Chronotype and BDNF Val66Met polymorphism influence awakening cortisol and trait anxiety in young adults

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Introduction

Chronotype and Trait Anxiety:

- Some studies associated eveningness with higher trait anxiety [1,2,3], while others did not [4,5].

Chronotype and Awakening Cortisol:

- Higher morningness was associated with higher morning cortisol in some studies [6,7] but not in others [8].

Possible contributor: Brain-Derived Neurotrophic Factor Val66Met polymorphism:

- Met-allele was associated with higher anxiety-like behavior in animals [9,10,11], but not consistently in humans [12].
- Both Val-allele and Met-allele were associated with increased cortisol reactivity to different paradigms as a function of sex [13,14], requiring further investigation.
- BDNF polymorphism was previously linked to differences in sleep characteristics. [15]

Aim: For Met-carriers, higher eveningness is expected to be associated with higher trait anxiety; and, higher morningness with higher morning cortisol

Method

- Participants:** 238 undergraduates from Bogazici University, Turkey (49% female; $M_{age} = 20.49$, $SD_{age} = 1.73$).
- Chronotype:** Morningness- Eveningness Questionnaire (MEQ) used to measure chronotype (morningness vs. eveningness), 19- items on a 4-point scale. Lower scores indicate eveningness and higher scores morningness.
- Trait Anxiety:** State-Trait Anxiety Inventory X (STAI) Trait was used to assess trait anxiety which has 20 items on a 4-point scale. Higher scores indicate higher trait anxiety.
- BDNF Val66Met Polymorphism:** Genotyped from saliva DNA, and grouped as Val-homozygotes vs. Met-carriers.
- Awakening Cortisol:** Measured from salivary cortisol that was collected for two days immediately after awakening. Cortisol levels correlated highly for between the two days ($r = .651$, $p = .00$), therefore average value is used in analysis.

Demographics

Table 1. Participant characteristics

	Female (n = 117)		Male (n = 121)		Total (N = 238)		
	M	SD	M	SD	M	SD	p
Age	20.35	1.64	20.61	1.82	20.48	1.74	.247
BMI	21.00	3.32	23.66	3.79	22.35	3.80	.001*
Chronotype	46.76	8.24	46.02	9.15	46.39	8.71	.516
Trait Anxiety	47.53	7.78	43.27	8.96	45.06	8.72	.001*
Sleep Quality	3.27	.75	3.23	.75	3.23	.75	.960
Sleep duration	06:30	01:25	06:19	01:14	06:25	01:20	.283
Awakening Time	08:07	01:17	08:00	01:27	08:04	01:22	.525

- Females statistically had lower BMI and higher trait anxiety.
- No difference was found by BDNF Val66Met genotype.

«	Val-homozygotes			Met-carriers		
	Female	Male	Total	Female	Male	Total
N (%)	68 (58.1%)	81 (66.9%)	149 (62.6%)	49 (41.9%)	40 (33.1%)	89 (37.4%)

Results on Awakening Cortisol

PROCESS Model 3:

- Chronotype had a main effect** ($b = .16$, $SE = 0.6$, $p = .01$): Morningness was associated with higher awakening cortisol.
- Sex had a main effect** ($b = 4.49$, $SE = 1.62$, $p = .01$): Women had higher awakening cortisol.
- No significant interaction.**
- Significant covariates: Physical activity, sleep duration and awakening time.*

Results on Trait Anxiety

PROCESS Model 3:

- Sex had a main effect** ($b = 4.5$, $SE = 1.6$, $p = .01$): Women had higher anxiety.
- Significant Chronotype and BDNF interaction** ($b = -.51$, $SE = .23$, $p = .03$).

PROCESS Model 1 (males):

- Significant Chronotype and BDNF interaction** ($b = -.54$, $SE = .25$, $p = .03$).
- Met-carrier males with higher eveningness exhibited higher trait anxiety compared to the males with Val-homozygote ($b = 5.9$, $SE = 2.8$, $p = .04$).

Significant covariates: Sleep quality

Discussion & Conclusion

- Inline with previous research, we report that Met-carrier males with higher eveningness show higher trait anxiety.
- But, higher morningness and being female was associated with higher morning cortisol independent of BDNF genotype, these findings underline the importance of chronotype.
- Further studies should investigate the effect of chronotype on trait anxiety and morning cortisol with other genotypes.

References

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