

Relationship Between Sleep Quality and Emotion Regulation (Internalizing/Externalizing Behavior) In Adults With and Without ASD



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Background

- Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that is characterized by deficits in social communication and restricted and repetitive behaviors and interests (American Psychological Association, 2013).
- Sleep Quality refers to levels of disturbance and the patterns of the sleep wake cycle in an individual.
- Internalizing Behaviors are emotional issues aimed towards one's self, like anxiety and depression. Externalizing Behaviors are behavioral issues expressed towards others such as aggression.
- Individuals with ASD are at higher risk for poor sleep quality due to circadian rhythm dysfunction, parasomnia, and a number of other sleep disorders (Mazzone, 2018).
- Individuals with ASD also demonstrate higher difficulty with emotional regulation, which can present as increased internalized anxiety or depression.
- If there are significant issues with sleep and circadian rhythm, this might lead to elevated issues with internalizing and externalizing behaviors. This study aims to look at the relationship sleep quality and internalizing/externalizing behaviors in adults with and without ASD.
- We hypothesize:
 - (1) ASD adults will have more sleep disturbances and higher impairments in internalizing/externalizing behaviors than TD adults.
 - (2) ASD adults will exhibit stronger correlations between PSQI sleep scores and internalizing/externalizing behaviors.
 - (3) Considering previous research, ASD females might exhibit higher impairments in internalizing scores than ASD males.

Methods

80 adults (ASD = 42), from the five-site NIH funded longitudinal ACE2, study were included in the analysis. ASD diagnoses was confirmed via standardized measures (ADOS-2, ADI).

Measures:

(1) **Pittsburgh Sleep Quality Index (PSQI)** - Self questionnaire that assesses sleep patterns and to determine the presence of sleep dysfunction and underlying sleep disorders.

(a) Subscales include: Subjective sleep quality, Sleep duration, Sleep Latency, Habitual Sleep Efficiency, Sleep Disturbances, Use of Sleep Medication, Daytime Drowsiness

(b) Higher scores indicate poorer sleep quality.

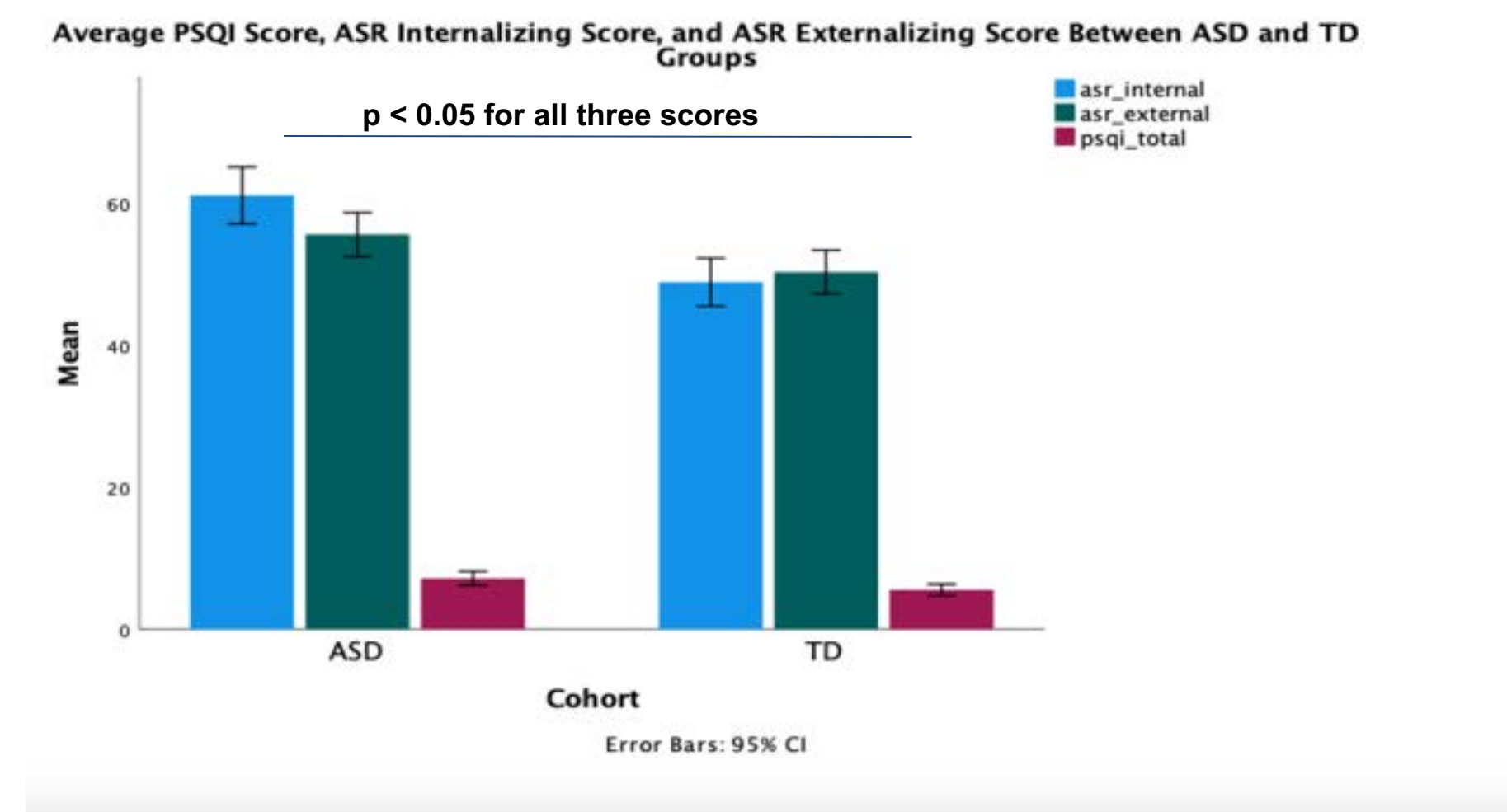
(1) **Adult Behavioral Checklist (ASR)** - Self questionnaire that assesses behavioral and emotion regulation issues in terms of externalizing and internalizing behaviors. Higher score indicate greater impairments.

	ASD		TD	
	Male	Female	Male	Female
Sample Size	24	18	21	17
Interview Age (Months)	246.08 ± 21.38	243.50 ± 19.14	243.38 ± 17.80	249.41 ± 16.63
ASR Internal Score	59.04 ± 9.77	63.78 ± 16.05	46.10 ± 10.75	52.24 ± 8.97
ASR External Score	53.75 ± 8.01	58.00 ± 11.78	51.38 ± 8.98	48.94 ± 9.890
PSQI Score	6.46 ± 2.34	8.11 ± 3.92	5.29 ± 2.39	5.88 ± 2.40

Results

Hypothesis 1: Are there differences in Sleep Quality and Internalizing/Externalizing Behavior Scores Between ASD and TD adults?

A one-way Anova test was used to analyze the difference in mean PSQI and ASR internalizing/externalizing scores between ASD and TD Individuals.

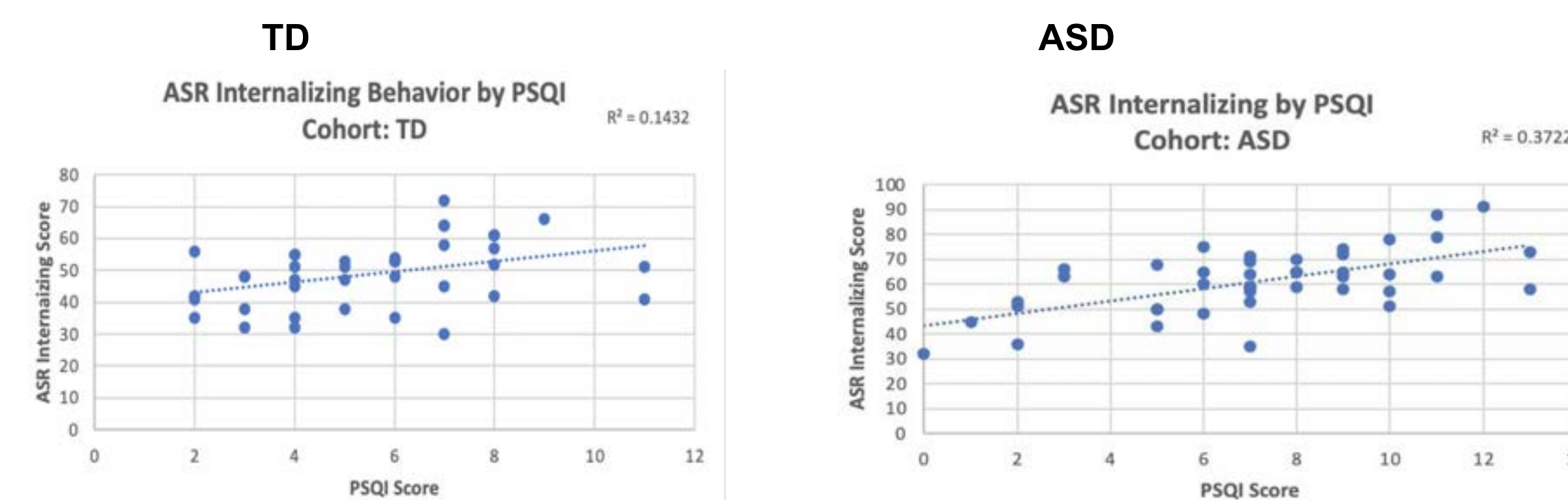


ASD adults exhibited higher PSQI scores indicating **poorer sleep quality**; $F(1,78) = 6.48, p < 0.05$. They also exhibited higher internalizing scores ($F(1,78) = 21.62, p < 0.001$) and higher externalizing scores ($F(1,78) = 5.985, p < 0.05$) indicating higher impairments in internalizing and externalizing behavior compared to TD adults.

Hypothesis 2: Is there a correlation between sleep quality and internalizing/externalizing behavior ASD and TD groups?

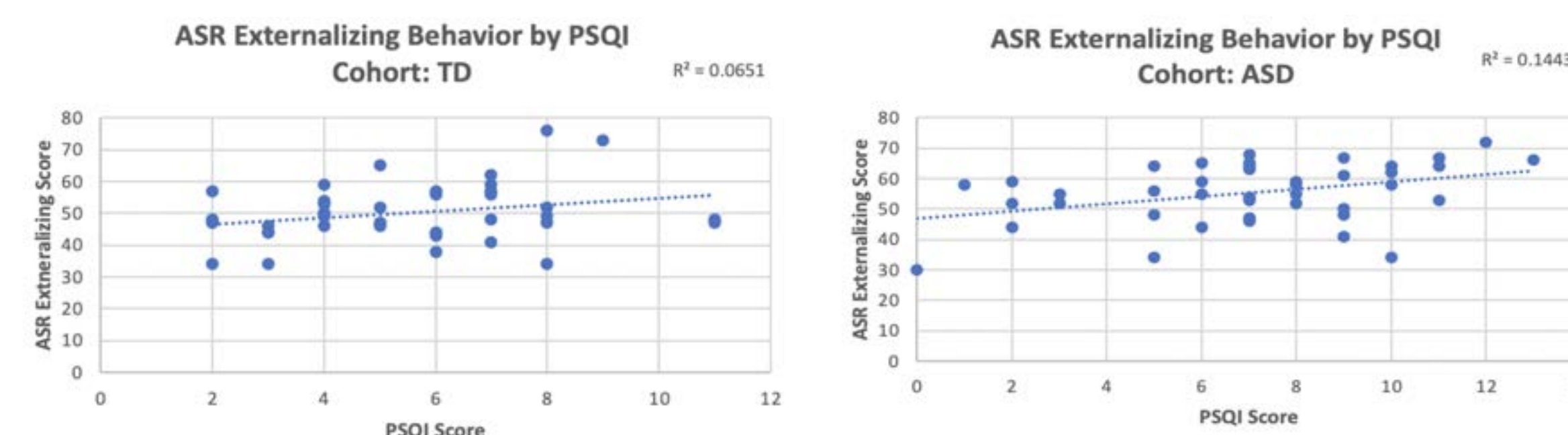
A correlation was run to determine the relationship between sleep quality and internalizing/externalizing behavior in both the ASD and the TD groups.

Sleep Quality and Internalizing Behavior



- a) Both ASD and TD adults **showed a significant positive correlation** between sleep quality (PSQI) and internalizing behavior (ASR internalizing)
- (a) ASD ($r = 0.610, p < 0.001$)
- (b) TD ($r = 0.378, p < 0.05$)

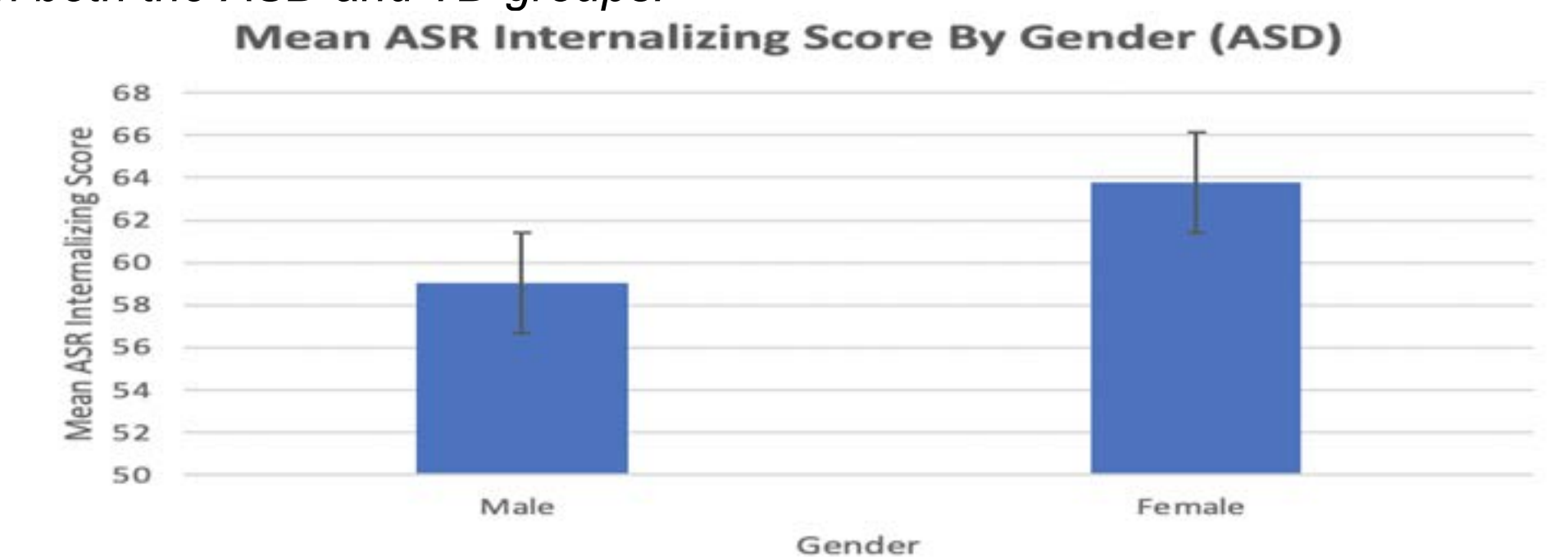
Sleep Quality vs Externalizing Behavior



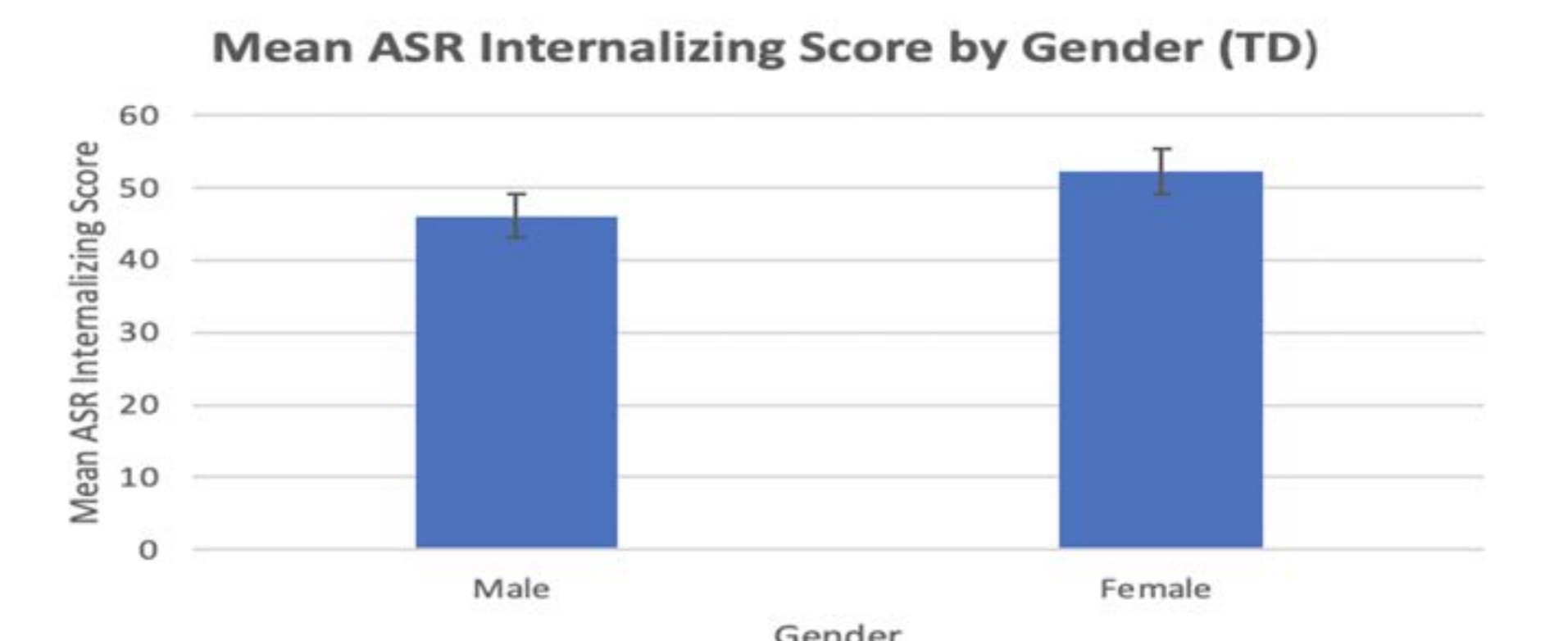
- a) ASD adults showed a **significant correlation** between sleep quality (PSQI) and externalizing behavior (ASR) ($r = 0.414, p < 0.01$).
- b) No significant correlation was observed in TD adults ($r = 0.255, p > 0.05$).

Hypothesis 3: Are there gender differences in internalizing behaviors within the TD or ASD groups?

A one-way Anova test was used to analyze the difference in mean ASR Internalizing Scores in both the ASD and TD groups.



Although females had slightly elevated ASR internalizing scores, **there was no statistically significant difference** between males and females in internalizing scores within the ASD sample ($F(1,40) = 1.403, p = 0.243$).



Although females exhibited slightly elevated ASR internalizing scores, **there was no statistically significant difference** between male and females in internalizing scores within the TD sample ($F(1,36) = 3.543, p = 0.068$).

Discussion

- Our results show that ASD individuals have greater ASR internalizing/externalizing scores and PSQI scores, indicating the **ASD adults have more significant issues with emotional regulation and overall sleep quality supporting our hypothesis**.
- While looking at correlations, we found a **positive association between internalizing behavior and PSQI scores** in both the ASD and TD groups.
- Correlations with externalizing behavior and PSQI, also showed a **positive, significant correlation** within the ASD group but not in the externalizing behavior.
- These relationships within the ASD group could indicate that sleep issues may exacerbate external factors such as irritability and aggression, while also increasing the risk of internalizing issues like anxiety and depression. Sleep disorders can impact circadian rhythm and the levels of serotonin produced by the brain, which may increase susceptibility for issues like anxiety and depression.
 - Since this is a correlation, the behavioral issues such as restlessness, anxiety, and depression are also known to cause insomnia and lack of sleep, and may very likely increase sleep issues as well.
- Although, we **did not find statistically significant gender differences** in internalizing behaviors in the ASD or TD group, ASD females did have elevated scores than males. Non-significant result may be attributed to the relatively high functioning sample and small sample of ASD individuals
- Future Research:**
 - Looking at an alternative measure for sleep that is more quantitative, such as an actiwatch, might provide more accurate and detailed results than self report.
 - Additionally, we didn't factor in behavioral therapies currently used by participants which could also impact sleep and behavioral pattern. Having a more detailed medical history could help provide additional details that can be taken into account.

References and Acknowledgments

- Mazzone, L., Postorino, V., Siracusano, M., Riccioni, A., & Curatolo, P. (2018). The Relationship between Sleep Problems, Neurobiological Alterations, Core Symptoms of Autism Spectrum Disorder, and Psychiatric Comorbidities. *Journal of clinical medicine*, 7(5), 102. <https://doi.org/10.3390/jcm7050102>

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