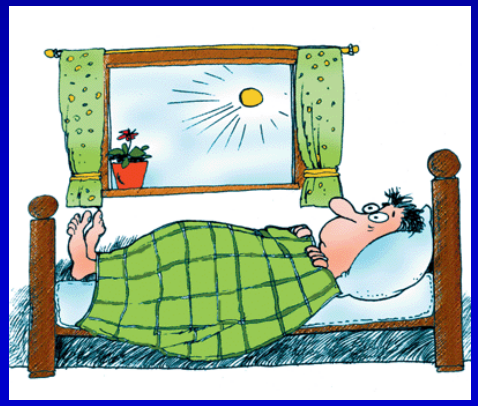
Biological Clock



Disruption of Circadian Rhythms

Increase snacking frequency

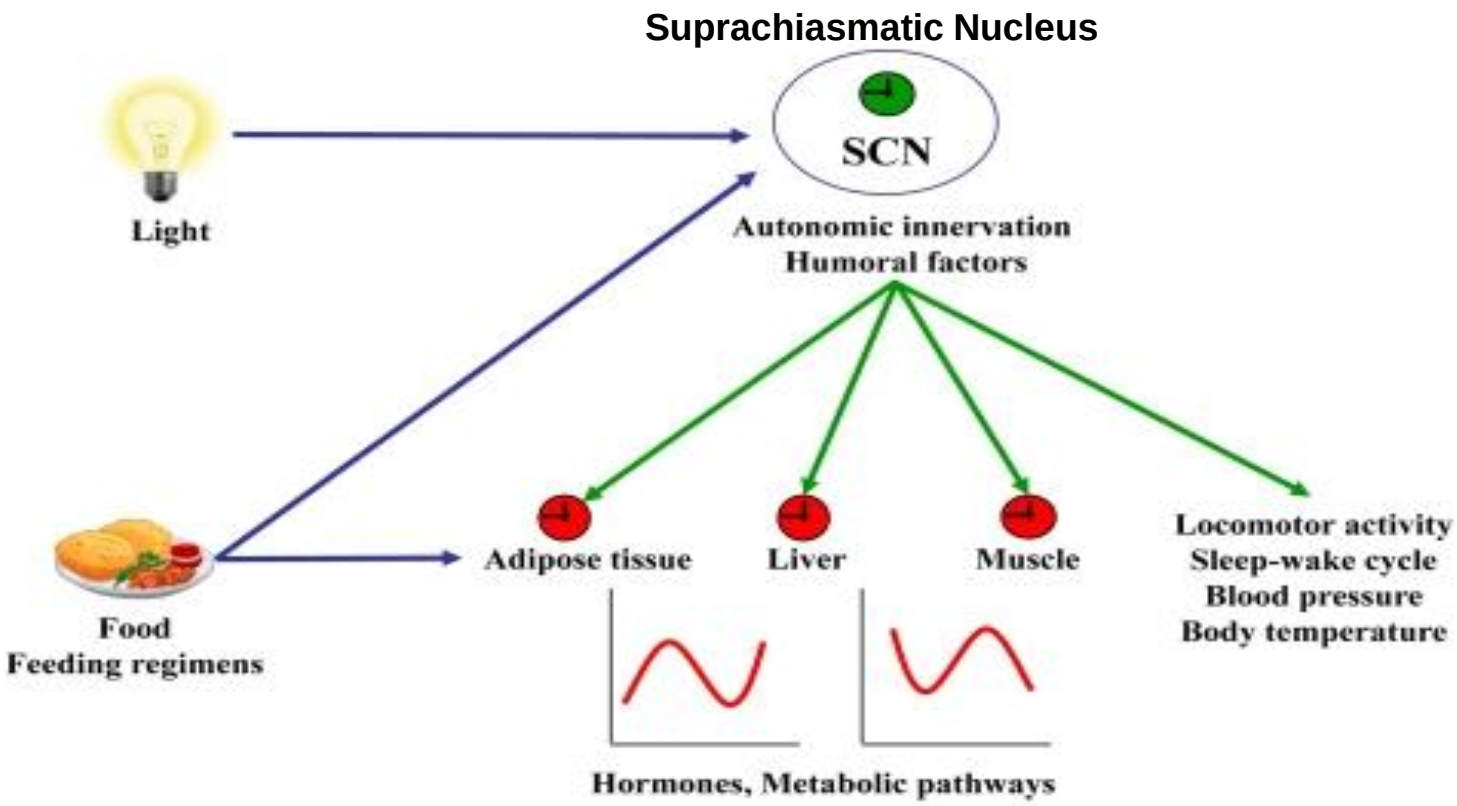
Reduced Sleeping time



Shift work

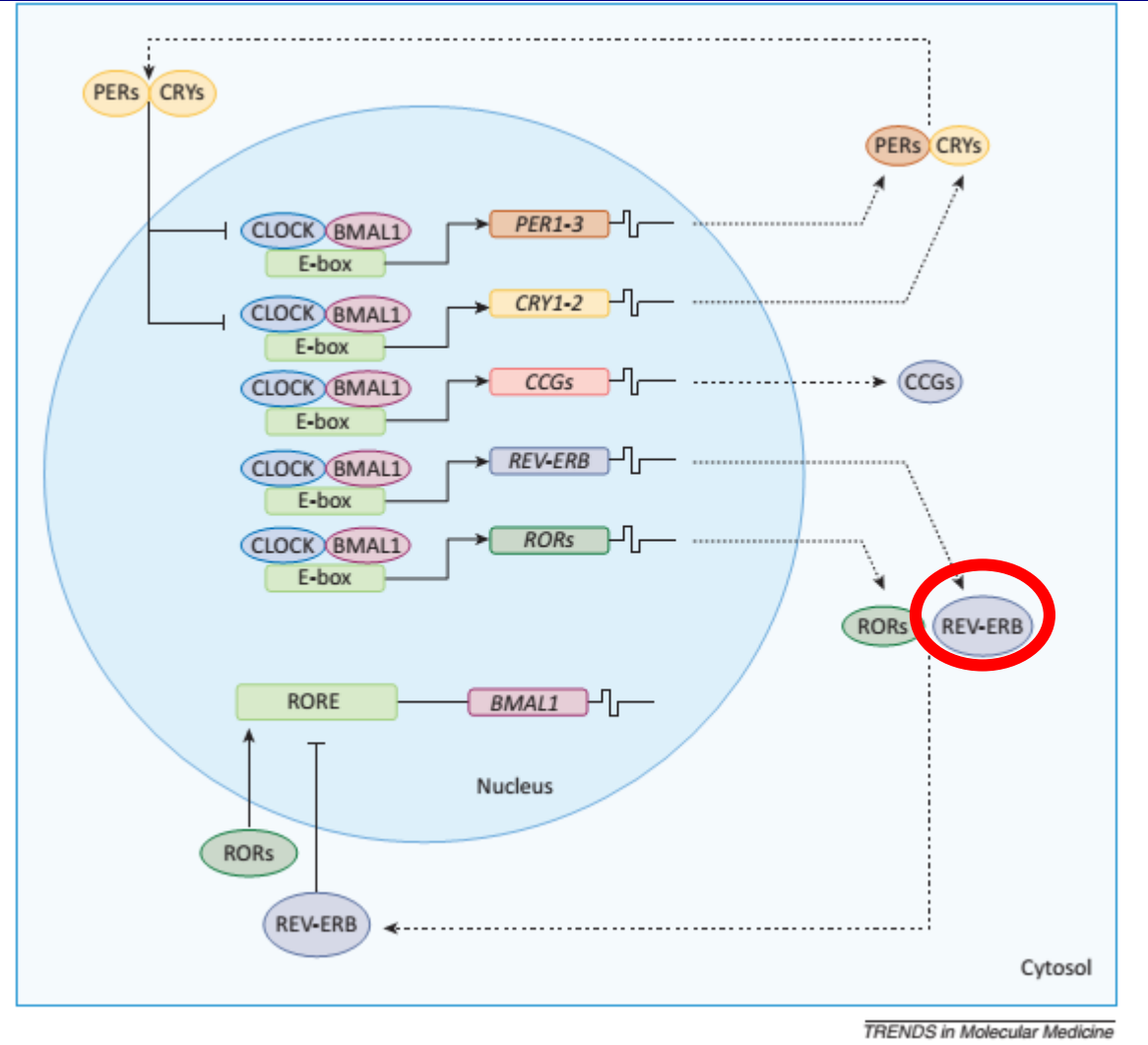
Decreased glucose tolerance and insulin sensitivity and increased risk of obesity and type 2 diabetes

Master Clock and Peripheral Clocks

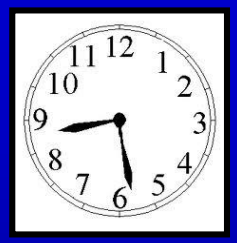


Froy,O. Endocrine Reviews, February 2010.

The biological clock at the molecular level



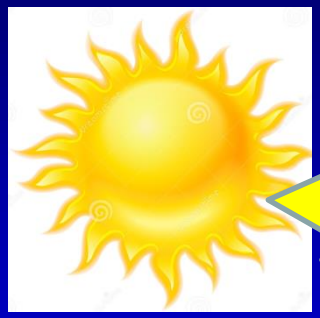
24h rhythms
of gene expression

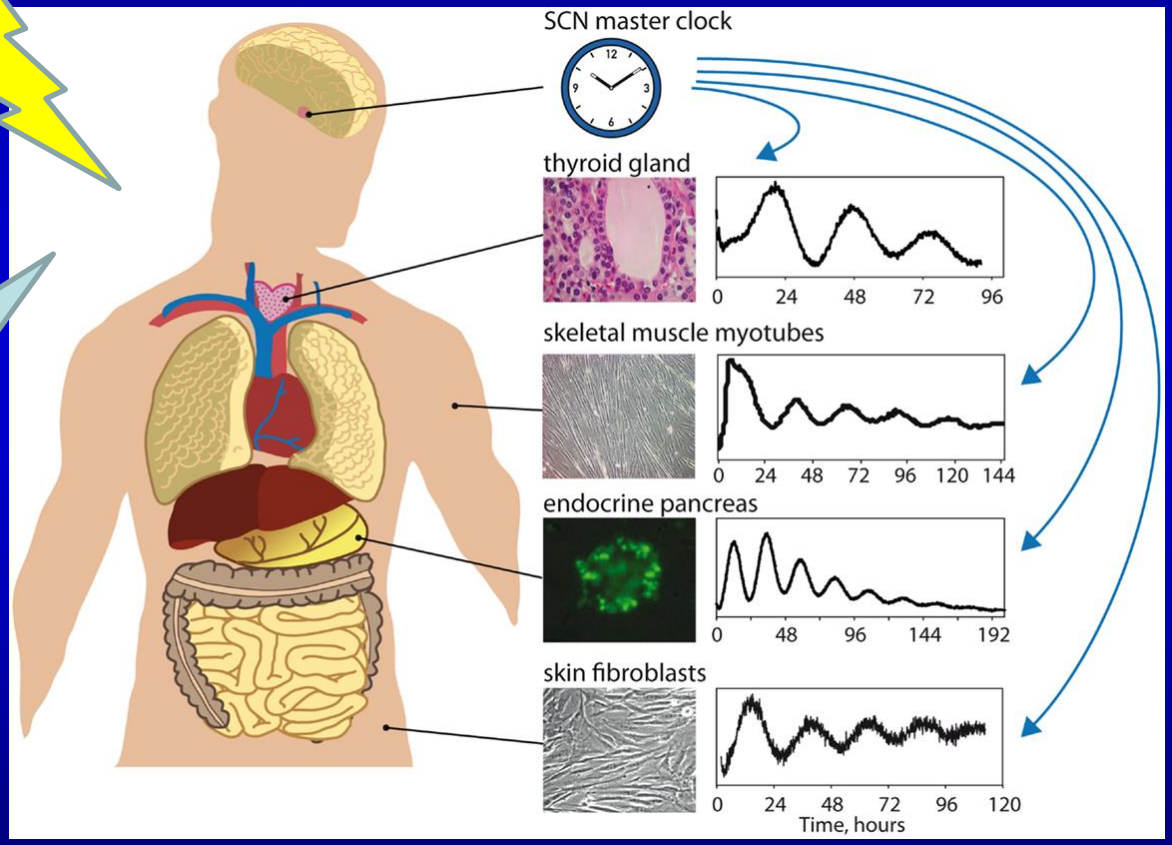


Metabolic output

Vieira et al. Trends in Molecular Medicine, 2014

Synchronizing Your Biological Clock

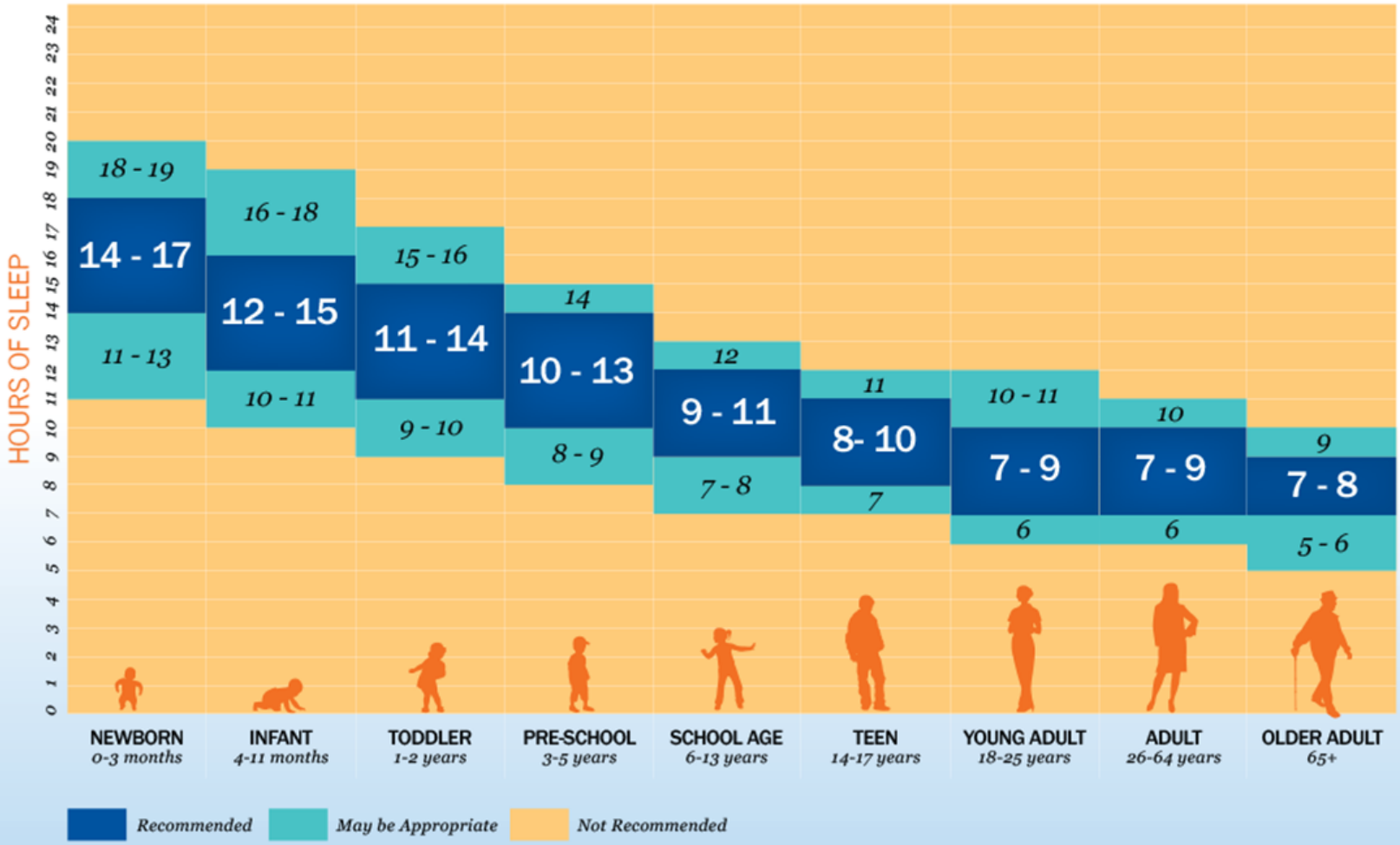




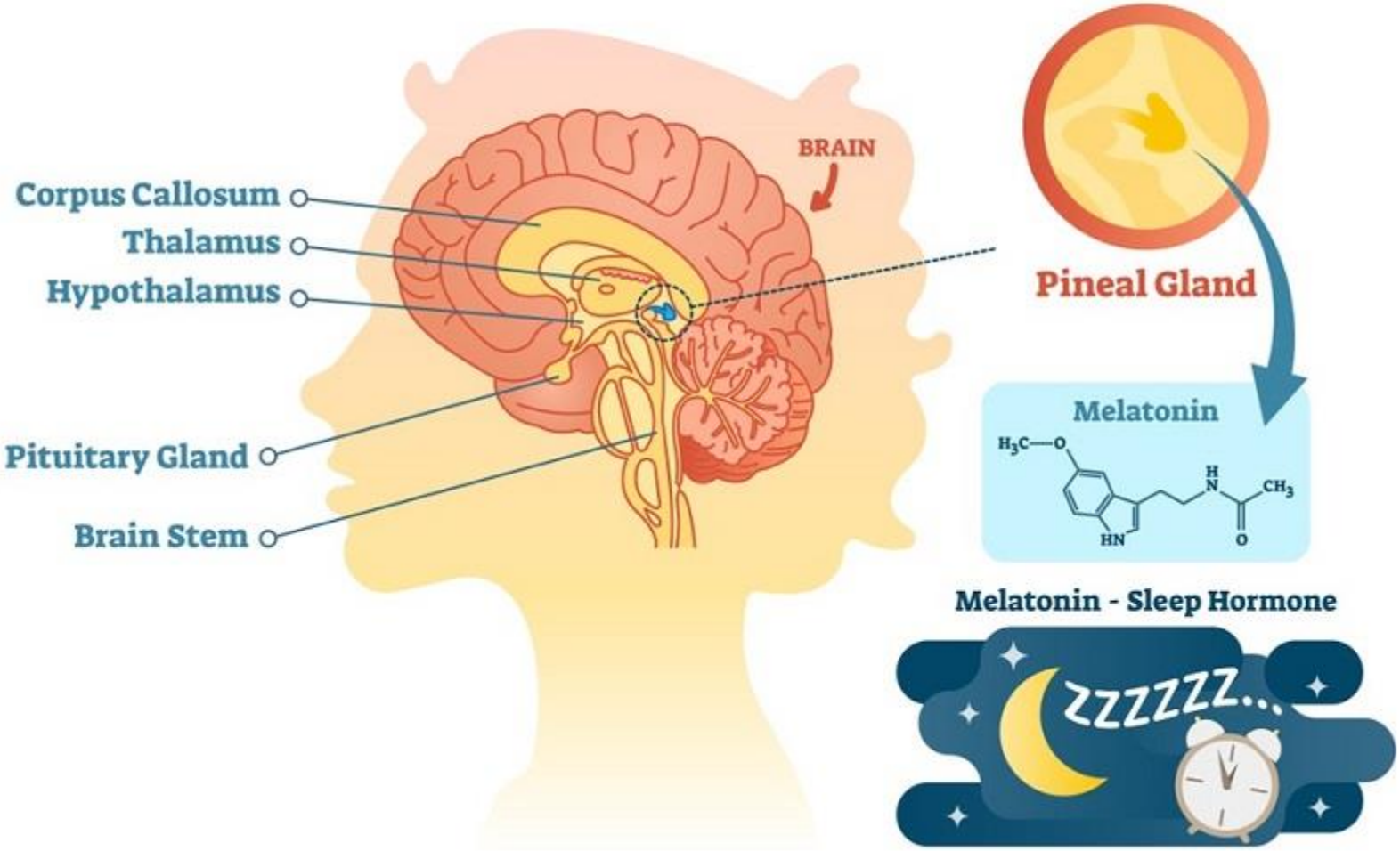
WHAT HAPPENS WHEN YOU SLEEP

NATIONAL SLEEP FOUNDATION

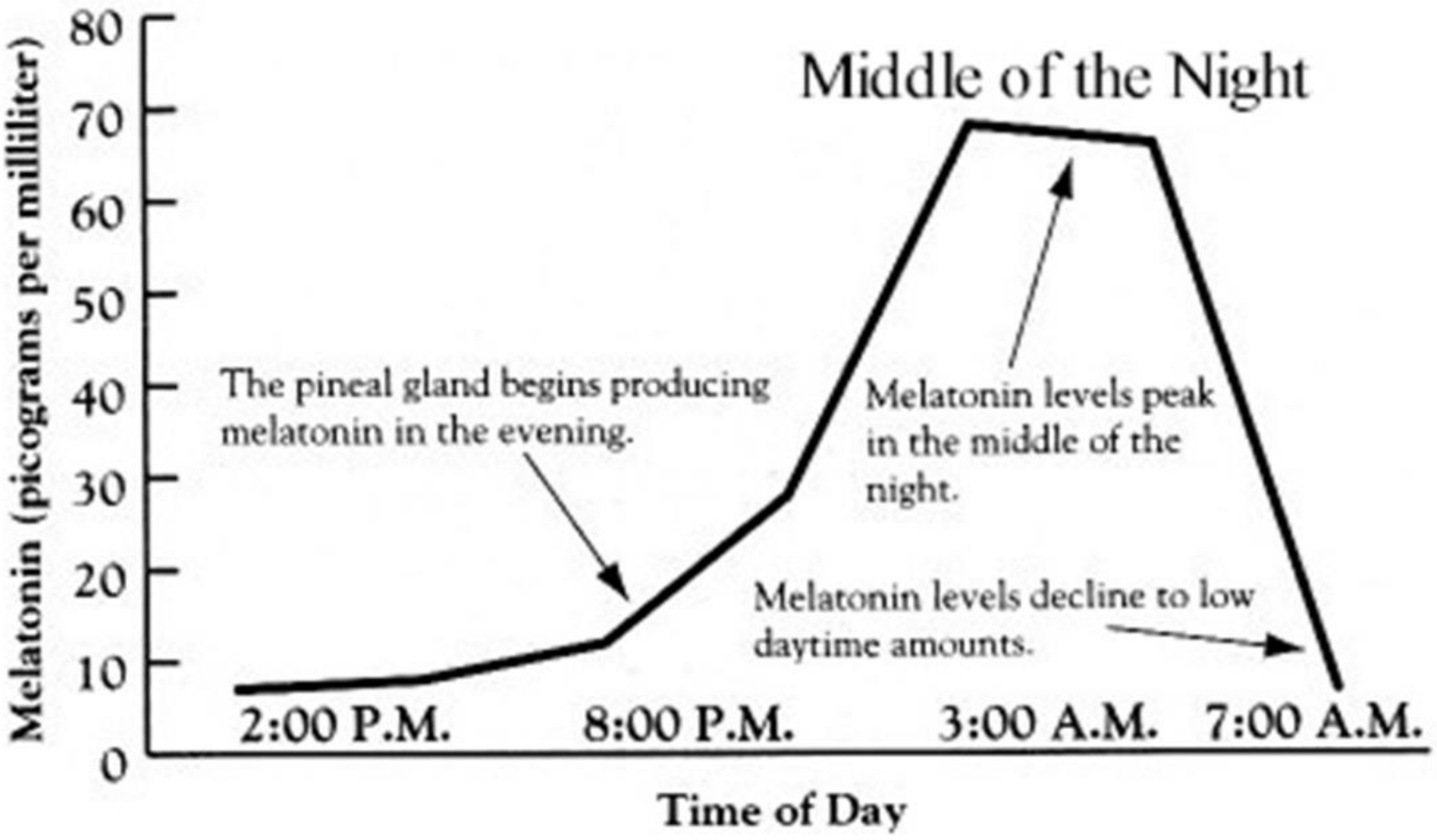
SLEEP DURATION RECOMMENDATIONS



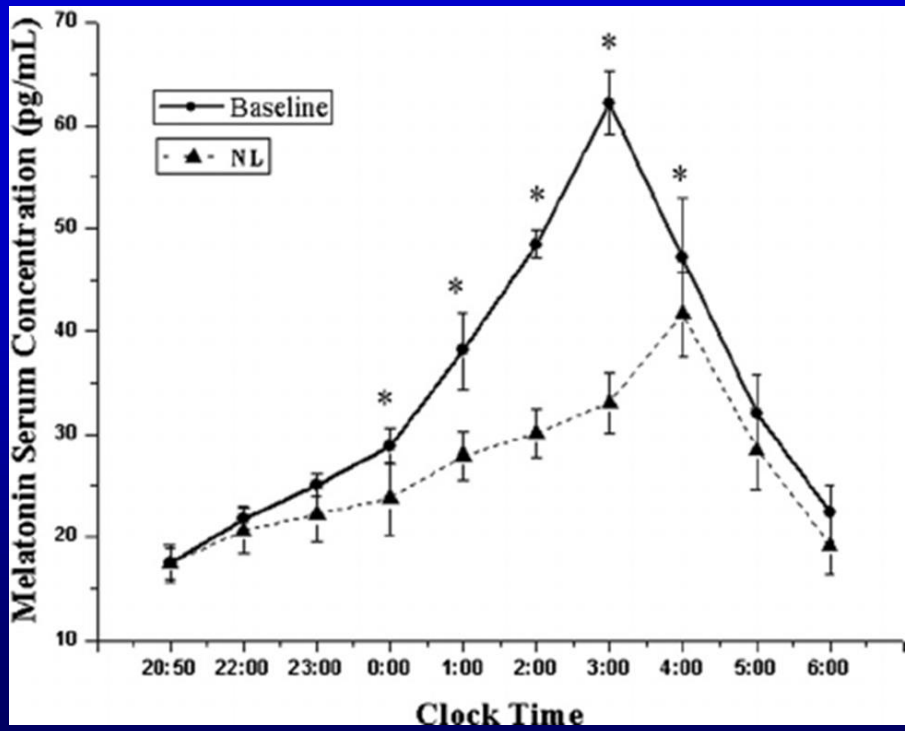
PINEAL GLAND



Melatonin


Middle of the Night
The pineal gland begins producing melatonin in the evening.
Melatonin levels peak in the middle of the night.
Melatonin levels decline to low daytime amounts.
Melatonin (picograms per milliliter)
80
70
60
50
40
30
20
10
0
2:00 P.M.
8:00 P.M.
3:00 A.M.
7:00 A.M.
Time of Day

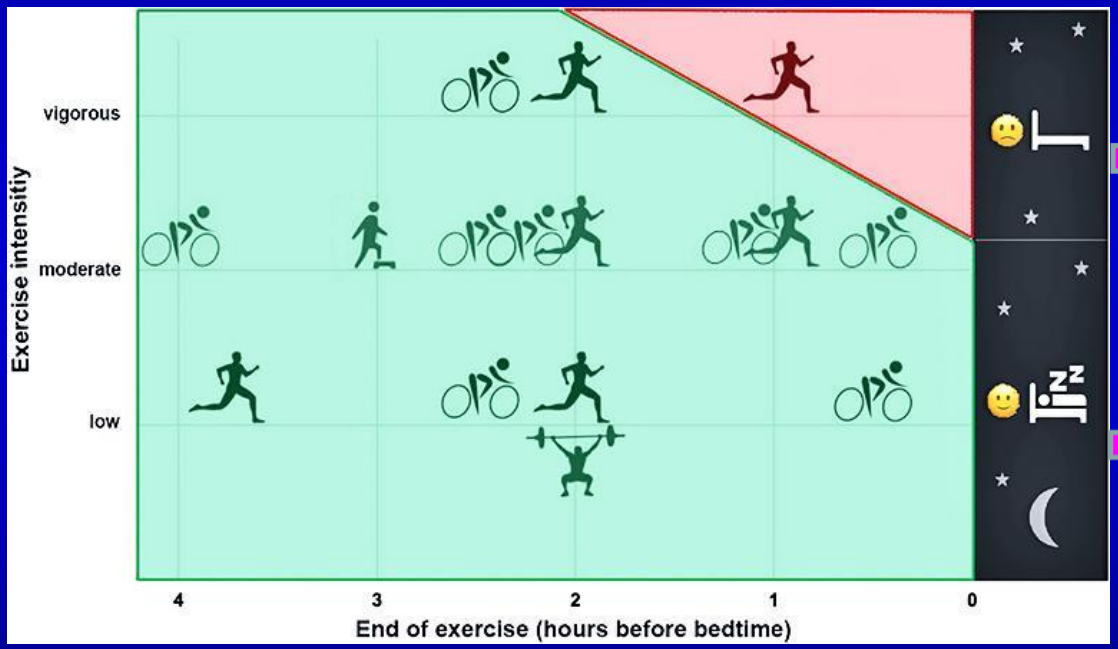
Artificial light at night



Huang, et al. Critical Care, 2015

Exercise Improves Sleep

Exercise Morning X Night



High intensity exercise around bedtime can have a negative effect on sleep.

Moderate intensity exercise around bedtime does not negatively affect sleep.

Jan Stutz, Sport Medicine, 2018.

Does circuit training improves anxiety, depression and sleep quality in adolescents?

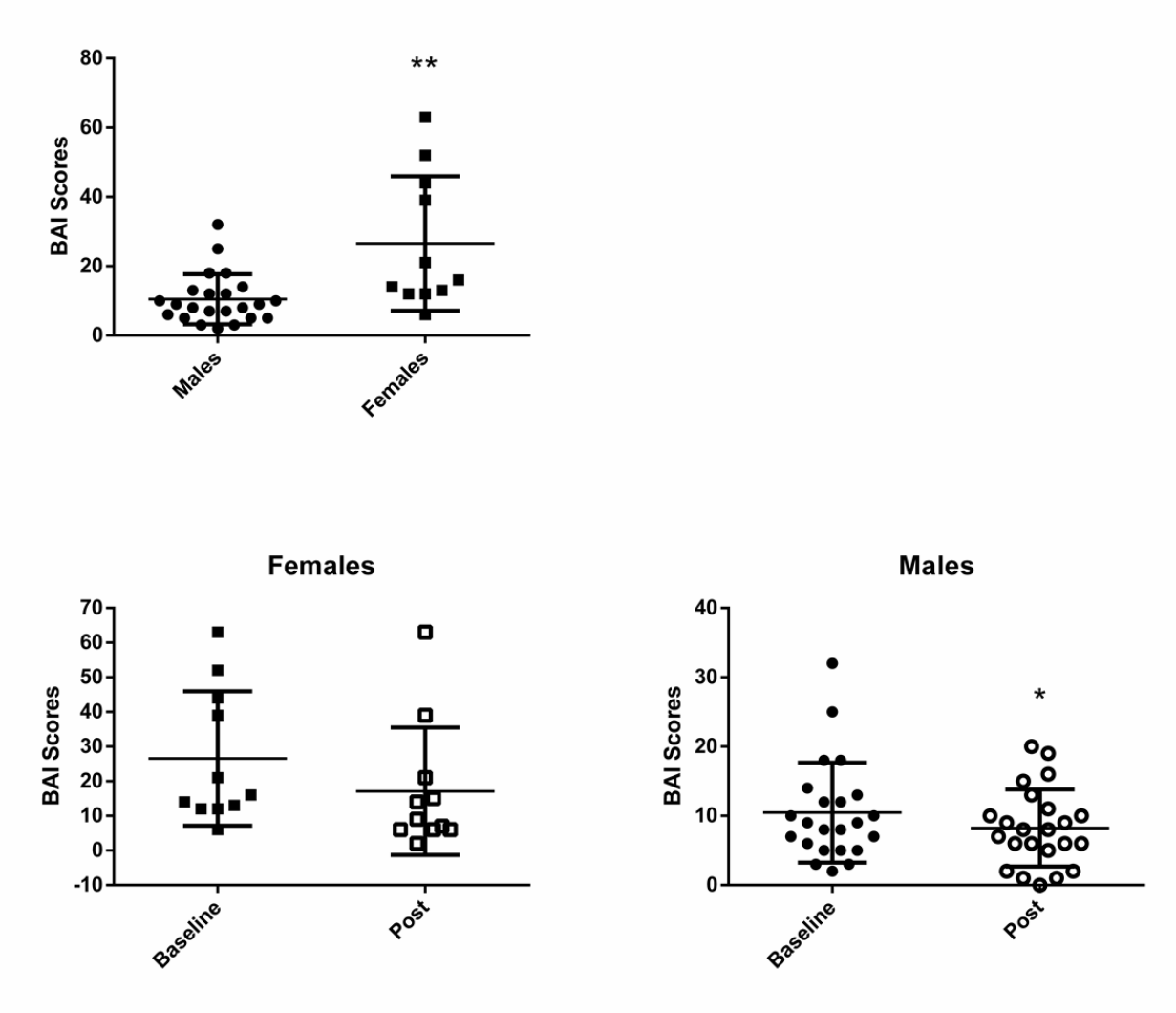
Why are we interested in adolescents?

- Teenagers have a different biological clock from the rest of the population!
- Teenagers need to sleep 9h a day.
- Teenagers have late preference for their daily activities.
- They are unable to go to sleep before 10:45 pm and their brains stay in SLEEP mode until 8:00 am!
- Most teenagers have evening chronotype!

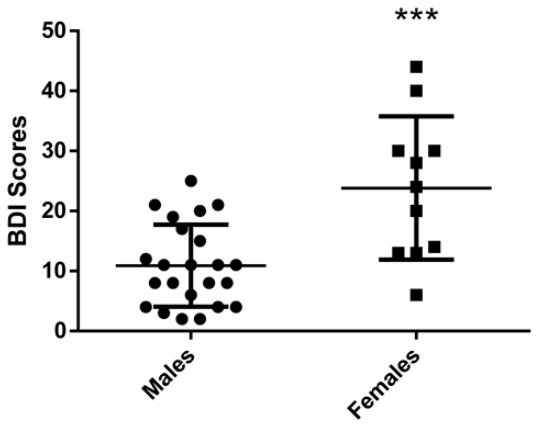
Effects of decreased sleep hours in adolescents

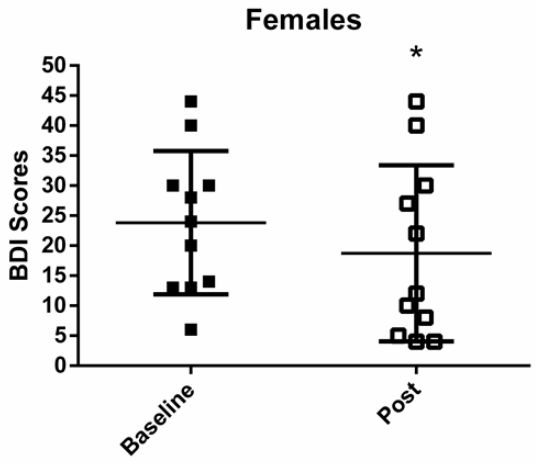
- Feeling of hopelessness and sadness.
- Increased use of cigarettes, cannabis and alcohol intake.
- Willingness to commit suicide.
- Increases in physical aggression.
- Sedentary lifestyle.

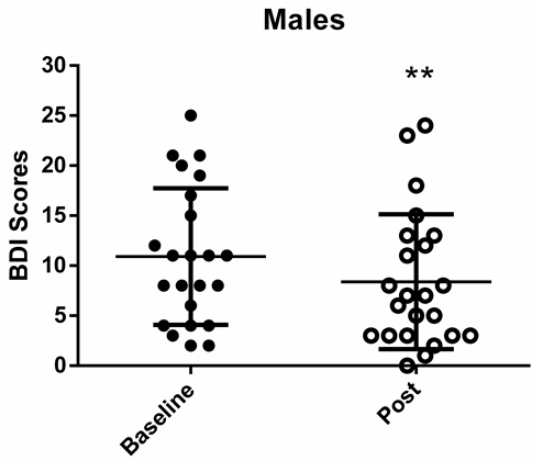
Anxiety levels in adolescents



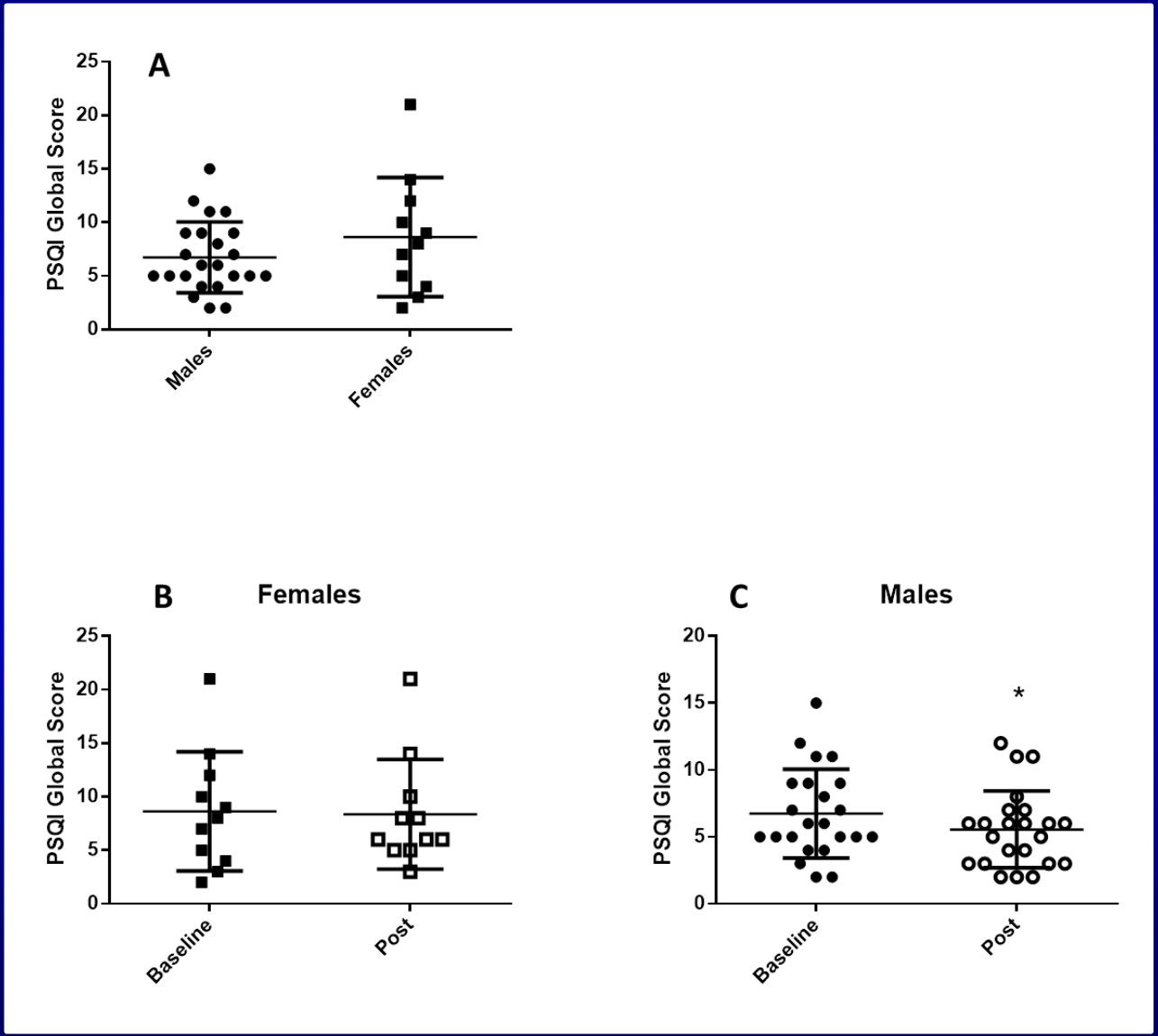
Depression levels in adolescents



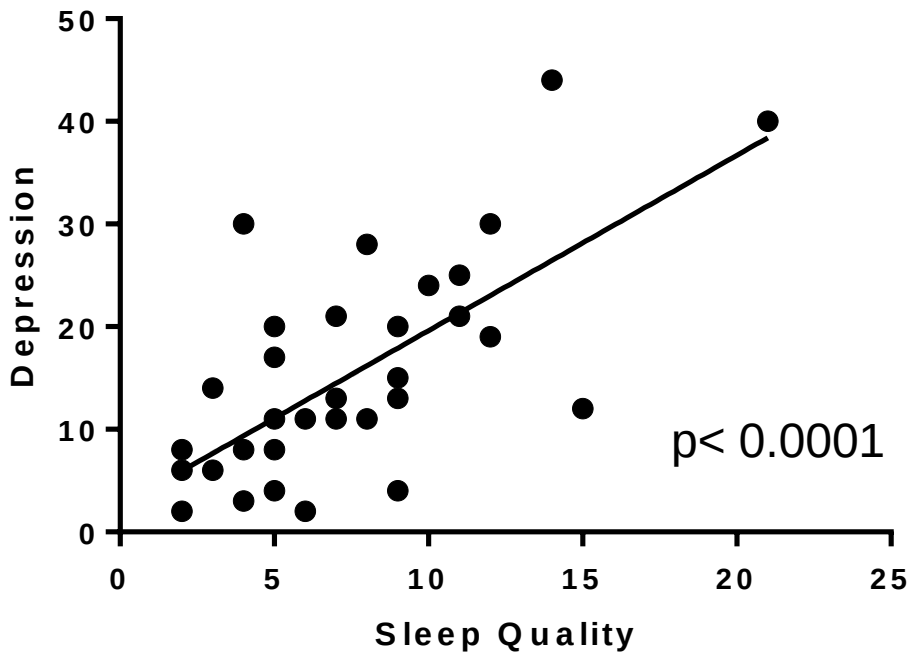




Poor Sleep Quality in adolescents



Correlation between Depression levels and Sleep Quallity



ACKNOWLEDGEMENTS

Reserch Group in Cronobiology, Exercise and Health-

CronoExs

MARIE CURIE ALUMNI

euraxess RESEARCHERS IN MOTION

LATIN AMERICA MCAA RESEARCH CONFERENCE
BUENOS AIRES OCTOBER 21-22 2019
mcaalatam2019.sched.com

Universidade Católica de Brasília