Associations between early-life mental health and abnormal sleep duration in adulthood

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Background

The bidirectional relationship between mental health problems and contemporaneous sleep duration is well established. Improved sleep quality is known to positively impact mental health[1] and vice-versa[2–4].

The relationship between early-life mental health and sleep later in life is less well understood. It has not been studied in a population-representative human sample before, despite the potential for negative mental and physical health consequences of long-lasting poor sleep.

Poor mental health is associated with a higher risk of all-cause mortality[5]. An association between early-life mental health and abnormal sleep could imply that poor early-life mental health has lasting effects on sleep architecture and thus mortality[6].

We hypothesised in this study that mental health as recorded at ages 5, 10 and 16 is associated with abnormal sleep (<6 or >9 hours per night on average) at age 46. We used data (including accelerometry) from the 1970 British Cohort Study (BCS70)[7].

Methods

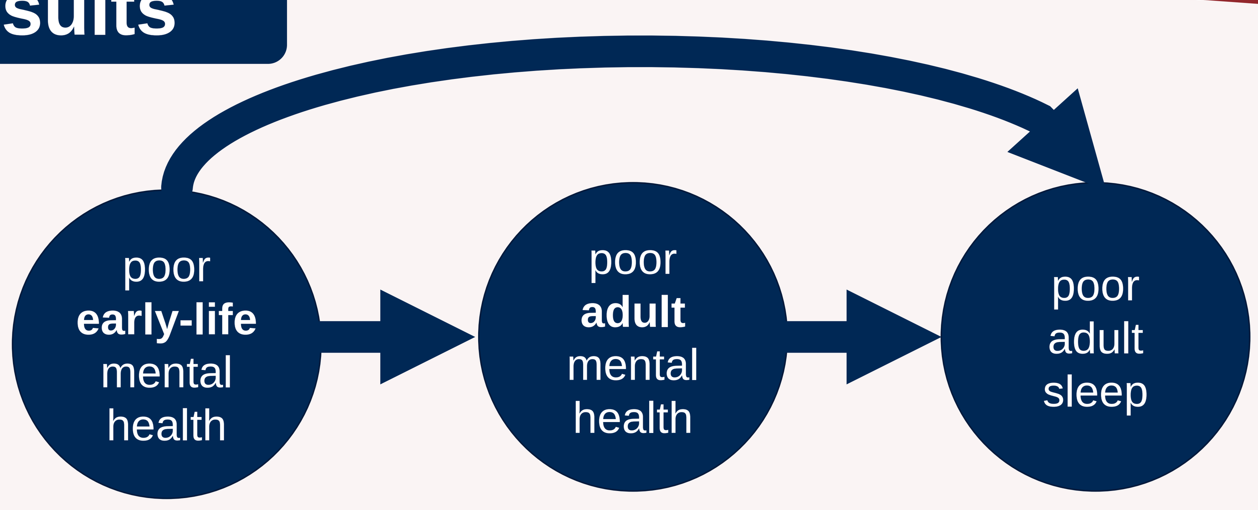
As part of the age 46 sweep, BCS70 participants wore an accelerometer on their thigh for one week. From this, we derived estimates of nightly sleep duration via three separate algorithms in literature[8,9] and analysed each separately.

In total, we had at least some data from 18 439 participants. From these, we had 8 493 valid self-reports of average sleep duration, 5 630 valid estimates from sleep diaries, and at least 4 996 valid estimates from each accelerometry algorithm.

We tested the associations between seven early-life mental health variables and the five measures of sleep duration (self-reported average, diary and accelerometer-based estimates) using modified Poisson regression with robust confidence intervals.

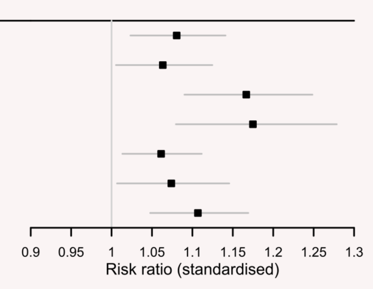
We controlled for a range of confounders, including perinatal, parental mental health, socioeconomic and physical health indicators during childhood. Missing data were handled using multiple imputation by chained equations[10] (200 imputations).

Results



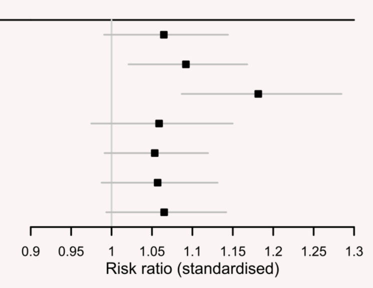
Self-reported average

Variable	RR	p	E-value
Rutter score (5)	1.081	0.005	1.178
Rutter score (10)	1.063	0.032	1.080
Child Development Scale (10)	1.167	0.000	1.404
Malaise score (16)	1.175	0.000	1.373
Behavioural & emotional problems (16)	1.061	0.012	1.130
Internalising behaviours (16)	1.074	0.031	1.089
Externalising behaviours (16)	1.107	0.000	1.272



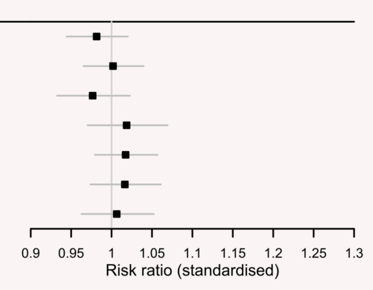
Diary-derived average

Variable	RR	p	E-value
Rutter score (5)	1.065	0.089	1.000
Rutter score (10)	1.092	0.011	1.167
Child Development Scale (10)	1.181	0.000	1.394
Malaise score (16)	1.059	0.176	1.000
Behavioural & emotional problems (16)	1.053	0.094	1.000
Internalising behaviours (16)	1.057	0.110	1.000
Externalising behaviours (16)	1.065	0.077	1.000



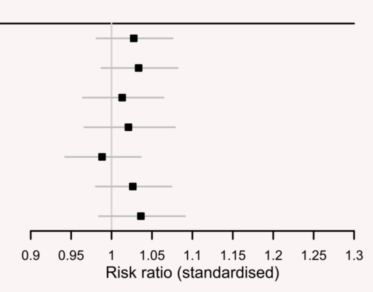
activPAL algorithm

Variable	RR	p	E-value
Rutter score (5)	0.982	0.343	1.000
Rutter score (10)	1.002	0.923	1.000
Child Development Scale (10)	0.977	0.315	1.000
Malaise score (16)	1.019	0.457	1.000
Behavioural & emotional problems (16)	1.017	0.376	1.000
Internalising behaviours (16)	1.016	0.456	1.000
Externalising behaviours (16)	1.006	0.778	1.000



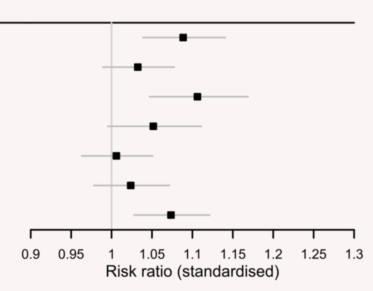
van der Berg et al. algorithm

Variable	RR	p	E-value
Rutter score (5)	1.027	0.249	1.000
Rutter score (10)	1.033	0.158	1.000
Child Development Scale (10)	1.013	0.604	1.000
Malaise score (16)	1.021	0.462	1.000
Behavioural & emotional problems (16)	0.988	0.626	1.000
Internalising behaviours (16)	1.026	0.266	1.000
Externalising behaviours (16)	1.036	0.176	1.000



Winkler et al. algorithm

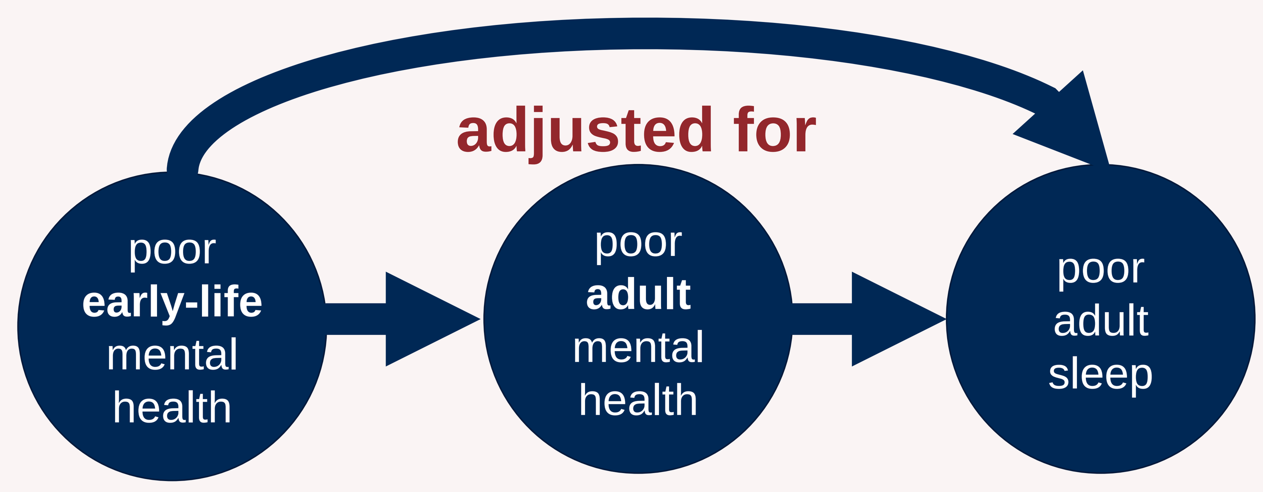
Variable	RR	p	E-value
Rutter score (5)	1.089	0.000	1.239
Rutter score (10)	1.032	0.143	1.000
Child Development Scale (10)	1.106	0.000	1.268
Malaise score (16)	1.052	0.074	1.000
Behavioural & emotional problems (16)	1.006	0.790	1.000
Internalising behaviours (16)	1.024	0.316	1.000
Externalising behaviours (16)	1.074	0.002	1.196



On a post-hoc basis, we ran the same regression analyses controlling for Malaise Inventory and Warwick-Edinburgh Mental Wellbeing Scale scores at age 42, to interrogate whether the relationship was likely to be mediated by adult mental health.

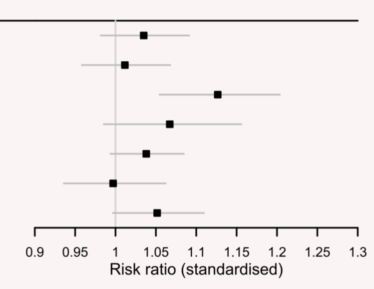
Protocol registration

Digital copy & references



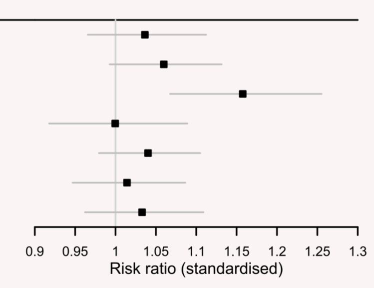
Self-reported average

Variable	RR	p	E-value
Rutter score (5)	1.035	0.204	1.000
Rutter score (10)	1.012	0.676	1.000
Child Development Scale (10)	1.127	0.000	1.294
Malaise score (16)	1.067	0.111	1.000
Behavioural & emotional problems (16)	1.038	0.095	1.000
Internalising behaviours (16)	0.997	0.927	1.000
Externalising behaviours (16)	1.052	0.067	1.000



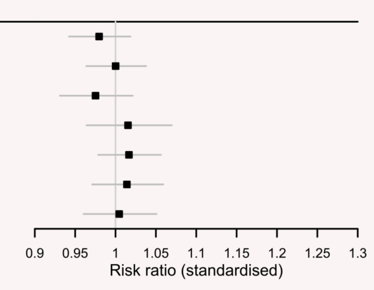
Diary-derived average

Variable	RR	p	E-value
Rutter score (5)	1.036	0.323	1.000
Rutter score (10)	1.060	0.082	1.000
Child Development Scale (10)	1.158	0.000	1.336
Malaise score (16)	1.000	0.993	1.000
Behavioural & emotional problems (16)	1.040	0.201	1.000
Internalising behaviours (16)	1.014	0.687	1.000
Externalising behaviours (16)	1.033	0.373	1.000



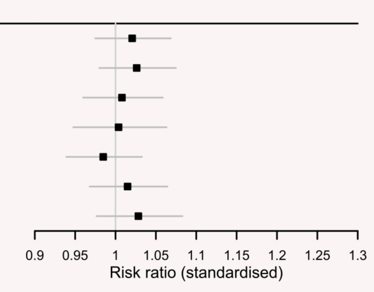
activPAL algorithm

Variable	RR	p	E-value
Rutter score (5)	0.980	0.301	1.000
Rutter score (10)	1.000	0.994	1.000
Child Development Scale (10)	0.975	0.289	1.000
Malaise score (16)	1.015	0.563	1.000
Behavioural & emotional problems (16)	1.017	0.398	1.000
Internalising behaviours (16)	1.014	0.527	1.000
Externalising behaviours (16)	1.005	0.843	1.000



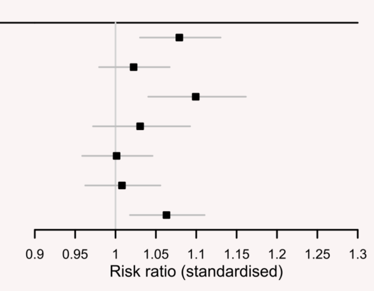
van der Berg et al. algorithm

Variable	RR	p	E-value
Rutter score (5)	1.021	0.384	1.000
Rutter score (10)	1.026	0.273	1.000
Child Development Scale (10)	1.008	0.750	1.000
Malaise score (16)	1.004	0.898	1.000
Behavioural & emotional problems (16)	0.985	0.527	1.000
Internalising behaviours (16)	1.015	0.540	1.000
Externalising behaviours (16)	1.028	0.291	1.000



Winkler et al. algorithm

Variable	RR	p	E-value
Rutter score (5)	1.079	0.001	1.207
Rutter score (10)	1.022	0.310	1.000
Child Development Scale (10)	1.099	0.001	1.246
Malaise score (16)	1.031	0.314	1.000
Behavioural & emotional problems (16)	1.001	0.952	1.000
Internalising behaviours (16)	1.008	0.736	1.000
Externalising behaviours (16)	1.063	0.006	1.153



Discussion

We found clear evidence that poor mental health in childhood predicts abnormal sleep duration at age 46 in a representative sample of the UK population born in 1970. Worse mental health by one standard deviation predicts a 5–18 % greater risk of abnormal sleep at age 46, depending on the exact measures.

Controlling for adult mental health variables attenuated associations with self-reported average sleep, but not those with the more objective measures (diary and accelerometer-based estimates). This could indicate that poor mental health drives measurement error in self-reported average sleep duration.

An important limitation of this study is the fact that the five measures of sleep are poorly correlated with each other. It is unclear which measures, if any, are reliable. The activPAL and van der Berg et al.[8] algorithms tended to give overestimates, which may explain the lack of associations with these measures.

Taken together, our findings suggest that protecting mental health in childhood could reduce the prevalence of abnormal sleep in middle-aged adults. It remains to be conclusively determined whether this substantially affects physical health, or whether this effect might be mitigated by intervening in adult mental health.

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