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INTRODUCTION

Older adults face a number of multifaceted challenges, such as:

- * **Impaired hearing** with 40% of people over the age of 50, and 71% of people over the age of 70 having hearing impairment [1]
- * **Cognitive decline** making an average older adult's cognitive performance similar to that of sleep-deprived younger adults [2][3]
- * **Sleep-wake cycle disruption** affecting as many as 50% of them [4]

Unexpected consequences may arise when such challenges occur together.

RESEARCH QUESTIONS

I- How are wellbeing and the ease and effectiveness of communication affected by factors that may use up or deplete cognitive resources such as sleep deprivation, ageing, and hearing loss, individually and additively?

II- Is that effect mediated by the role of cognitive resources?

Design	Experiments	Independent Variables	Dependent Variables
	Experiment 1	Variation in sleep quality across younger adults	➡ Cognitive resources, communication measures, and wellbeing
	Experiment 2	Variation in sleep quality across older adults	➡ Cognitive resources, communication measures, and wellbeing
	Experiment 3 A	Variation in sleep quality across older adults with hearing impairment	➡ Cognitive resources, communication measures, and wellbeing
	Experiment 3 B	Hearing aid intervention	➡ Cognitive resources, communication measures, wellbeing and sleep

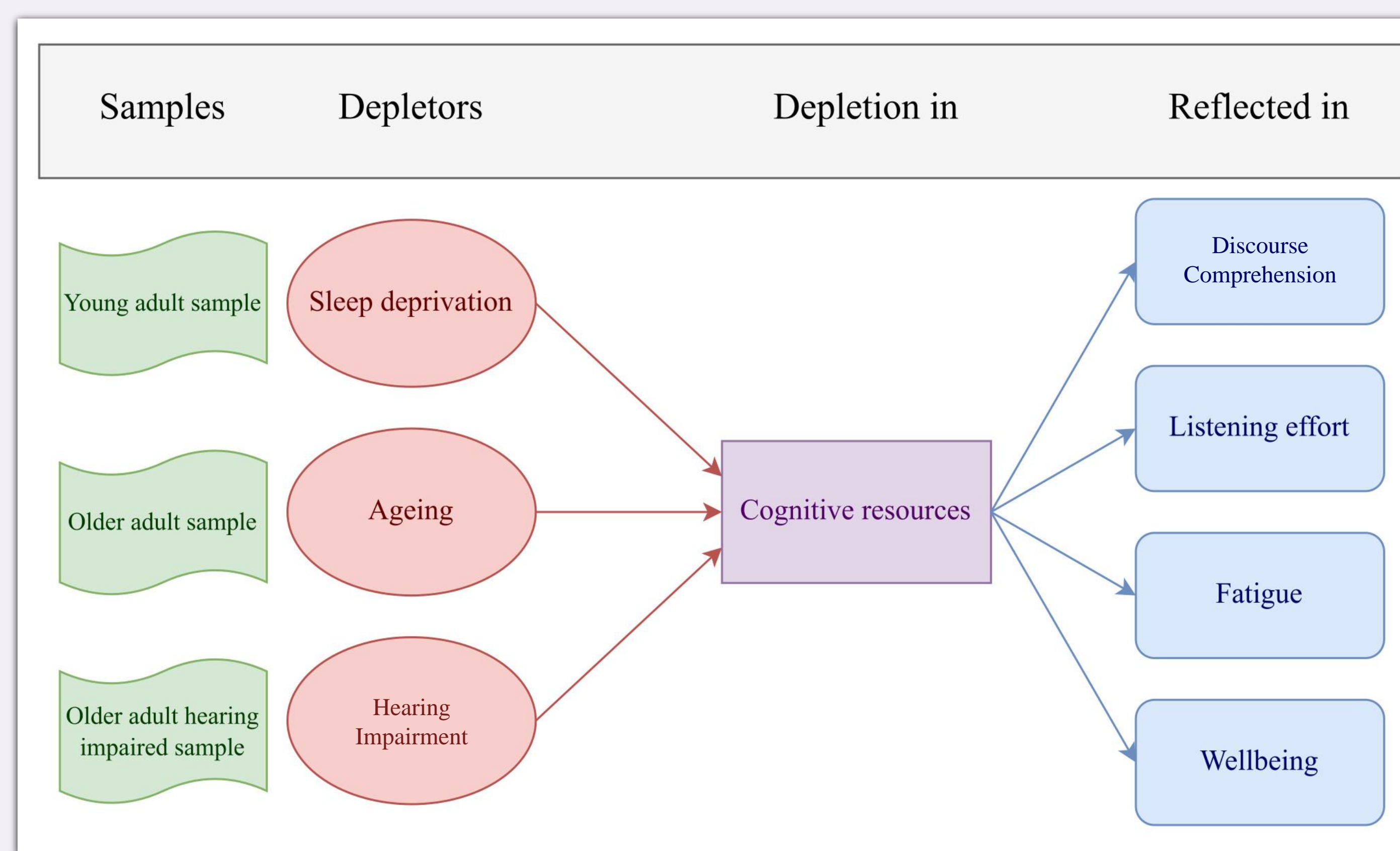
METHODS

3 experiments will be conducted, isolating the individual and additive effects of sleep quality, age, and hearing on the outcome variables: listening effort, fatigue, discourse comprehension, cognitive resources and overall wellbeing.

3 samples will be selected from younger adults, older adults, and older adults with hearing impairment.

The outcome variables will be measured in each of these three samples and calculated using within-group and between-group analyses.

The outcome variables will be assessed again after the hearing-impaired sample receives hearing aids.



EXPECTED RESULTS

- Poorer sleep, older age, and hearing impairment conditions are expected to negatively affect cognitive resources, especially when they are co-occurring.
- A decline in cognitive resources is expected to reflect poorly on listening effort, fatigue, discourse comprehension, and overall wellbeing.
- Aiding hearing is expected to free up cognitive resources, and reflect positively on the other outcome variables, and possibly indirectly improve sleep.

IMPLICATIONS

If the additive effects of the coexistence of multiple depleters are observed in the depletion of cognitive resources, which in turn is associated with poor outcomes, then a new model of cognitive resource depletion will be explored and expanded with other potential depleters.

A PILOT STUDY

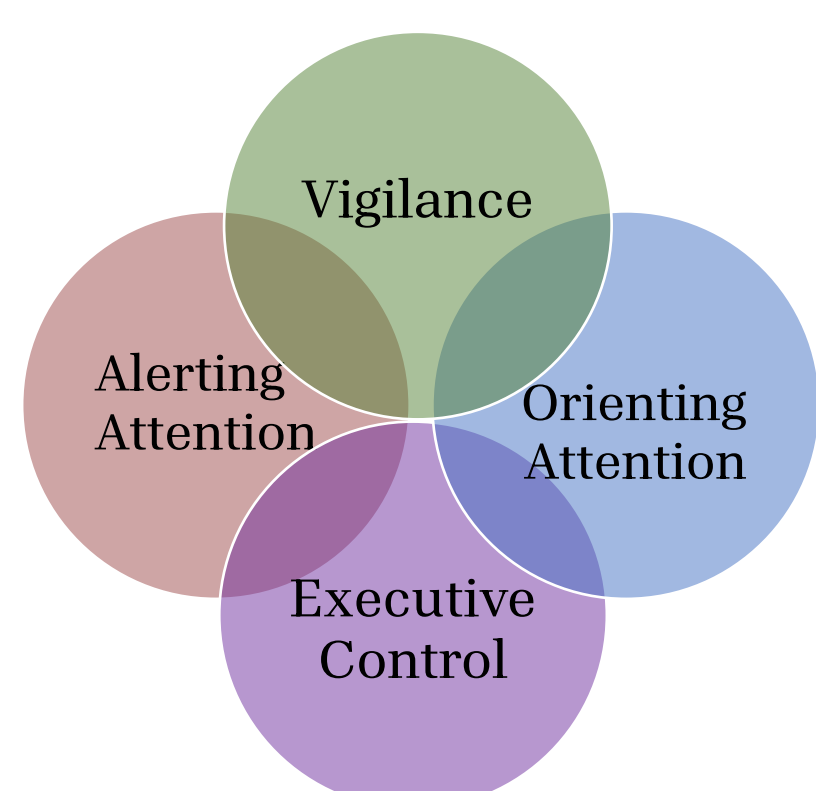
INTRODUCTION

- The construct of cognitive resources has been described and measured in different ways.
- It's important to determine the cognitive domain that best represents available resources that are free to allocate for the participation in day-to-day cognitive activities.

AIM

To determine which cognitive domain is most related to changes in the independent variables: sleep, age and hearing.

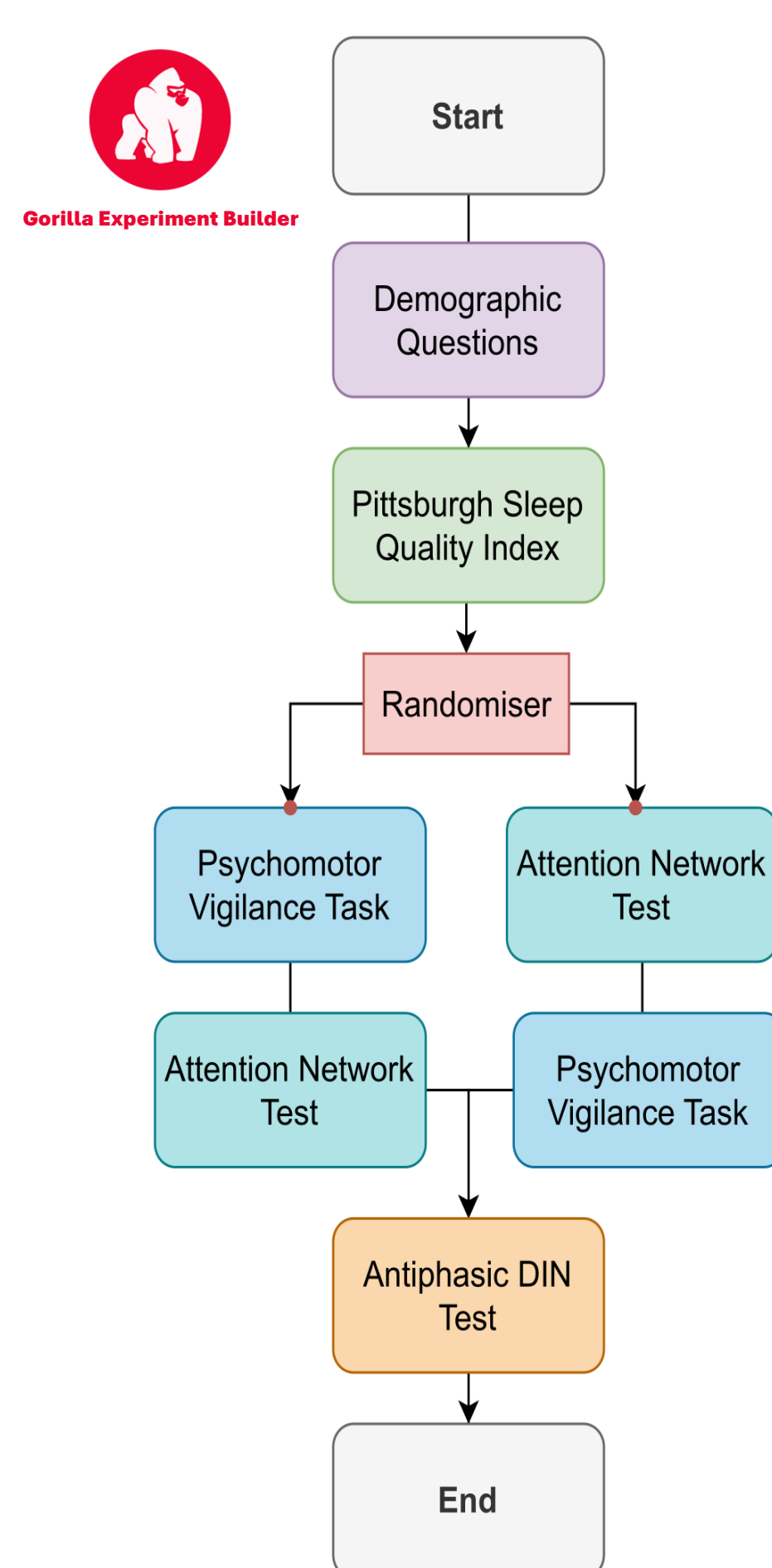
The cognitive domains tested:



METHODS

An online experiment was sent to participants to complete. See flowchart on the right for the tests included.

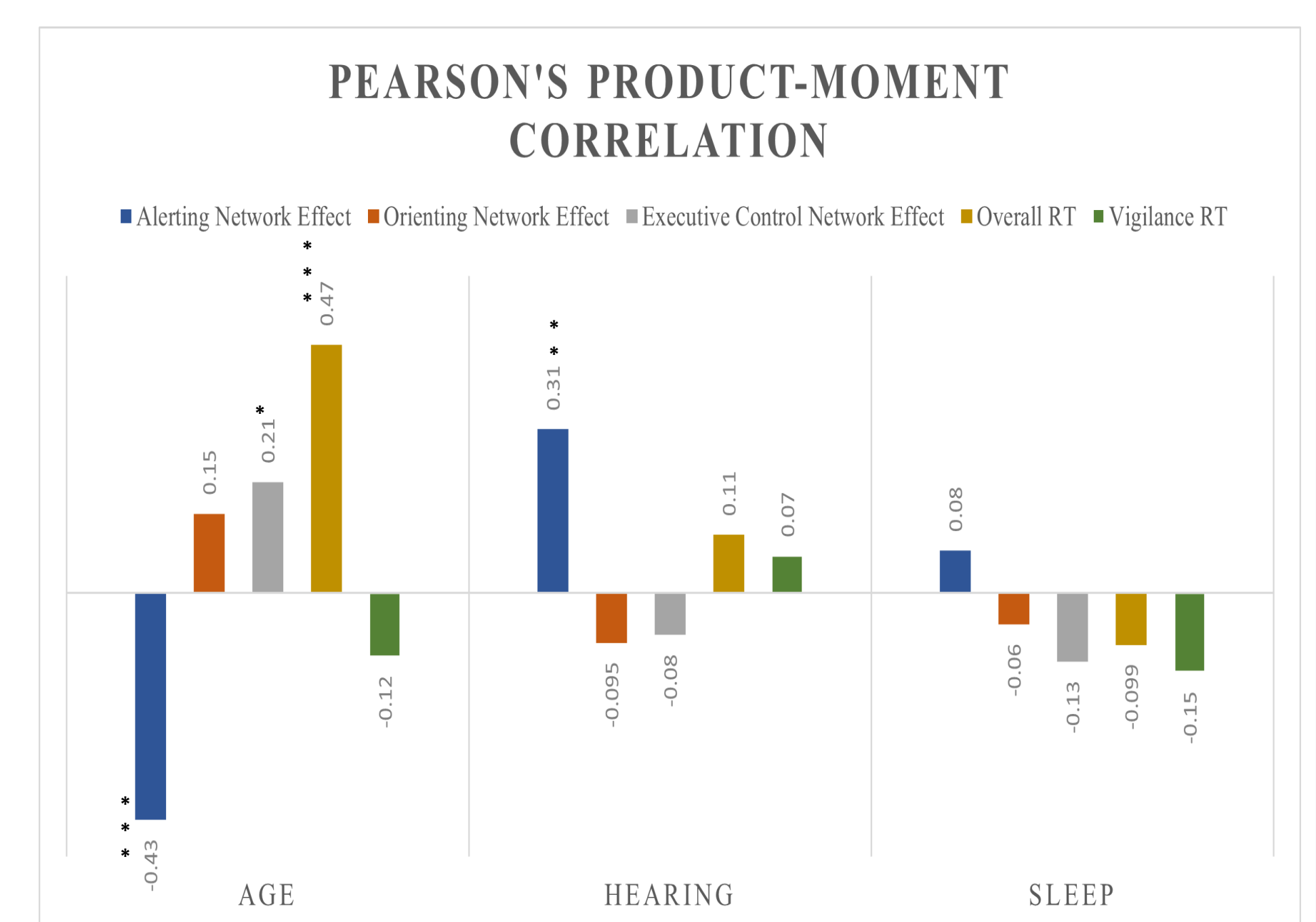
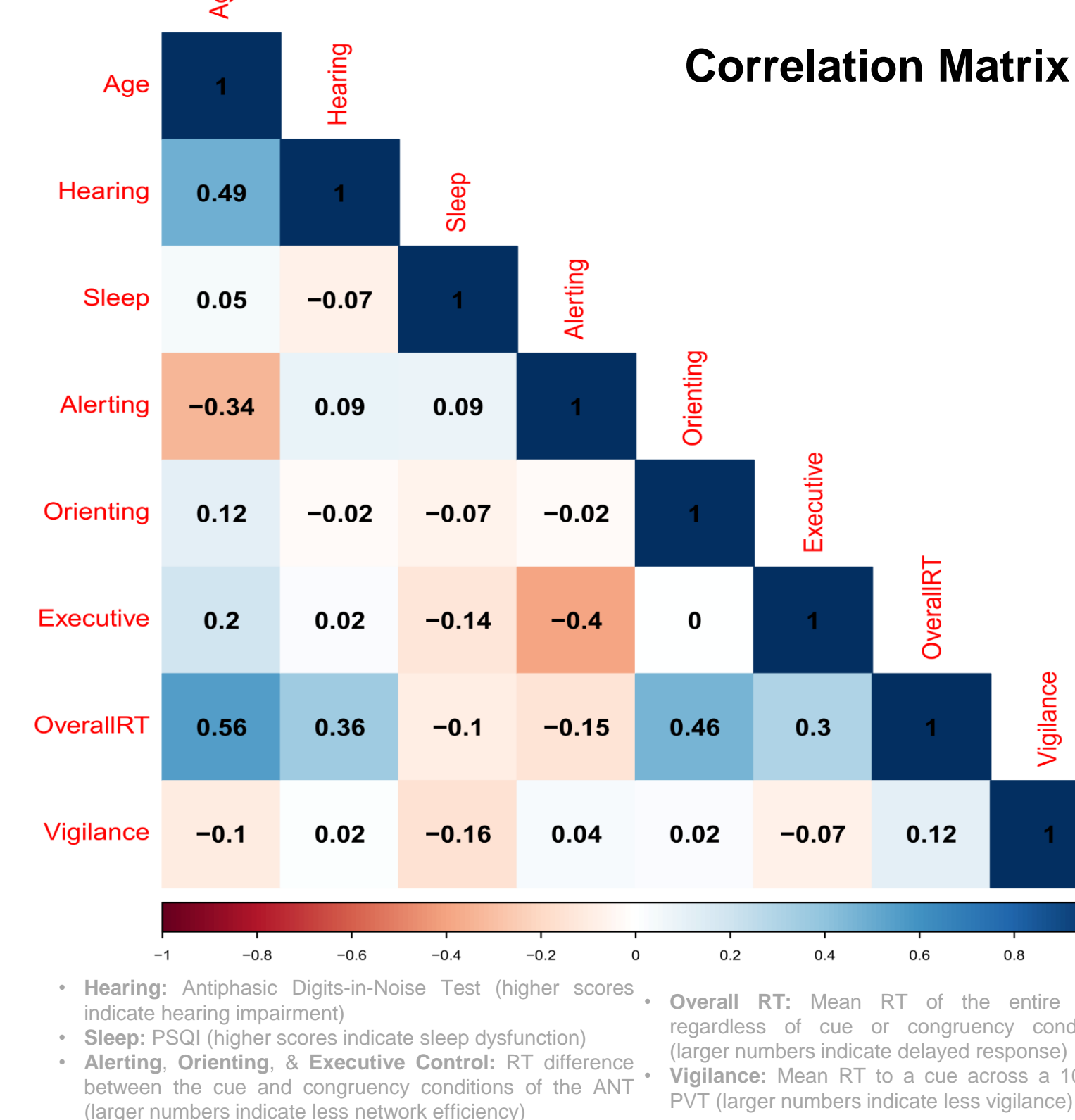
Online Pilot Study on Gorilla Experiment Builder



RESULTS

A total of 72 participants completed the entire experiment. The sample was slightly skewed towards younger, better sleeping and better hearing.

- **Vigilance:** no significant correlations with independent variables.
- **Orienting Attention:** no significant correlations either
- **Executive Attention:** an approaching significance small correlation with age when controlling for the effect of hearing
- **Alerting Attention:** significant correlation with aging and hearing impairment when controlling for the effects of each other
- **Overall RTs:** significant correlation with age controlling for hearing
- **MLR of the predictors Age and Hearing on Alerting Attention:** significant, explaining 19.91% of the variance in Alerting Network



Correlations in this table controlled for confounding factors. The correlation between age and the outcome measures controlled for the effects of hearing, and the correlations between hearing and outcome measures controlled for the effects of age.

CONCLUSIONS

- In this sample, the alerting attention is correlated with two of the independent variables, whereas the executive attention is correlated with one, and so is the overall RT.
- The older the age, the significantly longer the RT, and the less effective the cueing, as seen in similar studies.[5]
- The older the age, the significantly longer the time it takes for conflict resolution, indicating a decline in executive control, also seen in other studies.[6]
- Hearing and Age together have a significant moderate effect on the Alerting Network efficiency.

ACKNOWLEDGEMENTS

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