

Traumatic Brain Injury, Depression and Sleep Dysfunction in Former Professional Rugby Players

BACKGROUND

- Self-reported traumatic brain injury (srTBI) in retired professional athletes is associated with increased prevalence of anxiety, depression and sleep dysfunction. However, it is unclear whether these are early symptoms of traumatic encephalopathy syndrome or whether this association is due to psychosocial and methodological factors.
- Few studies have examined whether more objective proxies of repetitive head injury exposure (such as athletic history), or brain imaging, are associated with depression and sleep dysfunction.

METHODS

- We used cross-sectional data from 57 middle-aged, cognitively healthy, former professional rugby players and 114 controls, matched based on 9 risk factors for dementia.
- Questionnaires were used to collect srTBI burden (Brain Injury Screening Questionnaire), depressive symptoms (Center for Epidemiological Studies Depression scale, sleep dysfunction (Pittsburgh Sleep Quality Index), medical history and athletic history (total career length, play at the highest level, and position).
- Grey matter volumes and diffusion tensor imaging measures (fractional anisotropy (FA), mean (MD), axial (AxD) and radial diffusivity) were obtained using FreeSurfer (v7.1.0) and FSL (v6.0.5).
- We assessed how srTBI, athletic history, depression symptoms, sleep dysfunction, and the imaging markers were related using spearman correlations, multivariate regression models and partial least squares structural equation modelling.

	Rugby Players	Controls	p
N	57	114	-
Age	48.5	48.4	0.99
Sex (%Women)	44	46	0.87
Body Mass Index	29.0 (3.5)	28.4 (6.3)	0.10
Alcohol (units/week)	9.4 (9.1)	13.0 (12.6)	0.14
Blows to the Head (n)	9.8 (5.3)	5.4 (6.5)	<0.001
Feeling Dazed and Confused (n)	4.5 (3.8)	1.7 (2.7)	<0.001
Loss of Consciousness (n)	1.9 (2.4)	0.7 (1.1)	<0.001
Mild Physical Activity	4.7 (0.7)	4.8 (0.4)	0.78
Moderate Physical Activity	4.6 (0.7)	4.2 (0.9)	0.002
Vigorous Physical Activity	4.2 (1.0)	3.8 (1.1)	0.002
History of Depression (%)	11	23	0.08
History of a Sleep Disorder (%)	2	15	0.02
History of an Anxiety Disorder (%)	7	22	0.03
Symptoms of Depression (CESD Total)	8.0 (7.2)	9.1 (9.1)	0.65
Sleep Dysfunction (PSQI global score)	5.6 (3.1)	6.4 (3.9)	0.35
"Poor" sleepers (%)	44	47	0.79

Table 1. Former rugby players reported a higher srTBI burden, more frequent moderate and vigorous exercise, but were less likely to report previous anxiety or sleep disorders than controls.

RESULTS

- In former rugby players, athletic history correlated poorly with srTBI and was not associated with depressive symptoms or sleep dysfunction.
- srTBI (number of episodes of feeling dazed and confused, and number of episodes of loss of consciousness) was significantly associated with a higher prevalence of lifetime diagnosis of depression, anxiety or sleep disorder.

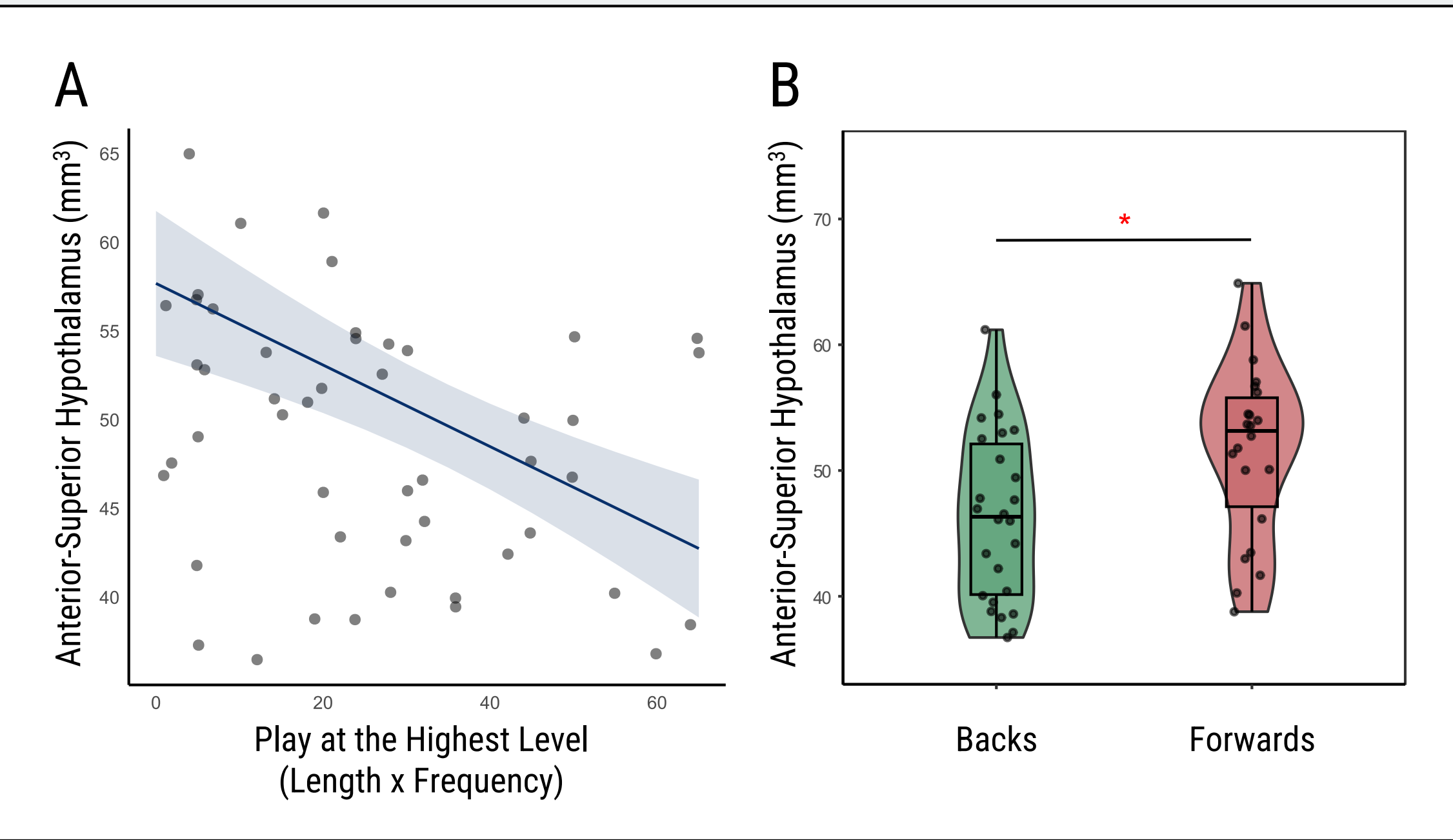


Figure 1A: In former rugby players, play at the highest level (length x frequency) was associated with a smaller anterior-superior hypothalamus. **1B:** Forwards had a larger anterior-superior hypothalamus compared with backs, although this may be driven by group differences in play at the highest level.

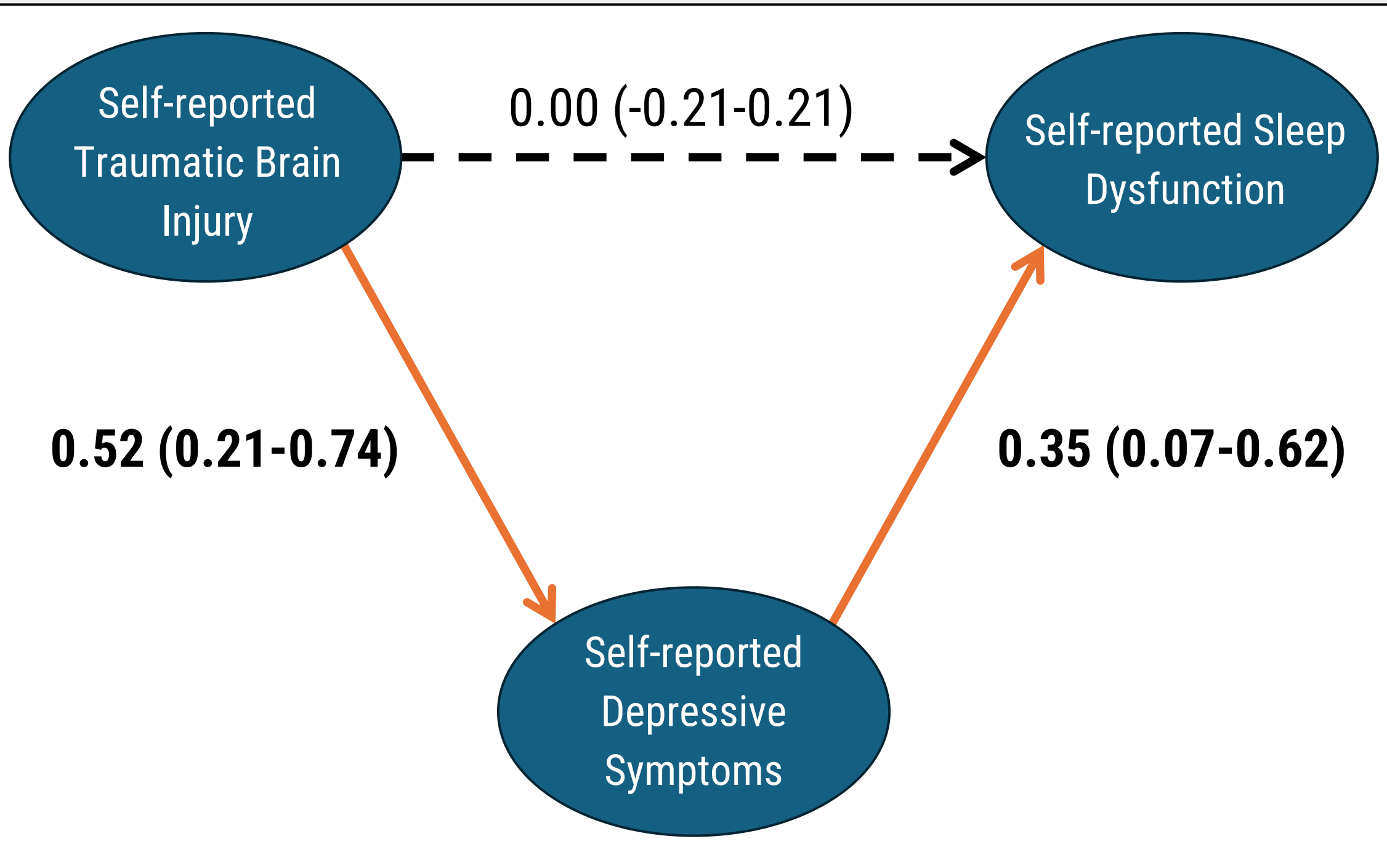


Figure 2: Higher srTBI (number of episodes of loss of consciousness) was directly associated with more depressive symptoms, and indirectly associated with more sleep dysfunction, fully mediated through depressive symptoms.

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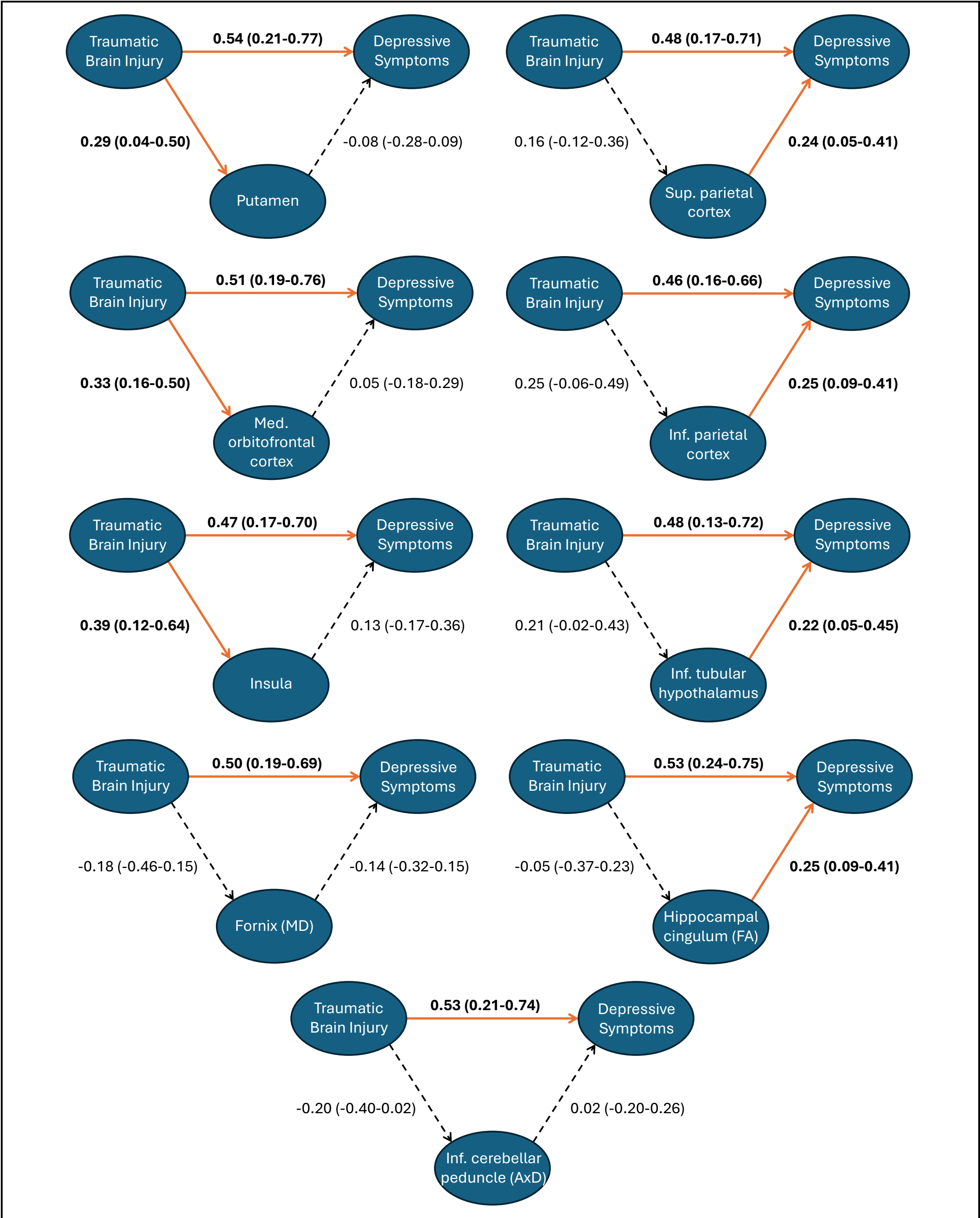


Figure 3: There were 9 brain regions which were significantly associated with either srTBI (number of episodes of loss of consciousness) or depressive symptoms. However, none of these mediated the association between srTBI and depressive symptoms.

CONCLUSION

- The association between self-reported TBI and depressive symptoms in former professional rugby players was not mediated by brain structure and may be better explained by psychosocial or methodological factors such as recall bias or common method bias.
- Sports associations should focus on reducing the stigma surrounding these symptoms and encourage former players to seek support from healthcare providers.

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