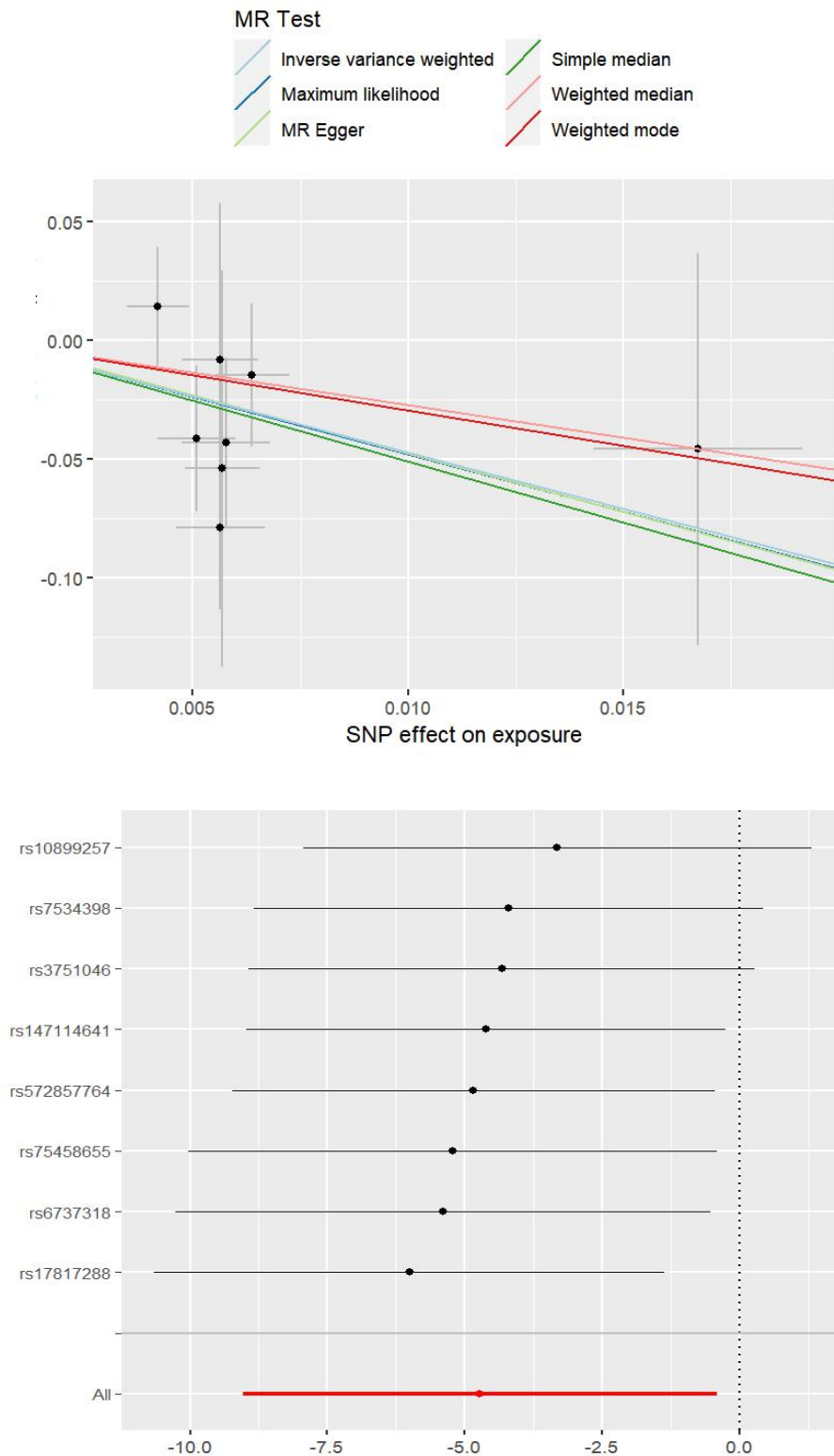


## Supplementary Figures

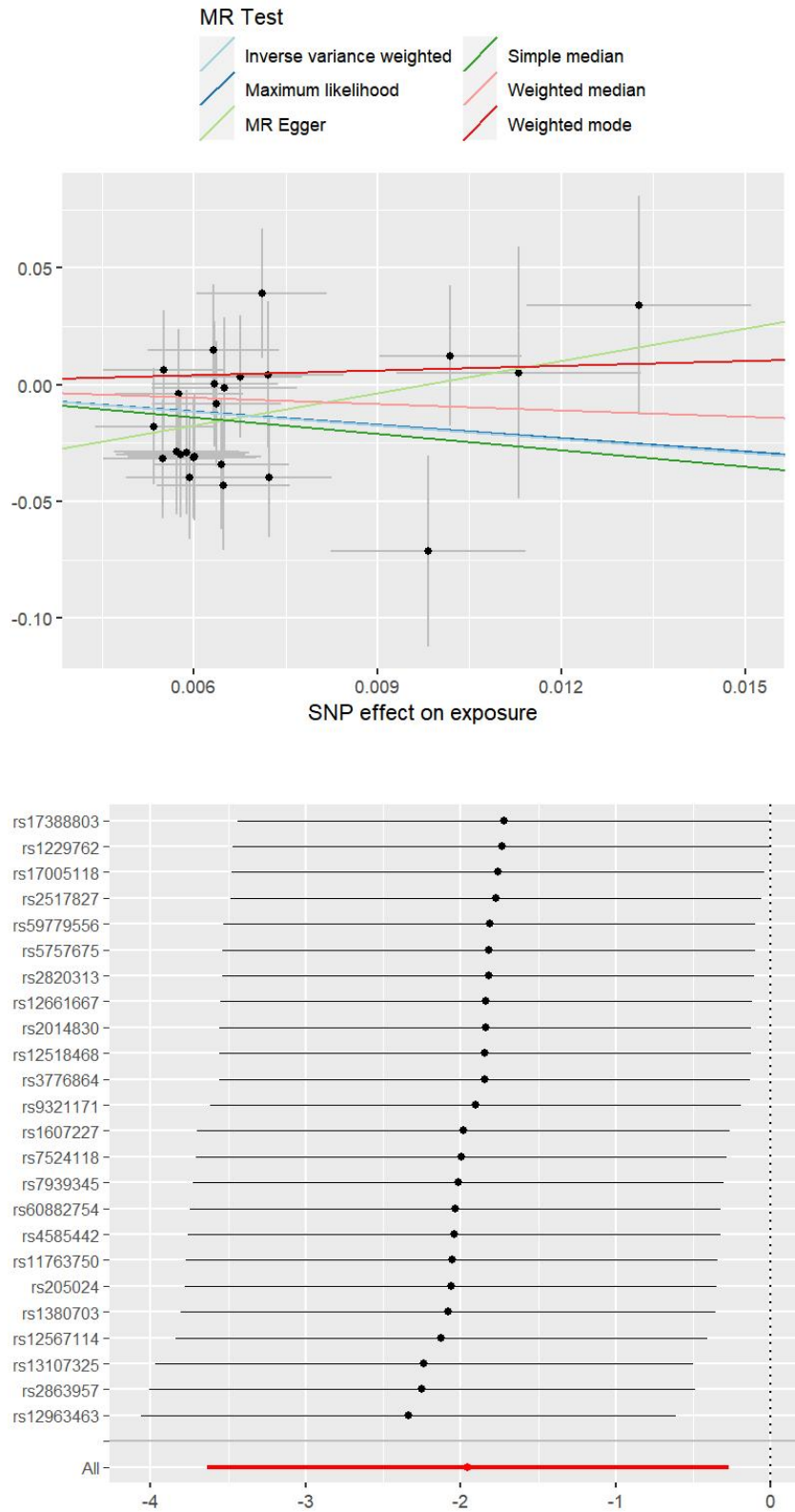
### Supplementary Figure 1

Scatter plot and leave-one-out plot of long sleep and PrRP associations with overlay of causal estimate in two-sample MR analysis



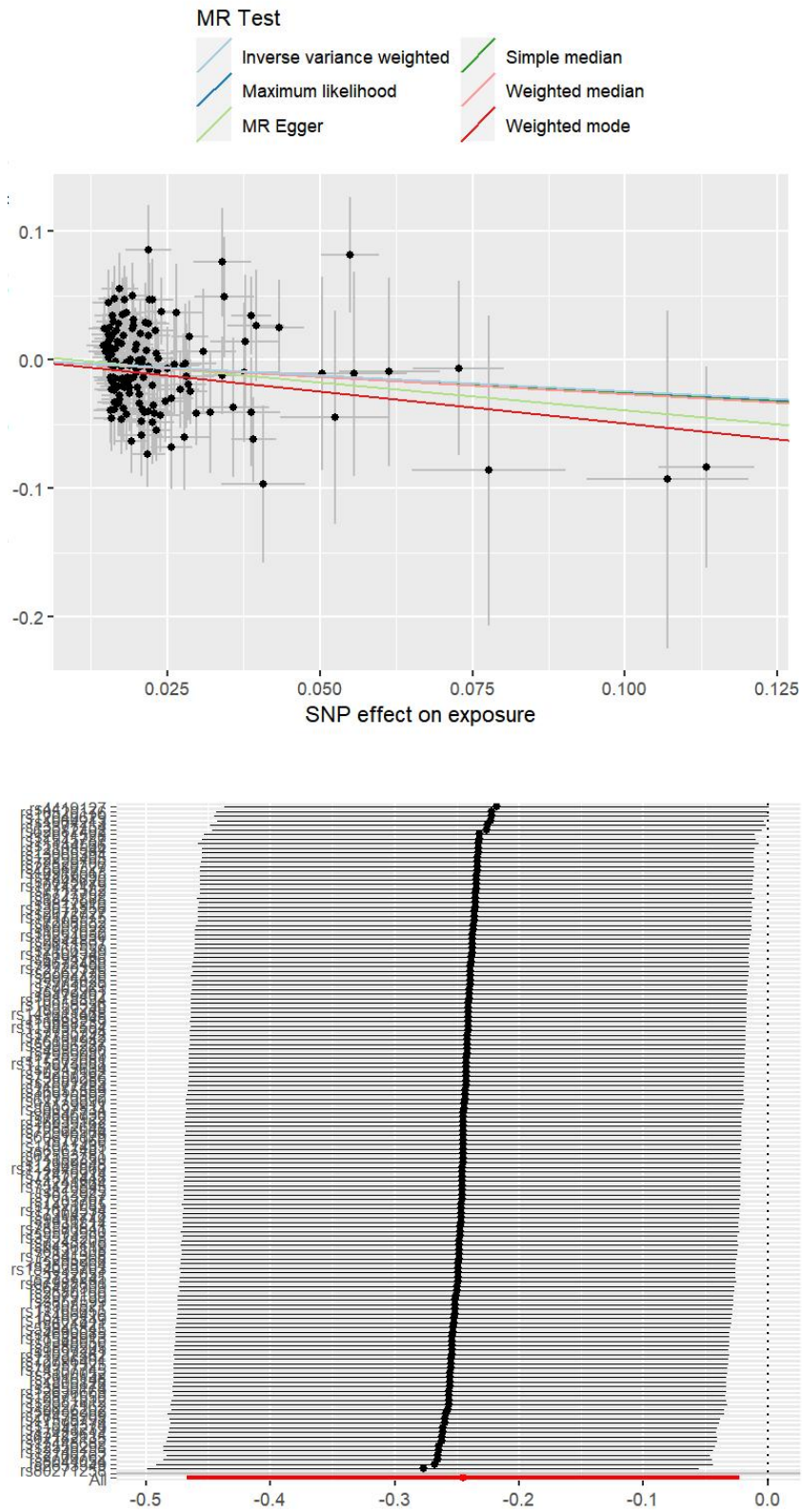
Supplementary Figure 2

Scatter plot and leave-one-out plot of short sleep and PrRP associations with overlay of causal estimate in two-sample MR analysis



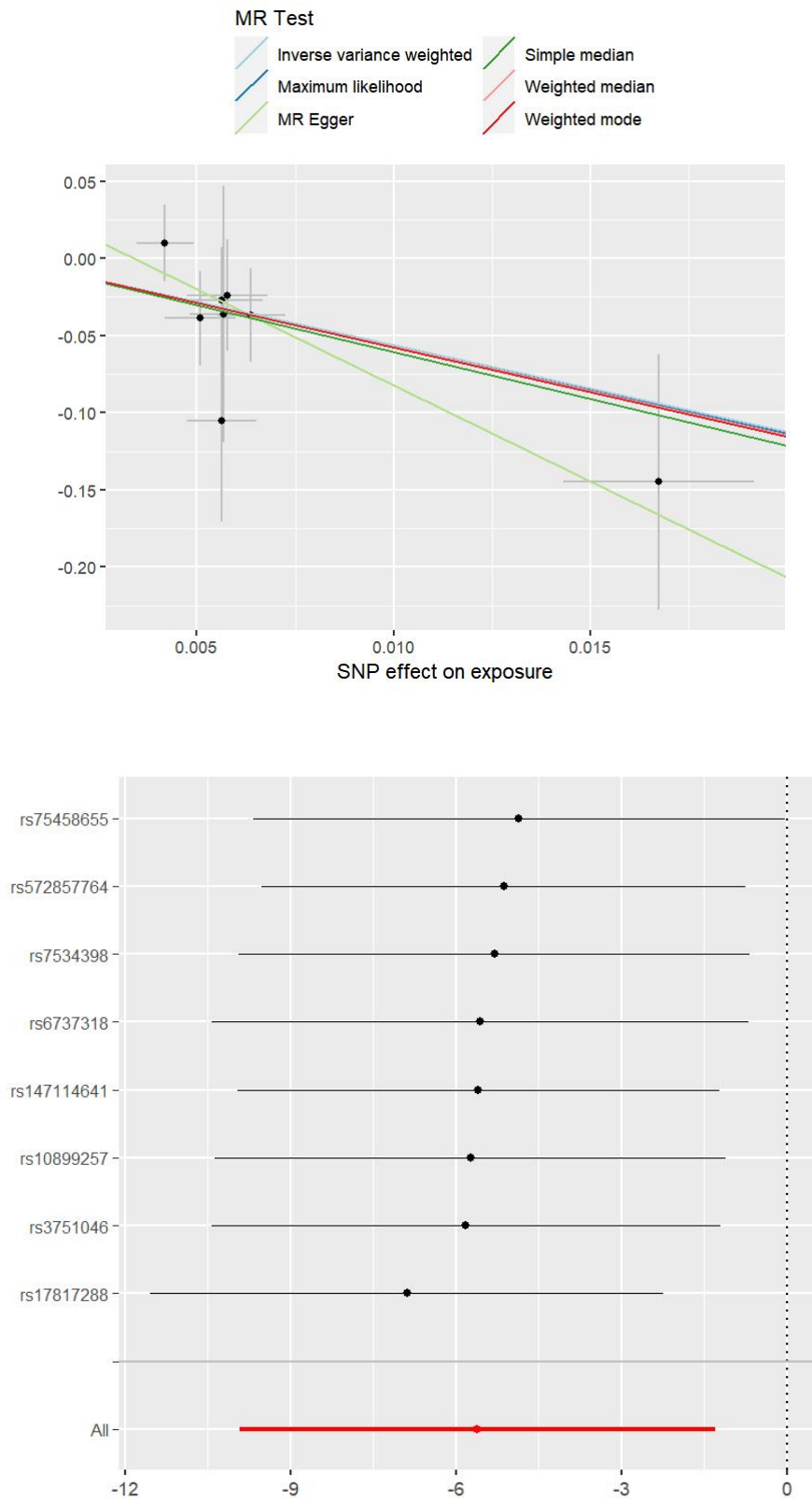
### Supplementary Figure 3

Scatter plot and leave-one-out plot of chronotype and CRFBP associations with overlay of causal estimate in two-sample MR analysis



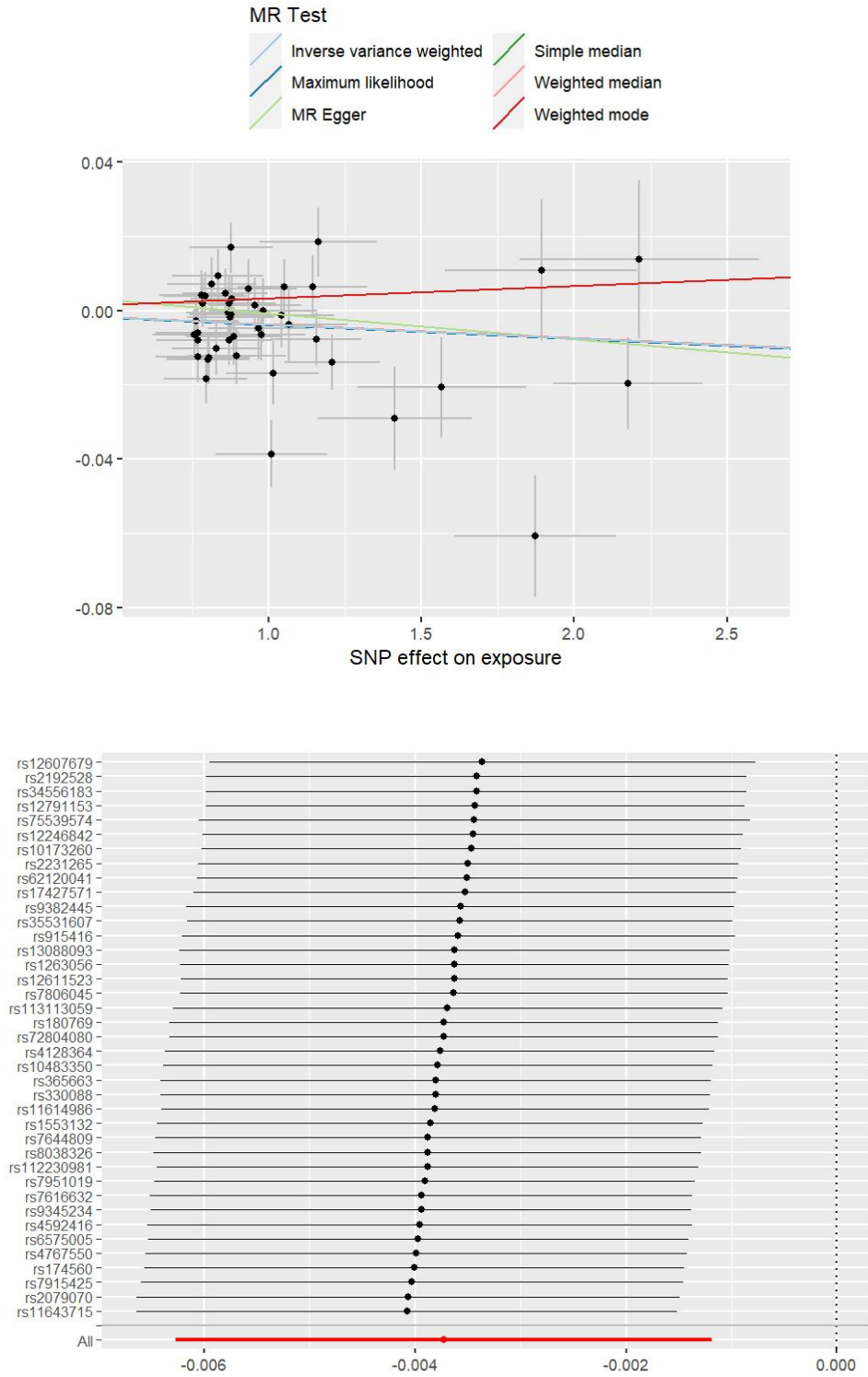
Supplementary Figure 4

Scatter plot and leave-one-out plot of long sleep and SRIF associations with overlay of causal estimate in two-sample MR analysis



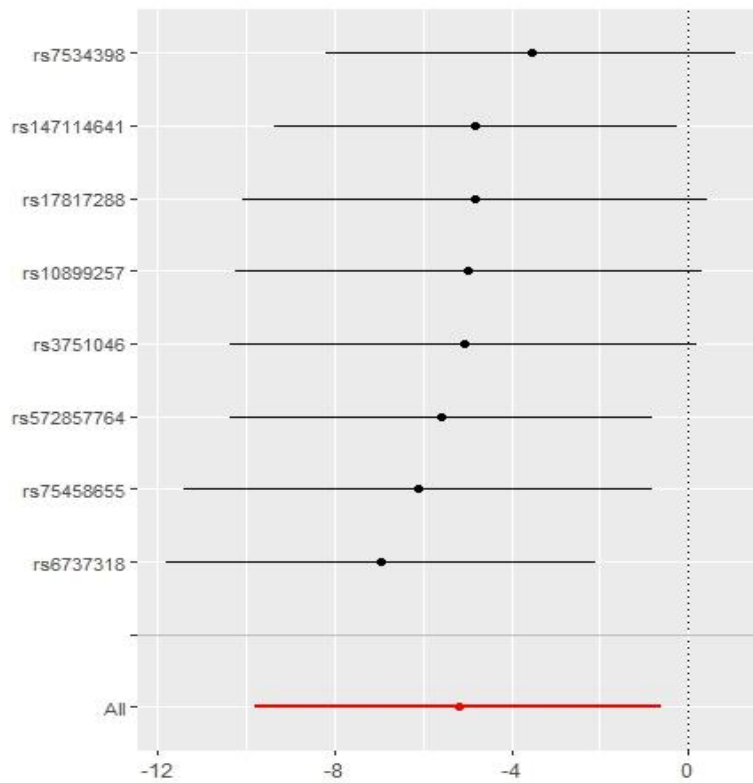
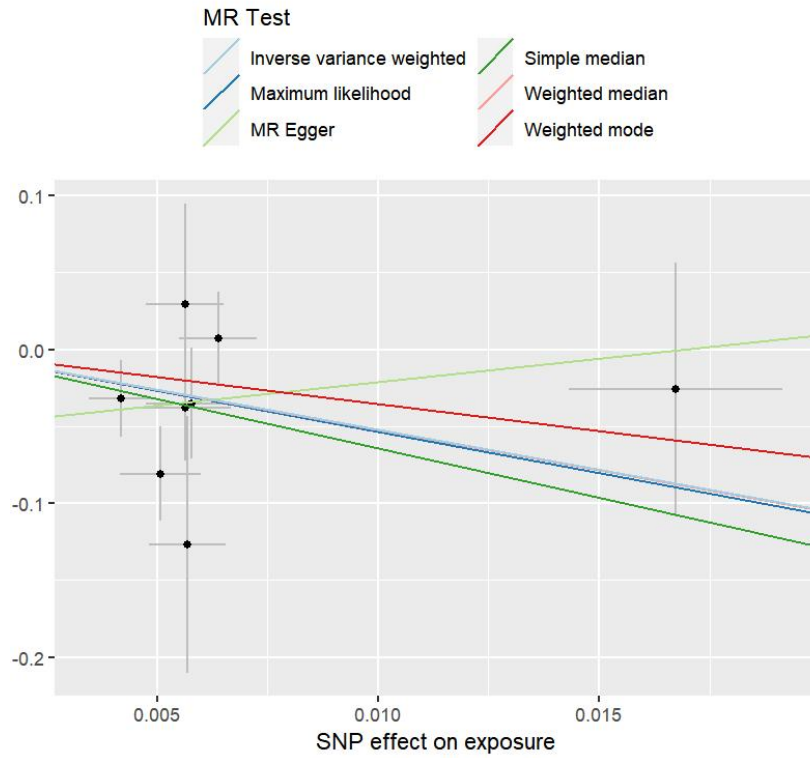
### Supplementary Figure 5

Scatter plot and leave-one-out plot of sleep duration and FT4 associations with overlay of causal estimate in two-sample MR analysis



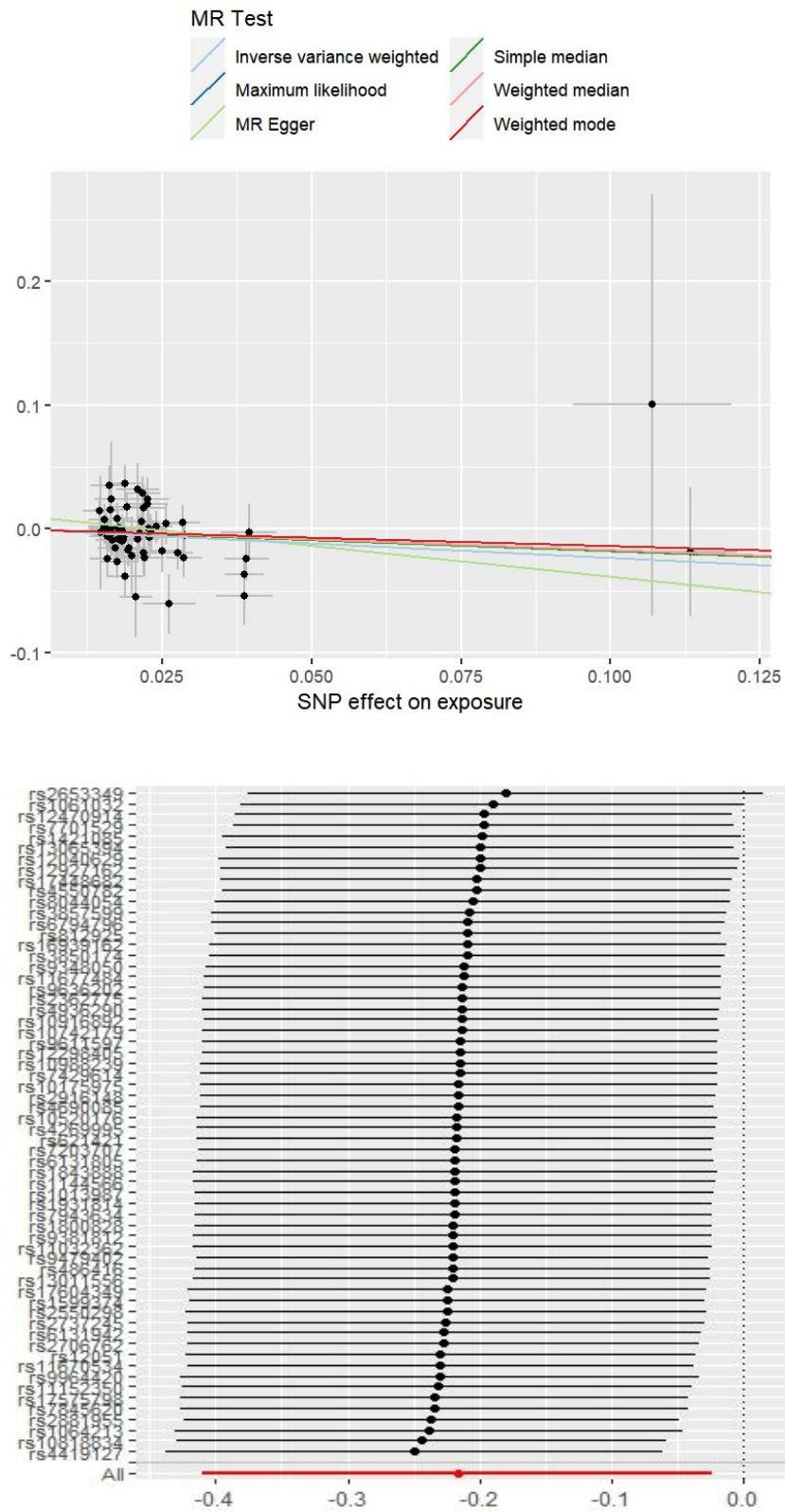
Supplementary Figure 6

Scatter plot and leave-one-out plot of long sleep and TPO associations with overlay of causal estimate in two-sample MR analysis



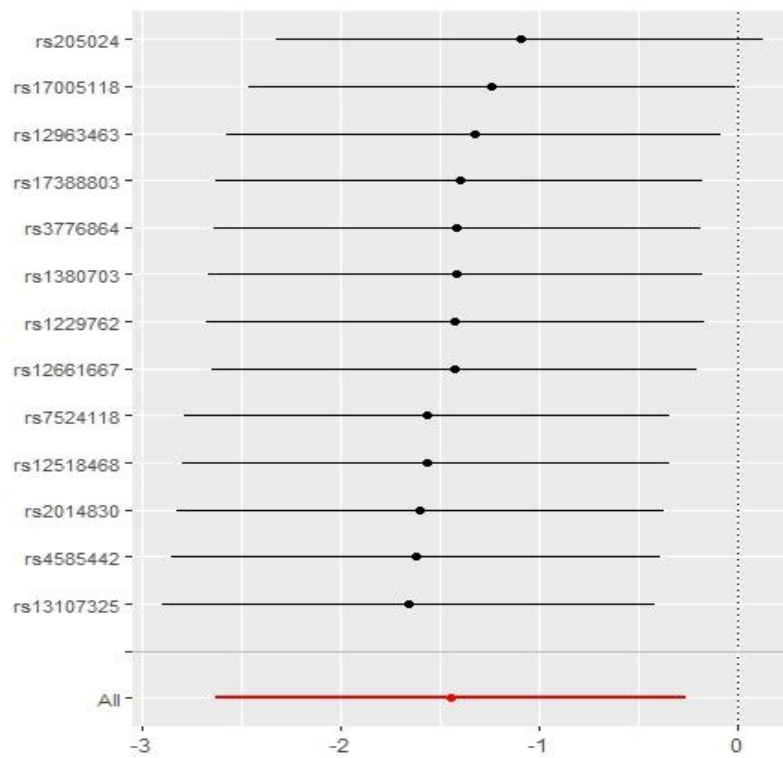
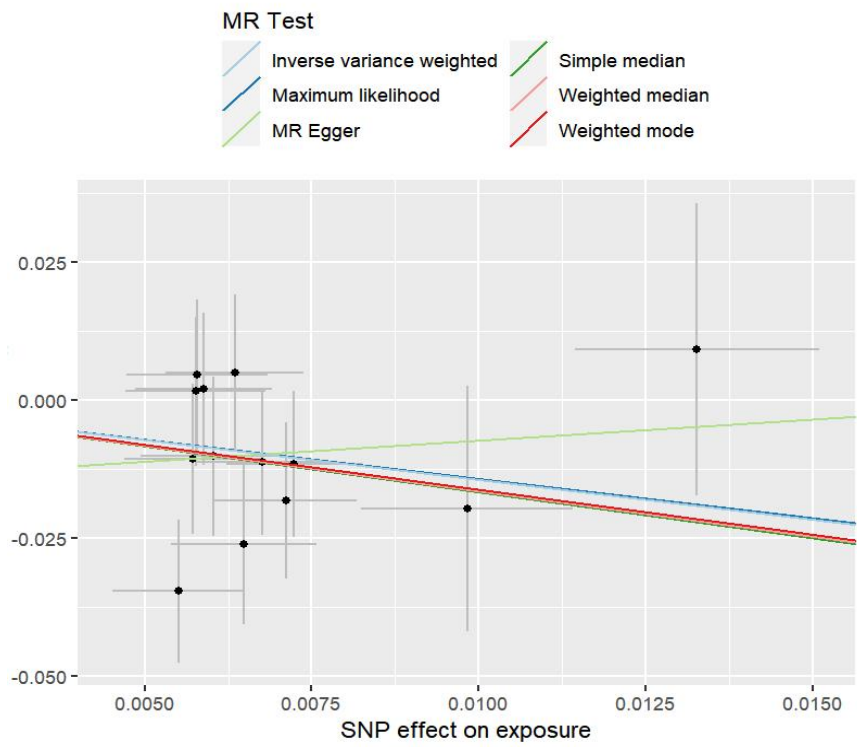
Supplementary Figure 7

Scatter plot and leave-one-out plot of chronotype and plasma cortisol associations with overlay of causal estimate in two-sample MR analysis



### Supplementary Figure 8

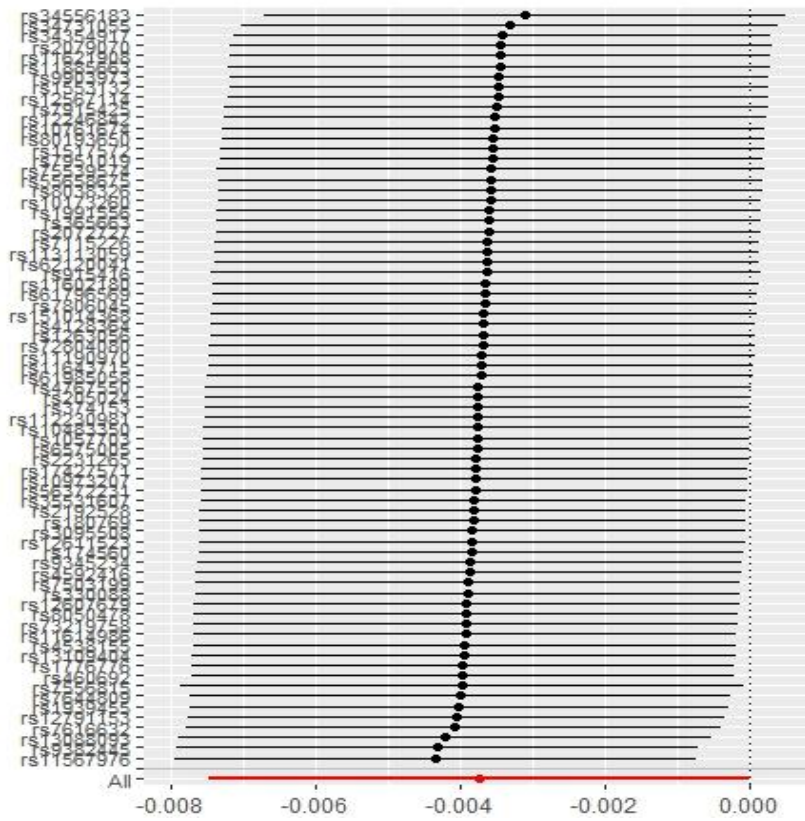
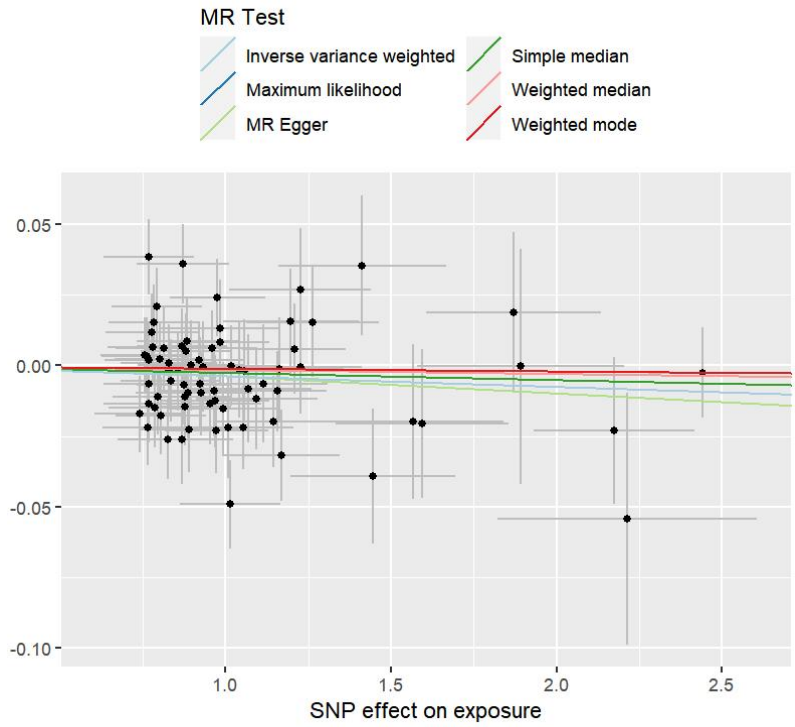
Scatter plot and leave-one-out plot of short sleep and plasma cortisol associations with overlay of causal estimate in two-sample MR analysis





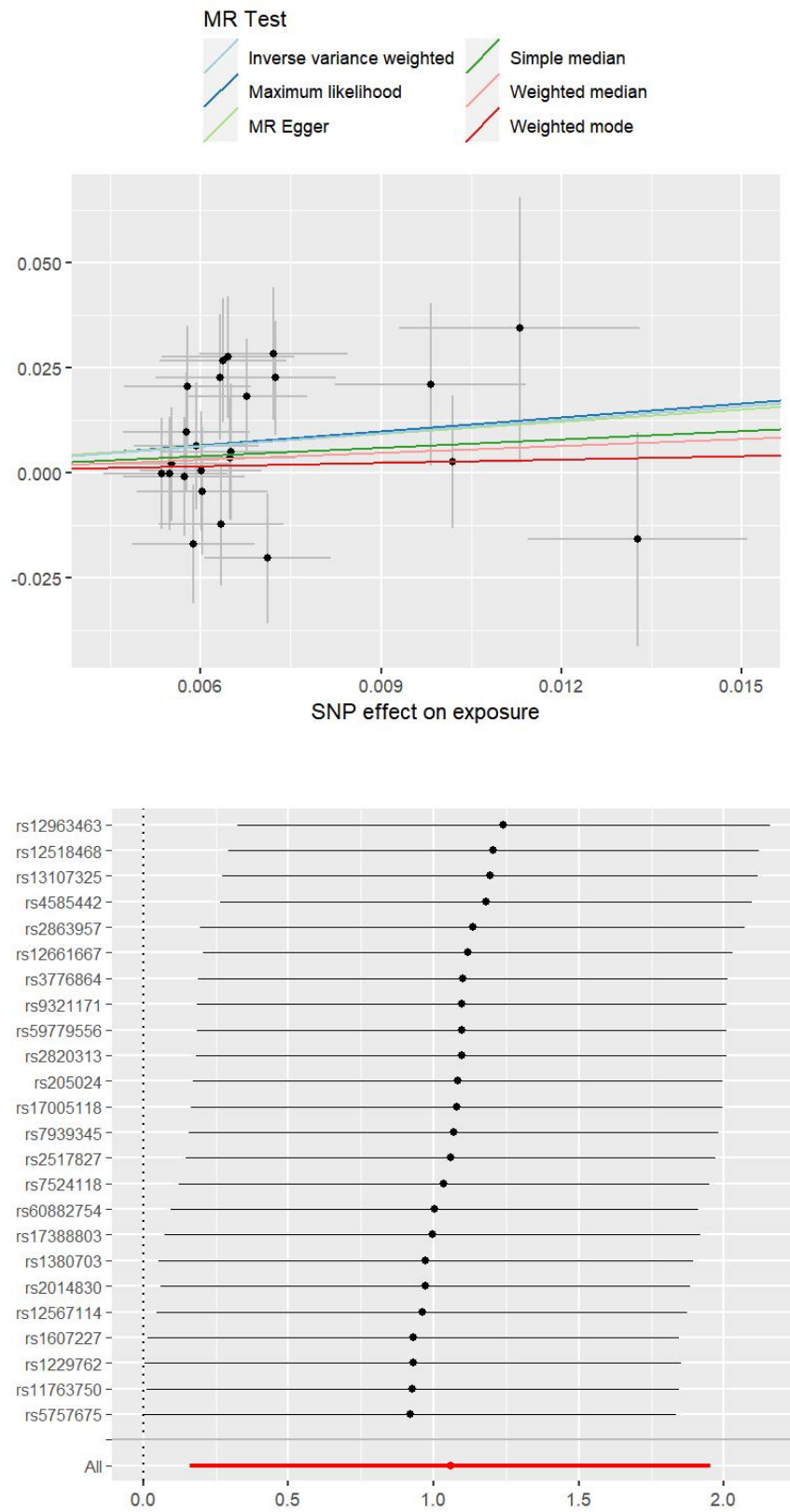
Supplementary Figure 9

Scatter plot and leave-one-out plot of sleep duration and P4 associations with overlay of causal estimate in two-sample MR analysis



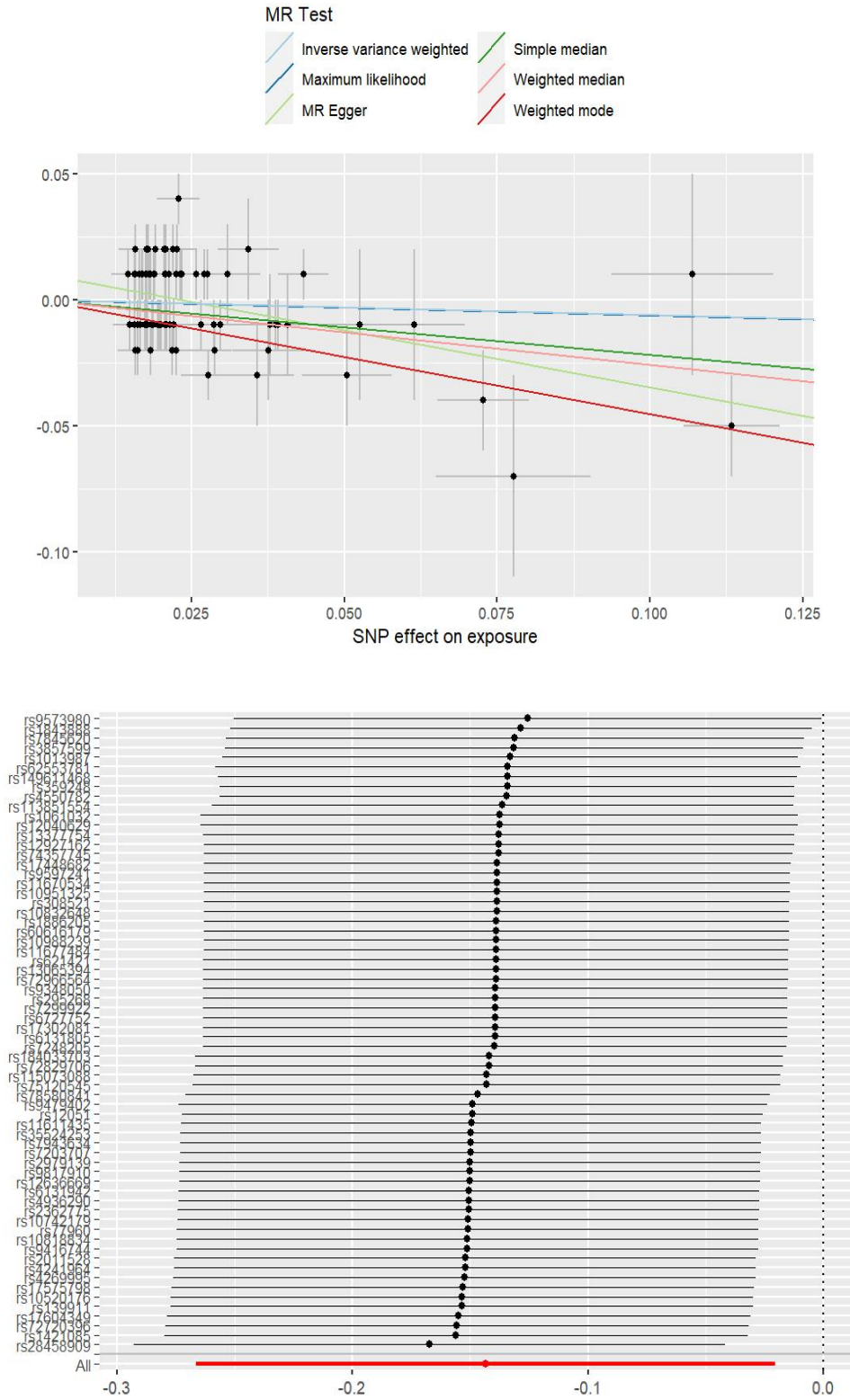
Supplementary Figure 10

Scatter plot and leave-one-out plot of short sleep and P4 associations with overlay of causal estimate in two-sample MR analysis



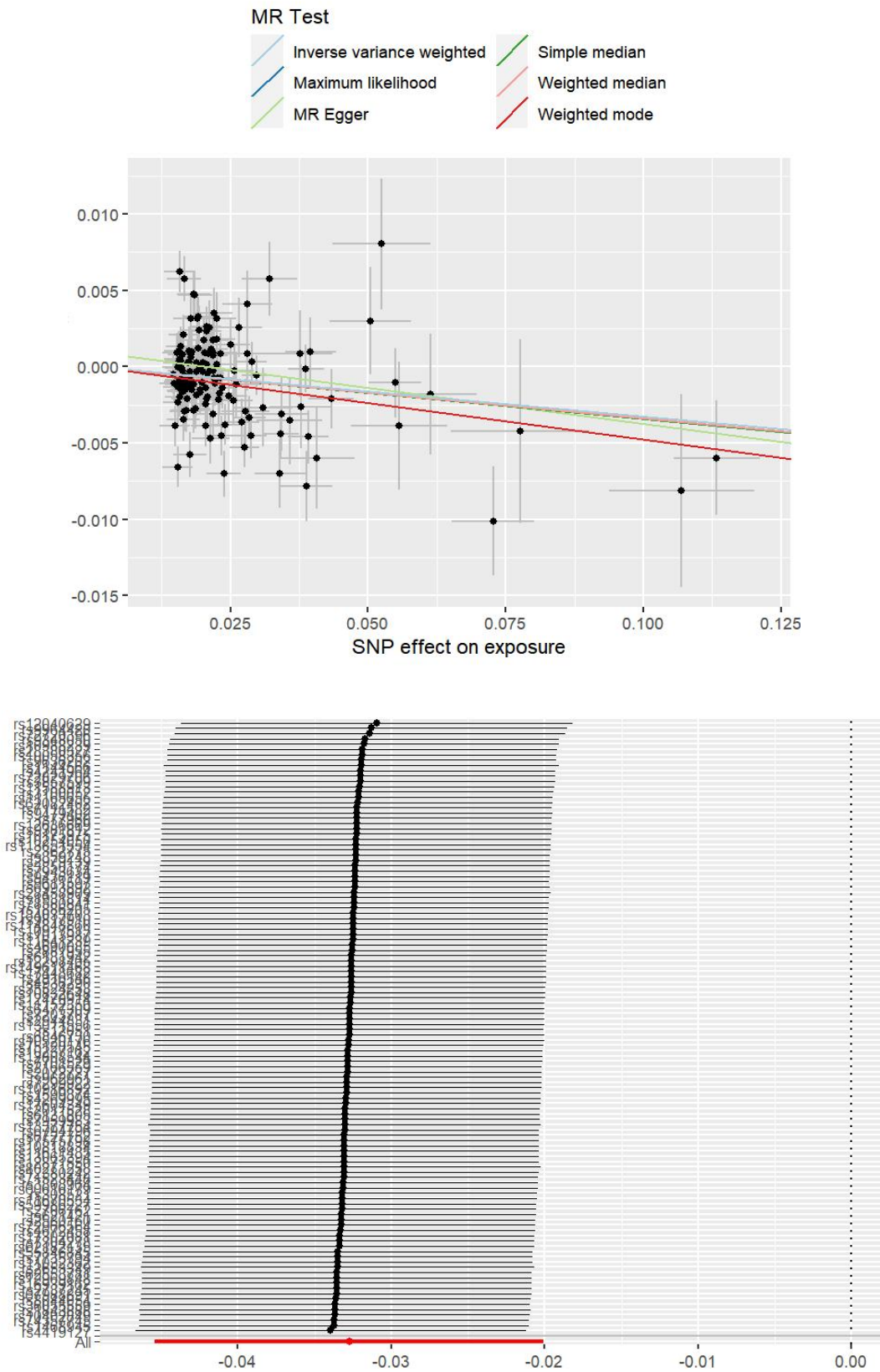
### Supplementary Figure 11

Scatter plot and leave-one-out plot of chronotype and DHEA-sulphate associations with overlay of causal estimate in two-sample MR analysis



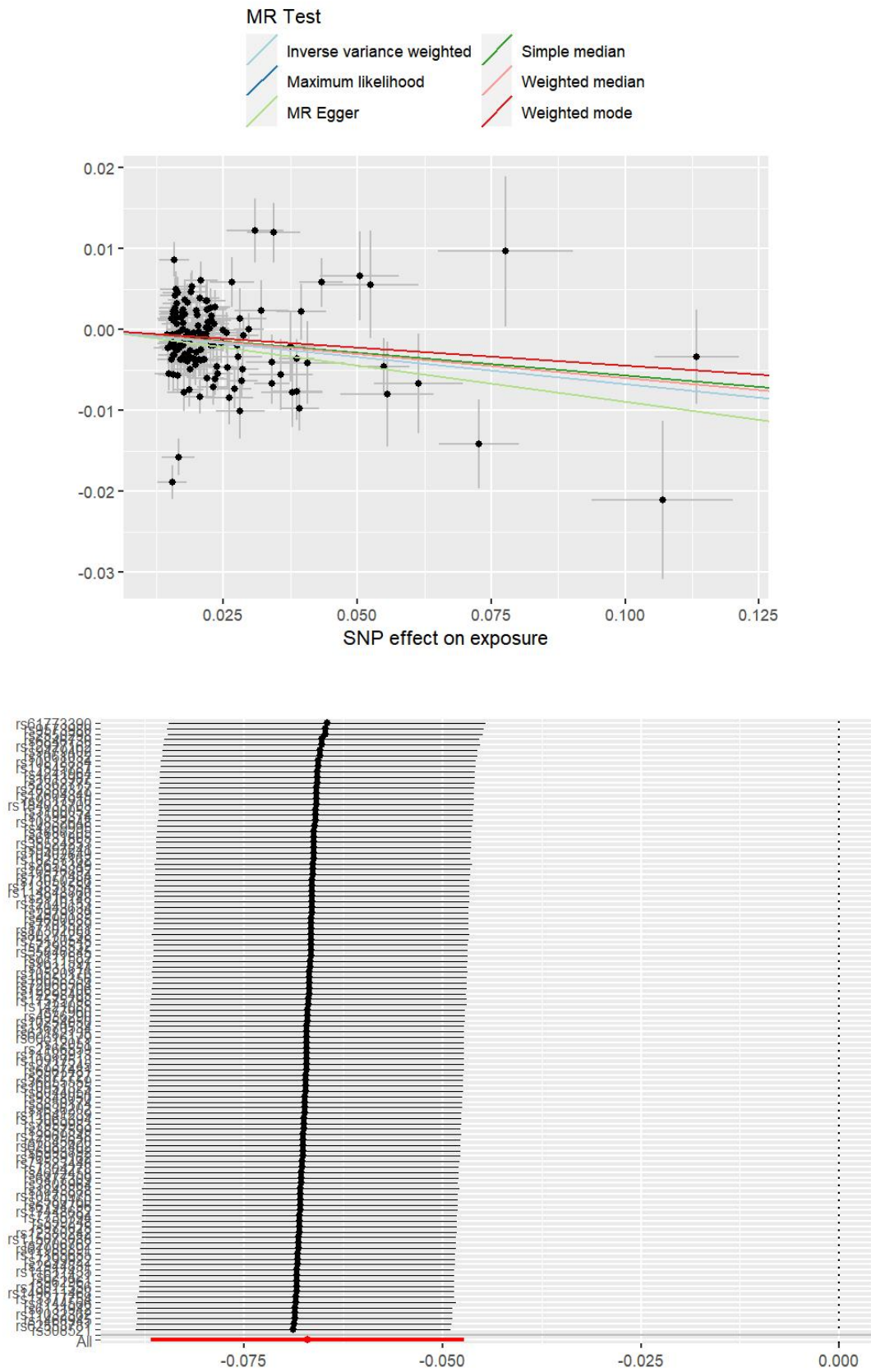
### Supplementary Figure 12

Scatter plot and leave-one-out plot of chronotype and TT associations with overlay of causal estimate in two-sample MR analysis



Supplementary Figure 13

Scatter plot and leave-one-out plot of chronotype and BT associations with overlay of causal estimate in two-sample MR analysis



Supplementary table 1. Details about the selected instrumental variables in MR analysis of the association between sleep traits and hypothalamic-pituitary-target gland axis function.

exposure (Sleep Traits)	SNP	Effect allele	Other allele	exp-Eaf	F-statistic	exp-Beta	exp-SE	exp-Pvalue	Sample size
insomnia (Jacqueline M. Lane et al, 2019)	rs4751	G	T	0.575309	30.6128491	-0.00772701	0.00139656	1.60E-08	237627
	rs12405761	A	C	0.570539	43.64462874	0.00923926	0.00139853	2.60E-11	237627
	rs11804386	G	A	0.666568	30.28287603	-0.00805764	0.00146423	2.60E-08	237627
	rs11184946	C	T	0.582984	39.40735428	-0.00878653	0.00139968	2.90E-10	237627
	rs6664467	G	A	0.86353	31.23964436	0.0112654	0.00201555	4.50E-08	237627
	rs2644128	C	G	0.449554	49.28141633	-0.0097367	0.00138698	1.00E-12	237627
	rs7572387	A	C	0.570618	49.21776074	-0.00983894	0.00140245	1.50E-12	237627
	rs113851554	G	T	0.942793	181.1584169	-0.0413744	0.00307399	1.30E-41	237627
	rs62158170	A	G	0.785192	51.28255818	0.0120517	0.00168292	5.70E-13	237627
	rs4577309	A	G	0.46879	34.19093895	0.00811816	0.00138836	3.70E-09	237627
	rs4688760	C	T	0.309505	51.56463219	-0.0107674	0.00149946	1.00E-12	237627
	rs9845387	C	A	0.959258	31.50627953	0.0196529	0.00350129	2.10E-08	237627
	rs1841625	A	G	0.568289	30.40863588	-0.00771112	0.00139836	3.60E-08	237627
	rs11097861	A	G	0.284352	35.64078795	-0.00916107	0.00153452	1.70E-09	237627
	rs1430205	C	T	0.541669	30.59640203	-0.00769252	0.0013907	3.60E-08	237627
	rs1592757	G	C	0.644161	39.19375105	-0.00903752	0.00144358	4.60E-10	237627
	rs7711696	G	T	0.695476	45.97554815	-0.0101773	0.00150096	9.90E-12	237627
	rs10947690	A	G	0.738436	30.46426892	-0.00868595	0.0015737	3.50E-08	237627
	rs314280	A	G	0.453284	38.6655947	-0.00863865	0.00138926	3.50E-10	237627
	rs3824081	T	C	0.475638	33.27517535	0.00801355	0.0013892	1.10E-08	237627
	rs6593005	A	G	0.258967	32.6798749	-0.00903102	0.00157978	8.60E-09	237627
	rs10280045	C	G	0.427157	41.46565019	-0.00906781	0.00140818	1.00E-10	237627

rs17151854	G	T	0.846784	30.99402742	-0.010705	0.00192286	2.40E-08	237627
rs10156602	A	G	0.637771	48.75736338	0.0101122	0.00144819	3.40E-12	237627
rs2296580	G	T	0.702012	46.62437043	0.0103125	0.00151028	8.70E-12	237627
rs2297787	T	A	0.920608	35.61740874	0.0152861	0.00256133	2.10E-09	237627
rs10838708	G	A	0.540565	36.00831334	0.00840241	0.00140024	2.50E-09	237627
rs324017	A	C	0.294978	40.57705851	0.00967624	0.00151903	1.10E-10	237627
rs2956278	A	G	0.785194	31.95319946	-0.00952347	0.00168476	1.30E-08	237627
rs68094047	C	T	0.749565	34.62695311	-0.00941756	0.00160041	3.30E-09	237627
rs1923770	T	A	0.382709	48.96470522	0.00996266	0.00142375	2.30E-12	237627
rs1327938	T	C	0.346215	38.65856088	-0.00911892	0.00146663	3.80E-10	237627
rs11635495	T	C	0.485702	34.42501207	-0.00813358	0.00138626	6.80E-09	237627
rs4886860	G	C	0.234173	47.36362326	0.0112372	0.00163281	6.10E-12	237627
rs17139246	T	C	0.610884	29.59429424	-0.00777532	0.00142927	4.10E-08	237627
rs2062113	T	C	0.429456	40.22037252	0.00889979	0.00140332	1.90E-10	237627
rs17669584	A	G	0.80454	29.24091484	-0.00964647	0.00178391	3.60E-08	237627
rs575346808	T	A	0.731596	45.30136556	-0.0105158	0.00156238	2.50E-11	237627
rs9894577	G	A	0.682406	69.09063597	-0.0123638	0.00148745	1.50E-16	237627
rs1942262	G	A	0.707539	53.61430574	-0.0111508	0.00152288	1.10E-13	237627
rs11673344	A	G	0.619812	36.94486902	-0.00868506	0.00142888	9.00E-10	237627

Chronotype (Samuel E. Jones et al, 2019)

rs1144566	T	C	0.029	209.319091	0.113367	0.00783578	5.80E-47	248094
rs2653349	A	G	0.2073	139.8607734	0.0387249	0.00327448	5.20E-32	248094
rs80271258	T	C	0.0844	132.7983379	-0.0549164	0.00476547	2.60E-30	248094
rs12040629	A	G	0.16	115.2002667	0.0391561	0.00364815	6.70E-27	248094
rs13377754	T	C	0.6104	116.0939941	0.0297291	0.00275916	6.90E-27	248094
rs28458909	T	C	0.1225	112.6664773	-0.0432803	0.00407749	2.60E-26	248094

rs1843888	A	G	0.5433	113.5615682	0.0288388	0.00270621	3.20E-26	248094
rs4729854	A	T	0.4701	109.0303592	-0.0287186	0.00275036	3.30E-25	248094
rs61773390	T	G	0.1931	101.9283135	0.0340792	0.00337553	1.20E-23	248094
rs1421085	T	C	0.5935	101.1313402	-0.0275621	0.00274075	1.50E-23	248094
rs9573980	A	G	0.9659	95.16819053	0.0727085	0.00745314	5.70E-22	248094
rs12927162	A	G	0.7276	91.16050377	0.0286498	0.00300067	6.80E-22	248094
rs9964420	A	C	0.2983	94.06839085	-0.0284801	0.00293643	8.60E-22	248094
rs2550298	T	C	0.3811	74.70071378	-0.0239989	0.0027767	3.60E-18	248094
rs9436119	A	G	0.3842	73.58417467	0.0234899	0.00273835	4.00E-18	248094
rs72720396	A	G	0.7741	72.52680997	-0.0271261	0.00318521	8.40E-18	248094
rs10520176	T	C	0.4926	74.09851823	0.0231498	0.00268932	1.40E-17	248094
rs139911	T	C	0.5722	73.29193727	-0.0233915	0.00273231	2.30E-17	248094
rs11032362	A	G	0.0937	71.55935722	0.0395538	0.00467579	4.80E-17	248094
rs1061032	T	G	0.094	65.94647975	0.0387677	0.00477391	2.00E-16	248094
rs9479402	T	C	0.9883	65.69847247	-0.106941	0.0131937	3.20E-16	248094
rs12969848	T	C	0.5313	65.42325541	0.0218632	0.00270301	1.30E-15	248094
rs67988891	C	G	0.6821	64.69394785	-0.0232401	0.00288939	3.70E-15	248094
rs9381812	A	G	0.7051	61.22431093	-0.023054	0.00294635	4.60E-15	248094
rs6967481	T	C	0.5011	58.48870799	0.0206433	0.00269925	6.90E-15	248094
rs4241964	T	G	0.5217	58.78104728	-0.020735	0.00270449	1.10E-14	248094
rs4419127	A	G	0.6622	58.29491643	0.0218058	0.00285599	1.30E-14	248094
rs62082402	T	G	0.1936	55.98839802	0.0256161	0.00342345	1.60E-14	248094
rs11545787	A	G	0.2482	57.58225379	-0.0238098	0.0031377	4.90E-14	248094
rs10951325	T	C	0.6319	54.01938944	0.0205969	0.00280238	7.90E-14	248094
rs6993892	T	C	0.6162	55.39110675	-0.0205162	0.00275662	8.40E-14	248094
rs75120545	T	C	0.0319	54.89630186	0.0613917	0.00828587	1.10E-13	248094



rs12140153	T	G	0.0892	52.63268001	-0.0340109	0.00468803	1.60E-13	248094
rs17604349	A	G	0.1848	53.6514576	-0.0257422	0.00351443	1.70E-13	248094
rs28380327	A	T	0.6317	54.54728157	0.0205097	0.00277698	2.90E-13	248094
rs308521	T	C	0.6039	52.58009824	0.0199718	0.00275427	3.70E-13	248094
rs2737245	T	G	0.2748	51.34683312	0.0215069	0.00300138	4.50E-13	248094
rs10916892	T	C	0.6203	51.69328891	-0.0199965	0.00278123	6.10E-13	248094
rs812925	C	G	0.6458	53.63749834	-0.0205641	0.00280786	6.90E-13	248094
rs7959983	T	C	0.5955	51.21214192	-0.0195258	0.00272849	9.50E-13	248094
rs13011556	C	G	0.7624	51.77168431	-0.0227424	0.00316075	1.10E-12	248094
rs10254050	C	G	0.1905	51.16654306	-0.0246317	0.00344351	1.20E-12	248094
rs1064213	A	G	0.4826	50.78211239	0.019141	0.00268602	1.30E-12	248094
rs8044054	T	C	0.3878	48.58144047	0.019218	0.00275723	1.50E-12	248094
rs17448682	T	C	0.2339	48.45388636	0.0221528	0.00318247	2.20E-12	248094
rs16939162	A	G	0.8304	48.62481542	0.0249887	0.00358356	2.20E-12	248094
rs1468945	A	G	0.7852	47.7090256	-0.0225859	0.00326992	4.20E-12	248094
rs6846730	T	C	0.2353	47.90045275	-0.0220017	0.00317897	5.60E-12	248094
rs12636669	T	C	0.0801	47.65819162	0.0343448	0.00497499	5.80E-12	248094
rs4269995	T	C	0.251	47.36825699	-0.021271	0.00309061	5.90E-12	248094
rs62553781	T	C	0.0329	47.0651998	-0.0504004	0.00734656	1.20E-11	248094
rs1013987	T	C	0.4033	44.29332993	-0.0182666	0.00274466	1.50E-11	248094
rs10988239	T	C	0.5117	46.48279542	-0.0186334	0.00273304	1.60E-11	248094
rs7304278	A	G	0.2827	44.90468399	-0.020255	0.00302264	2.20E-11	248094
rs2362775	T	C	0.5342	44.47372907	-0.0180186	0.0027019	2.80E-11	248094
rs12808544	A	C	0.2409	43.47086971	-0.0207525	0.00314754	3.00E-11	248094
rs17575798	A	G	0.1918	44.17050892	-0.0225553	0.00339377	4.20E-11	248094
rs77960	A	G	0.3304	42.91353843	0.0187567	0.00286325	4.20E-11	248094

rs72796401	A	T	0.1903	40.98085535	0.0219581	0.00343008	5.90E-11	248094
rs247929	C	G	0.5081	43.32987761	0.0177077	0.0026901	6.20E-11	248094
rs621421	T	C	0.6256	40.81312077	-0.0177395	0.00277678	7.50E-11	248094
rs184033703	A	G	0.0585	43.02739733	0.0377937	0.00576165	8.10E-11	248094
rs74357745	A	G	0.8803	41.48345568	0.026546	0.00412156	8.70E-11	248094
rs6131942	A	G	0.418	41.22586014	-0.0175437	0.00273235	9.40E-11	248094
rs60616179	A	G	0.9443	39.93776473	0.0375809	0.00594669	1.10E-10	248094
rs975025	T	C	0.0758	40.81901015	-0.0321062	0.00502525	1.30E-10	248094
rs10175975	T	C	0.1853	42.26724255	0.0228441	0.00351376	1.80E-10	248094
rs9817910	A	G	0.5576	39.5682181	-0.0170371	0.00270846	3.10E-10	248094
rs114848860	A	T	0.9737	40.57444084	-0.0555837	0.00872612	3.60E-10	248094
rs62182135	A	C	0.3285	39.69803039	-0.0179439	0.00284795	3.70E-10	248094
rs4936290	A	C	0.6584	39.21206713	-0.0177058	0.00282752	4.60E-10	248094
rs1886205	A	C	0.7604	37.80228442	0.0194352	0.00316104	4.90E-10	248094
rs7845620	A	C	0.8344	38.34107297	-0.0224873	0.00363166	5.20E-10	248094
rs7111582	A	G	0.8956	39.31982112	-0.0277534	0.00442599	5.20E-10	248094
rs10917513	T	C	0.6476	40.18285981	-0.0179024	0.00282417	6.70E-10	248094
rs3850174	A	T	0.2575	39.36951297	-0.0194471	0.00309938	6.80E-10	248094
rs3100052	A	G	0.3886	38.27803461	0.0170795	0.00276058	6.90E-10	248094
rs2979139	A	G	0.5048	38.91463739	-0.0168003	0.00269315	7.40E-10	248094
rs9348050	T	C	0.4864	38.24218551	0.016638	0.00269048	7.50E-10	248094
rs9597241	A	C	0.8106	38.29891832	0.0213884	0.00345609	7.50E-10	248094
rs9636202	A	G	0.2662	36.16262671	-0.0183734	0.00305534	7.50E-10	248094
rs7203707	A	C	0.5193	37.24850801	-0.0164726	0.00269903	7.60E-10	248094
rs6477309	T	C	0.6661	37.11231964	0.0174399	0.00286276	8.00E-10	248094
rs149611468	T	C	0.9888	37.97677434	0.0776374	0.0125983	8.50E-10	248094

rs2072727	T	C	0.4327	36.2708139	0.016352	0.00271514	8.50E-10	248094
rs7429614	T	G	0.416	36.36037864	0.0164171	0.00272259	9.20E-10	248094
rs80097534	T	G	0.0966	38.07174464	-0.0281025	0.00455453	9.30E-10	248094
rs113851554	T	G	0.0567	35.59155971	-0.0357353	0.00598996	1.00E-09	248094
rs4672458	T	C	0.4764	36.69508529	-0.0162709	0.00268601	1.10E-09	248094
rs10818834	T	C	0.7297	38.28793384	0.0188673	0.00304915	1.10E-09	248094
rs9416744	A	C	0.2595	37.97311829	0.0189843	0.00308075	1.30E-09	248094
rs11152350	A	C	0.467	36.59316914	-0.0163037	0.00269517	1.30E-09	248094
rs3857599	A	C	0.1659	36.06123065	0.0218522	0.00363894	1.40E-09	248094
rs359248	T	G	0.4564	35.52641241	-0.0161518	0.00270985	1.50E-09	248094
rs10742179	A	G	0.2627	35.64378118	0.0182967	0.00306465	1.50E-09	248094
rs12380242	T	C	0.5058	34.57425992	-0.015796	0.0026864	1.60E-09	248094
rs11677484	T	G	0.2574	36.0040356	0.0185564	0.00309256	1.70E-09	248094
rs12470914	A	T	0.1005	34.61531234	0.0261187	0.00443933	2.20E-09	248094
rs55846845	A	G	0.5177	35.29808397	-0.016	0.00269305	2.40E-09	248094
rs7299922	A	G	0.6388	33.27736587	0.016149	0.00279944	2.50E-09	248094
rs13065394	T	G	0.286	34.87437948	-0.017504	0.00296404	3.00E-09	248094
rs115073088	A	G	0.975	34.52638409	-0.0524798	0.00893134	3.10E-09	248094
rs10832648	A	C	0.1989	34.27836974	-0.019805	0.00338271	3.20E-09	248094
rs10237162	T	C	0.7232	34.17783116	0.0176177	0.00301354	3.50E-09	248094
rs2916148	A	G	0.4522	35.16964555	0.0162149	0.0027342	3.50E-09	248094
rs7701529	A	T	0.2393	35.28482903	-0.0188448	0.00317247	3.60E-09	248094
rs78580841	T	C	0.0694	33.37351067	0.0309392	0.0053556	3.70E-09	248094
rs2706762	T	C	0.1496	34.09493355	-0.0219218	0.00375432	4.00E-09	248094
rs11165655	A	G	0.5281	34.17221598	-0.0157164	0.00268854	4.10E-09	248094
rs7735794	A	G	0.2241	34.9111227	0.0201147	0.00340433	4.70E-09	248094

rs72829706	A	G	0.96	34.45181792	0.0407112	0.00693598	5.10E-09	248094
rs6794796	A	G	0.2897	33.71245487	0.0172176	0.00296536	5.30E-09	248094
rs2011528	T	C	0.8254	33.19874565	-0.0206881	0.00359054	5.30E-09	248094
rs35524253	A	G	0.3539	31.80555911	0.015862	0.00281259	5.80E-09	248094
rs10058356	T	C	0.6958	33.45143293	-0.0169817	0.00293612	6.80E-09	248094
rs17302081	T	C	0.4414	33.51138154	0.0156573	0.00270471	6.90E-09	248094
rs848552	C	G	0.4755	32.54476516	-0.0153219	0.00268579	7.00E-09	248094
rs9347926	A	T	0.4407	33.86820548	0.0157068	0.00269893	7.30E-09	248094
rs59986227	C	G	0.7493	33.07222254	-0.0178401	0.00310217	8.30E-09	248094
rs11670534	T	C	0.1614	33.42606852	-0.0209755	0.00362802	8.50E-09	248094
rs11611435	T	C	0.5561	33.91123136	0.0157403	0.00270297	8.60E-09	248094
rs72841368	A	T	0.8104	32.93036593	-0.0197592	0.00344327	8.70E-09	248094
rs10402849	T	C	0.2002	32.87109746	0.0192609	0.00335946	8.90E-09	248094
rs2166559	T	C	0.8611	31.81495278	-0.0218336	0.00387088	9.10E-09	248094
rs2944831	A	G	0.2946	34.13691703	0.0172414	0.00295094	1.10E-08	248094
rs11641239	T	C	0.2854	33.78449764	0.0172486	0.00296753	1.10E-08	248094
rs9394154	C	G	0.436	32.59806655	-0.0155027	0.00271526	1.30E-08	248094
rs6727752	A	G	0.3569	31.99578366	0.0156947	0.00277464	1.40E-08	248094
rs7943634	T	C	0.3075	31.97428494	-0.016455	0.00291003	1.40E-08	248094
rs11588913	A	G	0.4037	31.83852821	-0.0154525	0.00273856	1.50E-08	248094
rs1599374	A	G	0.5163	32.36988993	0.0153807	0.00270337	1.50E-08	248094
rs36055559	A	G	0.166	32.11087766	-0.0210912	0.00372199	1.50E-08	248094
rs6131805	T	G	0.4022	31.19434085	0.0156349	0.00279935	1.50E-08	248094
rs1931814	A	G	0.4787	32.72806731	0.0153877	0.00268976	1.60E-08	248094
rs1800828	C	G	0.7508	32.64231756	0.0176235	0.00308462	1.70E-08	248094
rs2580160	A	G	0.5554	31.53540156	0.0153499	0.00273342	1.70E-08	248094

rs9611597	A	T	0.8371	31.91375691	0.0208731	0.00369486	1.80E-08	248094
rs71523448	C	G	0.0788	30.7339727	-0.0280253	0.00505523	2.00E-08	248094
rs962961	T	C	0.3308	30.74643585	-0.0159069	0.00286872	2.00E-08	248094
rs4550782	T	G	0.6655	30.69168704	0.015797	0.00285144	2.20E-08	248094
rs486416	A	G	0.6527	30.83292493	-0.0154284	0.00277852	2.30E-08	248094
rs72966564	T	C	0.2507	31.09674811	-0.0174371	0.00312692	2.50E-08	248094
rs73050286	T	C	0.7817	29.81421751	0.0178095	0.00326167	2.60E-08	248094
rs12871550	A	G	0.3229	30.95503754	0.0159966	0.00287516	2.60E-08	248094
rs3808964	T	G	0.6326	31.56841764	0.0157096	0.00279601	2.70E-08	248094
rs12298405	T	C	0.3301	30.63198648	-0.0158538	0.00286448	2.70E-08	248094
rs7298532	T	C	0.7213	30.34185861	0.0164304	0.00298282	2.70E-08	248094
rs12206814	C	G	0.4869	30.8400311	0.015175	0.00273257	2.80E-08	248094
rs7248205	T	C	0.6003	29.25973908	0.0148995	0.00275446	3.80E-08	248094
rs4690085	A	G	0.5348	30.00686647	-0.0147386	0.00269058	3.90E-08	248094
rs295268	T	C	0.7403	29.01846073	-0.0165883	0.00307939	4.10E-08	248094
rs2881955	T	C	0.2788	28.83440562	0.0161216	0.00300229	4.30E-08	248094
rs12051	A	G	0.6119	27.81060414	-0.014573	0.0027634	5.00E-08	248094

Sleep Duration (Hassan S. Dashti et al, 2019)

rs7556815	A	G	0.219	220.7854247	2.443	0.1644138	1.30E-49	446118
rs75539574	C	A	0.086	79.51478971	2.175	0.2439132	6.90E-19	446118
rs12607679	T	C	0.738	60.29481012	1.208	0.1555704	8.30E-15	446118
rs915416	C	G	0.29	59.65394739	1.156	0.1496712	9.90E-15	446118
rs9940646	C	G	0.578	54.74807428	1.017	0.1374474	1.20E-13	446118
rs13109404	T	G	0.928	50.09205794	1.872	0.2644974	1.40E-12	446118
rs8050478	G	A	0.5	49.91092209	0.96	0.1358856	1.70E-12	446118
rs56372231	T	C	0.334	49.88680468	1.017	0.1439886	2.20E-12	446118

rs13088093	G	T	0.336	45.84844112	0.976	0.144141	7.00E-12	446118
rs2079070	C	G	0.265	46.76407166	1.053	0.1539828	7.50E-12	446118
rs34556183	A	G	0.72	44.94857259	1.015	0.1513938	2.30E-11	446118
rs3095508	C	A	0.594	44.37234023	0.921	0.1382622	3.10E-11	446118
rs34731055	T	C	0.181	43.61069912	1.168	0.1768668	3.70E-11	446118
rs73219758	G	A	0.708	43.19724868	0.984	0.1497156	5.60E-11	446118
rs10973207	T	G	0.158	42.78318097	1.226	0.1874364	6.00E-11	446118
rs2139261	G	C	0.749	41.64313334	1.122	0.1738686	8.50E-11	446118
rs4592416	G	A	0.464	41.83688475	0.881	0.136206	9.30E-11	446118
rs365663	A	G	0.546	41.24409522	0.878	0.1367142	1.00E-10	446118
rs1517572	C	A	0.581	40.76005616	0.879	0.1376802	1.50E-10	446118
rs7915425	T	C	0.175	40.67488033	1.144	0.1793754	2.00E-10	446118
rs330088	C	T	0.547	40.37335254	0.868	0.1366068	2.70E-10	446118
rs8038326	A	G	0.727	39.24618685	0.955	0.152442	2.80E-10	446118
rs460692	C	T	0.137	39.91977319	1.263	0.1998984	3.60E-10	446118
rs9382445	T	C	0.623	38.77726245	0.872	0.1400322	4.80E-10	446118
rs4767550	G	A	0.414	38.3352706	0.858	0.138576	6.30E-10	446118
rs11885663	T	C	0.248	38.36607759	0.973	0.1570866	8.60E-10	446118
rs1991556	G	A	0.774	36.9949257	0.994	0.1634238	1.00E-09	446118
rs1057703	G	T	0.147	36.60253585	1.164	0.1923966	1.10E-09	446118
rs4128364	C	T	0.339	37.2904324	0.876	0.1434516	1.40E-09	446118
rs61796569	T	C	0.27	36.29737931	0.927	0.1538658	1.50E-09	446118
rs10483350	G	A	0.195	36.67716793	1.042	0.172056	1.50E-09	446118
rs7115226	A	C	0.074	37.16222211	1.594	0.2614794	1.70E-09	446118
rs269054	A	T	0.422	35.42867605	0.819	0.1375962	2.10E-09	446118
rs112230981	A	G	0.95	36.38230449	1.892	0.3136722	2.20E-09	446118

rs11602180	C	T	0.837	35.43546187	1.095	0.183948	2.30E-09	446118
rs2192528	A	G	0.48	34.69769986	0.802	0.136152	2.70E-09	446118
rs12246842	A	G	0.46	34.7162806	0.804	0.136455	3.90E-09	446118
rs205024	T	C	0.384	35.33620121	0.83	0.1396266	3.90E-09	446118
rs12567114	A	G	0.276	34.09631904	0.89	0.152418	4.30E-09	446118
rs7616632	T	G	0.522	33.83721861	0.792	0.1361532	4.30E-09	446118
rs6575005	T	C	0.758	34.72303542	0.934	0.1585032	4.40E-09	446118
rs1776776	T	C	0.874	34.27058724	1.198	0.2046426	4.90E-09	446118
rs11621908	C	T	0.917	33.51393602	1.446	0.2497788	5.60E-09	446118
rs10421649	A	T	0.557	33.59554825	0.798	0.1376772	6.90E-09	446118
rs2072727	T	C	0.436	33.62300618	0.795	0.1371036	7.90E-09	446118
rs113113059	T	C	0.78	34.73738106	0.968	0.1642392	8.40E-09	446118
rs374153	C	T	0.158	32.23009083	1.057	0.1861848	9.10E-09	446118
rs151014368	A	G	0.206	32.60490276	0.966	0.1691748	9.10E-09	446118
rs62120041	T	C	0.934	32.5880963	1.567	0.2744982	9.60E-09	446118
rs7503199	C	T	0.734	33.09829257	0.885	0.1538298	1.00E-08	446118
rs1939455	G	T	0.879	32.92233186	1.226	0.2136708	1.20E-08	446118
rs7951019	G	T	0.032	31.99277463	2.213	0.391251	1.20E-08	446118
rs17732997	C	G	0.569	31.94721314	0.776	0.137292	1.20E-08	446118
rs61985058	T	C	0.143	33.18246373	1.116	0.1937358	1.30E-08	446118
rs17427571	A	G	0.684	32.26255921	0.83	0.1461264	1.30E-08	446118
rs7806045	T	C	0.755	31.6979645	0.887	0.1575462	1.40E-08	446118
rs35531607	C	T	0.474	31.88336504	0.77	0.1363668	1.50E-08	446118
rs7644809	T	C	0.422	32.23407516	0.784	0.1380888	1.60E-08	446118
rs9345234	C	A	0.578	32.05885976	0.781	0.1379358	1.80E-08	446118
rs12791153	T	A	0.081	31.18855246	1.413	0.253014	1.90E-08	446118

rs1263056	A	G	0.519	31.59438896	0.768	0.1366332	2.00E-08	446118
rs55658675	C	T	0.645	30.73612722	0.788	0.1421352	2.00E-08	446118
rs11567976	T	C	0.571	31.37521513	0.768	0.1371096	2.10E-08	446118
rs180769	T	C	0.425	30.73408809	0.763	0.1376304	2.30E-08	446118
rs1553132	G	A	0.258	31.47697679	0.87	0.1550682	2.50E-08	446118
rs9903973	C	T	0.467	31.57630605	0.766	0.1363164	2.60E-08	446118
rs11614986	A	G	0.821	30.82216724	0.983	0.1770606	2.70E-08	446118
rs2231265	G	A	0.772	30.67763732	0.897	0.1619502	2.70E-08	446118
rs174560	C	T	0.314	31.0735425	0.815	0.146205	2.80E-08	446118
rs10173260	C	T	0.606	30.77833147	0.77	0.1387932	2.90E-08	446118
rs72804080	G	A	0.15	31.010754	1.068	0.1917852	2.90E-08	446118
rs12611523	A	G	0.545	30.80266986	0.758	0.1365762	3.10E-08	446118
rs11643715	G	C	0.291	30.99835348	0.834	0.1497948	3.20E-08	446118
rs4538155	T	C	0.647	29.91391026	0.779	0.1424298	3.60E-08	446118
rs34354917	C	A	0.71	30.23040752	0.825	0.1500486	3.90E-08	446118
rs80193650	G	A	0.162	30.11948628	1.01	0.1840338	4.10E-08	446118
rs10761674	C	T	0.477	29.62617791	0.74	0.1359546	4.20E-08	446118
rs11190970	G	A	0.799	29.69092745	0.923	0.1693908	4.60E-08	446118

short sleep duration (Hassan S. Dashti et al, 2019 )

rs7524118	T	C	0.291624	29.90151811	-0.0057622	0.00105376	4.90E-08	106192
rs2186122	A	T	0.438434	34.00626458	-0.0056704	0.000972376	4.80E-09	106192
rs12567114	G	A	0.7246	34.49743204	0.00632465	0.00107682	4.10E-09	106192
rs2820313	A	G	0.658888	35.34860096	-0.00600641	0.00101025	2.30E-09	106192
rs1380703	A	G	0.616469	45.33728626	-0.00676427	0.0010046	1.60E-11	106192
rs2863957	C	A	0.781508	77.04148568	0.0101896	0.0011609	2.60E-18	106192



rs2014830	C	T	0.698128	30.34820597	0.00578646	0.00105038	2.70E-08	106192
rs17005118	G	A	0.735064	35.56449384	-0.00648249	0.00108701	2.50E-09	106192
rs13107325	C	T	0.925472	52.67161192	-0.0132682	0.0018282	2.50E-13	106192
rs12518468	T	C	0.671544	33.22495249	-0.00588504	0.00102098	8.50E-09	106192
rs3776864	A	C	0.66721	31.53735877	0.00572403	0.00101927	1.70E-08	106192
rs4585442	A	G	0.688977	37.51348239	-0.00634685	0.00103625	8.10E-10	106192
rs2517827	C	A	0.688933	32.73840912	-0.00592859	0.00103615	5.70E-09	106192
rs12661667	C	T	0.736505	30.6814928	-0.00602193	0.00108717	2.80E-08	106192
rs9367621	T	A	0.43104	31.51602316	0.00544503	0.000969917	1.60E-08	106192
rs9321171	C	T	0.540122	30.71760077	0.00535425	0.000966062	4.20E-08	106192
rs11763750	G	A	0.814346	34.17821469	0.00721224	0.00123366	5.10E-09	106192
rs1229762	C	T	0.335499	50.71433258	-0.00723933	0.00101656	1.00E-12	106192
rs60882754	A	T	0.938985	31.89883392	0.011304	0.00200145	1.80E-08	106192
rs1607227	G	T	0.704938	36.46775659	0.0063693	0.00105472	1.50E-09	106192
rs7939345	T	G	0.207569	30.23566763	0.00649836	0.0011818	4.00E-08	106192
rs17388803	A	C	0.894352	38.33411055	-0.00982621	0.00158706	6.50E-10	106192
rs59779556	T	G	0.553827	32.31736191	0.00549133	0.000965961	2.00E-08	106192
rs205024	C	T	0.616724	31.23137418	0.00551041	0.000986026	2.70E-08	106192
rs12963463	C	T	0.299425	45.03801352	0.00711437	0.0010601	1.90E-11	106192
rs5757675	G	T	0.259528	34.49860114	0.00645515	0.00109902	2.70E-09	106192

long sleep duration (Hassan S. Dashti et al, 2019)

rs7534398	T	A	0.798618	31.25598361	-0.00507915	0.000908499	2.10E-08	34184
rs6737318	A	G	0.778159	52.9827253	-0.00638002	0.000876506	3.40E-13	34184
rs10899257	G	A	0.855527	29.88896094	-0.00563809	0.00103128	4.60E-08	34184
rs75458655	C	T	0.977027	47.68090733	-0.0167308	0.00242295	5.40E-12	34184
rs3751046	A	G	0.852658	31.60599913	-0.00577495	0.00102722	2.00E-08	34184

rs17817288	A	G	0.518127	33.23278794	0.00418824	0.000726521	8.90E-09	34184
rs147114641	C	A	0.77403	42.99886666	0.00568908	0.000867588	4.90E-11	34184
rs146467757	G	T	0.772153	42.00421843	0.00563786	0.000869897	8.10E-11	34184
rs572857764	T	A	0.775271	41.11506835	0.00562714	0.000877581	1.30E-10	34184
rs62073915	A	G	0.77868	46.15394564	0.00605568	0.000891371	1.00E-11	34184

Supplementary table 2. Overview of the source of hypothalamic-pituitary-target gland axis function data.

Trait	GWAS ID	Year	Sample size	Number of SNPs	Population	Discovery GWAS
Thyrotropin-releasing hormone	prot-a-3102	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Prolactin-releasing peptide	prot-a-2376	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Corticotropin-releasing factor-binding protein	prot-a-659	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Somatostatin-28	prot-a-2846	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Progonadoliberein-1	prot-a-1233	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
growth hormone 1	prot-b-30	2018	3394	5270646	European	Lasse Folkersen et al, 2018, PMID: 28369058
Luteinizing hormone	prot-a-529	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Follicle stimulating hormone	prot-a-528	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Thyroid Stimulating Hormone	prot-a-530	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Corticotropin	prot-a-2326	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
prolactin	prot-b-28	2018	3394	5270646	European	Lasse Folkersen et al, 2018, PMID: 28369058
Oxytocin-neurophysin 1	prot-a-2159	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
FT4	NA	2018	49269	8048941	European	Alexander Teumer et al, 2018, PMID: 30367059
TSH	NA	2018	54288	8048941	European	Alexander Teumer et al, 2018, PMID: 30367059
Thyroid peroxidase	prot-a-3088	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Thyroglobulin	prot-a-2960	2018	3301	10534735	European	Benjamin B Sun et al, 2018, PMID: 29875488
Plasma cortisol	ieu-a-1012	2014	12597	2660192	European	Jennifer L Bolton et al, 2014, PMID: 25010111
Aldosterone	NA	2021	7669	NA	European	Janne Pott et al, 2021, PMID: 34822396
Estradiol overall	ebi-a-GCST90012105	2020	206927	16136413	European	Katherine S Ruth et al, 2020, PMID: 32042192
Estradiol male	ebi-a-GCST90020091	2021	147690	7489424	European	Daniel Schmitz et al, 2020, PMID: 34255042
Estradiol Female	ebi-a-GCST90020092	2021	163985	7488193	European	Daniel Schmitz et al, 2020, PMID: 34255042
Progesterone overall	NA	2021	3549	NA	European	Janne Pott et al, 2021, PMID: 34822396
Progesterone male	NA	2021	2220	NA	European	Janne Pott et al, 2021, PMID: 34822396

Progesterone female	NA	2021	1329	NA	European	Janne Pott et al, 2021, PMID: 34822396
Total testosterone overall	ebi-a-GCST90012114	2020	425097	16132861	European	Katherine S Ruth et al, 2020, PMID: 32042192
Total testosterone male	ebi-a-GCST90012113	2020	194453	16131612	European	Katherine S Ruth et al, 2020, PMID: 32042192
Total testosterone female	ebi-a-GCST90012112	2020	230454	16135161	European	Katherine S Ruth et al, 2020, PMID: 32042192
Bioavailable testosterone overall	ebi-a-GCST90012104	2020	382988	16137327	European	Katherine S Ruth et al, 2020, PMID: 32042192
Bioavailable testosterone male	ebi-a-GCST90012103	2020	178782	16131701	European	Katherine S Ruth et al, 2020, PMID: 32042192
Bioavailable testosterone female	ebi-a-GCST90012102	2020	188507	16139906	European	Katherine S Ruth et al, 2020, PMID: 32042192
Sex hormone-binding globulin overall	ebi-a-GCST90012111	2020	370125	16137172	European	Katherine S Ruth et al, 2020, PMID: 32042192
Sex hormone-binding globulin male	ebi-a-GCST90012109	2020	180726	16136768	European	Katherine S Ruth et al, 2020, PMID: 32042192
Sex hormone-binding globulin female	ebi-a-GCST90012107	2020	189473	16140044	European	Katherine S Ruth et al, 2020, PMID: 32042192
dihydroepiandrosterone sulphate	ebi-a-GCST004941	2017	9722	21770677	European	Bram P Prins et al, 2017, PMID: 28887542

Supplementary table 3. Full result of MR estimation of associations between sleep traits and hypothalamic function.

Exposure	Outcome	Mr methods	No. of SNP	$\beta$	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
insomnia		Maximum likelihood	38	-0.2551798	-1.134788	0.6244289	0.5696223	0.5904472	0.254159	FALSE
		MR Egger	38	-0.8861542	-3.764353	1.9920449	0.5499899			
		Simple median	38	-0.4611966	-1.731864	0.8094707	0.4651923			
		Weighted median	38	-0.3580235	-1.68394	0.9678925	0.5855022			
		Inverse variance weighted	38	-0.265229	-1.135326	0.6048678	0.5501997			
		Weighted mode	38	-0.6748056	-3.058927	1.7093156	0.5532646			
chronotype		Maximum likelihood	146	-0.20278262	-0.4208399	0.01527462	0.06834814	0.8826486	<0.001	TRUE
		MR Egger	146	-0.25658836	-0.9211233	0.40794656	0.45041229			
		Simple median	146	-0.17008681	-0.4777869	0.13761331	0.28438623			
		Weighted median	146	-0.15441952	-0.4804979	0.17165886	0.33094886			
		Inverse variance weighted	146	-0.20055978	-0.4166304	0.01551082	0.06886573			
		Weighted mode	146	-0.06054566	-0.912182	0.7910907	0.89040369			
sleep duration	TRH	Maximum likelihood	73	0.000724074	-0.006020233	0.007468381	0.8333344	0.09754935	<0.001	FALSE
		MR Egger	73	0.000365335	-0.027187413	0.027918082	0.9793394			
		Simple median	73	0.001502504	-0.008372646	0.011377655	0.7616403			
		Weighted median	73	0.003134783	-0.007234094	0.013503661	0.5549644			
		Inverse variance weighted	73	0.000710073	-0.006629142	0.008049288	0.8495983			
		Weighted mode	73	0.009622802	-0.009703083	0.028948687	0.3375155			
short sleep		Maximum likelihood	24	-0.716156	-2.4242899	0.9919779	0.41121694	0.3152597	0.7441294	TRUE
		MR Egger	24	7.5673379	-0.3354225	15.4700983	0.07387071			
		Simple median	24	-0.6531923	-2.9079134	1.6015289	0.59486213			
		Weighted median	24	-0.5579269	-3.0623997	1.9465459	0.6539761			
		Inverse variance weighted	24	-0.736475	-2.5148316	1.0418816	0.41696413			

long sleep		Weighted mode	24	-0.999904	-5.8197823	3.8199742	0.6912078			
		Maximum likelihood	8	-1.4961154	-5.878247	2.886016	0.5033878			
		MR Egger	8	3.5936732	-12.379219	19.566566	0.6746785			
		Simple median	8	0.4380005	-5.491703	6.367704	0.8859072	0.2140952	0.0265489	TRUE
		Weighted median	8	1.6864486	-4.270277	7.643174	0.5764249			
		Inverse variance weighted	8	-1.4520826	-6.495328	3.591163	0.5725259			
insomnia		Weighted mode	8	1.75866	-4.8846	8.40192	0.6066565			
		Maximum likelihood	38	-0.370453808	-1.251065	0.5101578	0.4096393			
		MR Egger	38	0.49120749	-2.416367	3.3987821	0.7424709			
		Simple median	38	-0.492050896	-1.735354	0.7512527	0.4321987	0.4631508	0.1740548	FALSE
		Weighted median	38	0.043895982	-1.243795	1.3315871	0.9472392			
		Inverse variance weighted	38	-0.385545992	-1.2573	0.4862085	0.3860306			
chronotype		Weighted mode	38	-0.008937226	-2.061704	2.0438299	0.9931368			
		Maximum likelihood	146	-0.03778286	-0.2561398	0.1805741	0.7345014			
		MR Egger	146	-0.05735674	-0.7242436	0.6095301	0.8663689			
		Simple median	146	-0.06439967	-0.3776112	0.2488119	0.686861	0.4849737	<0.001	FALSE
	PRH	Weighted median	146	-0.13442564	-0.4589858	0.1901346	0.4140794			
		Inverse variance weighted	146	-0.03713089	-0.2532116	0.1789499	0.7362658			
sleep duration		Weighted mode	146	-0.12398408	-0.8784646	0.6304964	0.7435081			
		Maximum likelihood	73	0.003284396	-0.0034399	0.010008692	0.3383973			
		MR Egger	73	-0.008003479	-0.033042993	0.017036034	0.5330076			
		Simple median	73	0.003594352	-0.006261724	0.013450428	0.4744274	0.4289311	<0.001	TRUE
		Weighted median	73	0.000272891	-0.009832561	0.010378344	0.9576276			
		Inverse variance weighted	73	0.003280765	-0.003428483	0.009990013	0.3378494			
short sleep		Weighted mode	73	-0.001680102	-0.022334748	0.018974544	0.8735906			
		Maximum likelihood	24	-1.899146	-3.603258	-0.19503447	<b>0.02893869</b>	0.7531616	0.5302767	TRUE

		MR Egger	24	4.6157694	-3.287855	12.5193938	0.26465393			
		Simple median	24	-2.3324707	-4.675104	0.01016255	<b>0.05099791</b>			
		Weighted median	24	-0.9160386	-3.328752	1.49667496	0.45678201			
		Inverse variance weighted	24	-1.9545228	-3.637117	-0.27192873	<b>0.0228005</b>			
		Weighted mode	24	0.6725403	-4.544513	5.88959368	0.80276975			
long sleep		Maximum likelihood	8	-4.823441	-9.222075	-0.424807	<b>0.03161134</b>			
		MR Egger	8	-4.898108	-17.994866	8.19865	0.49117599			
		Simple median	8	-5.120672	-11.208217	0.966873	0.11705592	0.6197573	0.02554583	TRUE
		Weighted median	8	-2.736716	-8.506342	3.032911	0.3593918			
		Inverse variance weighted	8	-4.726278	-9.038174	-0.414382	<b>0.03168517</b>			
		Weighted mode	8	-2.970338	-10.2797	4.339025	0.43194594			
insomnia		Maximum likelihood	38	0.17588279	-0.7119249	1.06369	0.6977986			
		MR Egger	38	0.14354067	-3.6651721	3.952253	0.9415248			
		Simple median	38	-0.24430894	-1.597022	1.108404	0.7163585	0.004808487	<0.001	FALSE
		Weighted median	38	0.15046348	-1.2730659	1.573993	0.8374968			
		Inverse variance weighted	38	0.1683134	-0.9673319	1.303959	0.7714409			
		Weighted mode	38	-0.08009613	-2.3542657	2.194073	0.9466479			
chronotype		Maximum likelihood	146	-0.2475692	-0.466149	-0.02898929	<b>0.02642242</b>			
	CRFBP	MR Egger	146	-0.4353058	-1.1206736	0.25006197	0.21519867			
		Simple median	146	-0.2583349	-0.576041	0.05937126	0.11832664	0.2962619	<0.001	TRUE
		Weighted median	146	-0.2654122	-0.5976222	0.06679789	0.11694828			
		Inverse variance weighted	146	-0.2450328	-0.4673998	-0.02266581	<b>0.03078953</b>			
		Weighted mode	146	-0.4959749	-1.359726	0.36777612	0.29151923			
sleep duration		Maximum likelihood	73	0.005399249	-0.001320775	0.01211927	0.115308342			
		MR Egger	73	-0.00590507	-0.031921938	0.0201118	0.657772141	0.2606881	<0.001	FALSE
		Simple median	73	0.014107884	0.004287691	0.02392808	<b>0.005232366</b>			

		Weighted median	73	0.009766982	-0.00010182	0.01963578	<b>0.048197016</b>			
		Inverse variance weighted	73	0.005360097	-0.001606822	0.01232702	0.131566437			
		Weighted mode	73	0.018168549	-0.00329439	0.03963149	0.093906433			
short sleep		Maximum likelihood	24	-0.5976446	-2.301082	1.105792	0.4916676			
		MR Egger	24	1.5989659	-6.305437	9.503369	0.6955673			
		Simple median	24	-0.6766837	-2.885469	1.532102	0.573693	0.5626117	0.4971918	TRUE
		Weighted median	24	-0.2271794	-2.712572	2.258213	0.8481393			
		Inverse variance weighted	24	-0.6196801	-2.301925	1.062564	0.4702972			
		Weighted mode	24	-0.2690058	-4.74409	4.206078	0.9029783			
long sleep		Maximum likelihood	8	-1.4584237	-5.805668	2.888821	0.5108303			
		MR Egger	8	-1.6037984	-14.693262	11.485665	0.8182079			
		Simple median	8	-0.7914033	-6.588226	5.005419	0.7893228	0.546624	0.00466965	TRUE
		Weighted median	8	-1.8894949	-7.306861	3.527872	0.5065755			
		Inverse variance weighted	8	-1.4323485	-5.741861	2.877164	0.5147604			
		Weighted mode	8	-1.7932307	-8.957392	5.370931	0.6308965			
insomnia		Maximum likelihood	38	-0.35437482	-1.234859	0.5261089	0.43019634			
		MR Egger	38	-2.4980668	-5.376421	0.3802879	0.09755837			
		Simple median	38	-0.01016684	-1.296871	1.2765376	0.98765355	0.5280339	0.1965321	FALSE
		Weighted median	38	-0.45278535	-1.719147	0.8135763	0.48012604			
		Inverse variance weighted	38	-0.36869439	-1.238958	0.5015693	0.40632952			
	SRIF	Weighted mode	38	-2.03720685	-4.477353	0.4029389	0.11820071			
chronotype		Maximum likelihood	146	0.002049782	-0.2157663	0.2198659	0.985284			
		MR Egger	146	0.374386452	-0.2902378	1.0390107	0.2714005			
		Simple median	146	0.047731863	-0.2521843	0.347648	0.7594084	0.9864308	<0.001	FALSE
		Weighted median	146	0.069089814	-0.2379736	0.3761532	0.6437304			
		Inverse variance weighted	146	0.002055808	-0.214034	0.2181456	0.9851229			



sleep duration	Weighted mode	146	0.23554344	-0.5382403	1.0093272	0.5725891			
	Maximum likelihood	73	-0.000904385	-0.007634858	0.005826089	0.7922667			
	MR Egger	73	-0.012329455	-0.038045014	0.013386103	0.3505412			
	Simple median	73	-0.003957784	-0.01393123	0.006015663	0.4259586	0.308039	<0.001	FASLE
	Weighted median	73	-0.004266104	-0.01400639	0.005474183	0.3941282			
short sleep	Inverse variance weighted	73	-0.00089317	-0.007781842	0.005995501	0.7993956			
	Weighted mode	73	-0.010044937	-0.02832869	0.008238816	0.3127836			
	Maximum likelihood	24	-0.5145045	-2.212594	1.183585	0.5526052			
	MR Egger	24	1.9951069	-5.90849	9.898704	0.6256722			
	Simple median	24	-0.8086281	-3.235889	1.618633	0.4823451	0.8414632	0.1848812	TRUE
long sleep	Weighted median	24	-0.5736272	-2.900012	1.752758	0.6311138			
	Inverse variance weighted	24	-0.532377	-2.214654	1.1499	0.5350828			
	Weighted mode	24	-1.7920993	-6.047691	2.463492	0.4374384			
	Maximum likelihood	8	-5.667209	-10.077345	-1.2570732	<b>0.0117795</b>			
	MR Egger	8	-12.456992	-25.547839	0.6338551	0.11143359			
insomnia	Simple median	8	-6.073374	-11.798441	-0.348307	<b>0.03911455</b>	0.8221315	0.02796002	TRUE
	Weighted median	8	-5.724122	-11.389274	-0.0589709	<b>0.04765833</b>			
	Inverse variance weighted	8	-5.613575	-9.926155	-1.3009955	<b>0.01073274</b>			
	Weighted mode	8	-5.770263	-12.650214	1.1096877	0.13103776			
	Maximum likelihood	38	-0.2362028	-1.115375	0.642969	0.5984828			
GnRH- 1	MR Egger	38	-0.2808939	-3.159248	2.5974601	0.8493863			
	Simple median	38	-0.2760854	-1.524632	0.9724615	0.66472	0.6584854	0.3213063	FALSE
	Weighted median	38	-0.450096	-1.677064	0.776872	0.4721418			
	Inverse variance weighted	38	-0.2460513	-1.116234	0.6241311	0.5794377			
	Weighted mode	38	-0.4810696	-2.480058	1.5179185	0.6399201			
chronotype	Maximum likelihood	146	0.09004431	-0.1280117	0.3081004	0.4183054	0.8672745	<0.001	FALSE

	MR Egger	146	-0.46374924	-1.1283384	0.2008399	0.1735415			
	Simple median	146	0.09497217	-0.2185681	0.4085125	0.55272			
	Weighted median	146	0.0735012	-0.2393855	0.3863879	0.6452078			
	Inverse variance weighted	146	0.08872025	-0.127363	0.3048034	0.4209673			
	Weighted mode	146	0.12170622	-0.8067541	1.0501666	0.7976013			
sleep duration	Maximum likelihood	73	0.002429535	-0.004308187	0.009167256	0.4797216			
	MR Egger	73	-0.003953617	-0.030971173	0.023063938	0.7750879			
	Simple median	73	0.005457967	-0.004228239	0.015144174	0.2694121	0.1429911	<0.001	FALSE
	Weighted median	73	0.001532471	-0.00822137	0.011286312	0.7581245			
	Inverse variance weighted	73	0.002402726	-0.004805677	0.00961113	0.5135545			
	Weighted mode	73	-0.00777753	-0.029794691	0.014239631	0.4909338			
short sleep	Maximum likelihood	24	0.3008859	-1.4032105	2.004982	0.7292902			
	MR Egger	24	5.3444751	-2.5591493	13.248099	0.1986509			
	Simple median	24	0.789539	-1.615484	3.194562	0.5199363	0.507516	0.4979203	TRUE
	Weighted median	24	1.2858271	-0.9569158	3.52857	0.2611307			
	Inverse variance weighted	24	0.2890467	-1.3935474	1.971641	0.7363421			
	Weighted mode	24	2.0881598	-2.0287379	6.205057	0.3304969			
long sleep	Maximum likelihood	8	-0.3702911	-4.743446	4.0028636	0.86818811			
	MR Egger	8	-13.4287761	-26.519623	-0.3379293	0.09107931			
	Simple median	8	-0.7257106	-7.111459	5.6600381	0.82373407	0.4691555	0.00542644	TRUE
	Weighted median	8	-1.0756495	-6.963889	4.8125896	0.7203073		2	
	Inverse variance weighted	8	-0.3614855	-4.674065	3.951094	0.86950323			
	Weighted mode	8	-3.250046	-10.790802	4.2907105	0.42617405			

Italics that appear in the table indicate that the analysis is statistically significant ( $p < 0.05$ )

Supplementary table 4. Full result of MR estimation of associations between sleep traits and pituitary function.

Exposure	Outcome	Mr methods	No. of SNP	$\beta$	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
insomnia		Maximum likelihood	38	-0.41793068	-1.300213	0.4643514	0.3531805	0.1877139	0.03511093	FALSE
		MR Egger	38	1.23781524	-1.902284	4.377914	0.4447877			
		Simple median	38	-0.2865821	-1.592123	1.0189584	0.6670182			
		Weighted median	38	-0.08615274	-1.405388	1.2330828	0.8981506			
		Inverse variance weighted	38	-0.44151603	-1.394551	0.5115187	0.3638694			
		Weighted mode	38	0.69678719	-1.576897	2.970471	0.5517307			
chronotype	GH1	Maximum likelihood	146	-0.17285845	-0.3911116	0.04539471	0.1205815	0.6619259	<0.001	TRUE
		MR Egger	146	0.25058689	-0.4138421	0.91501584	0.4609848			
		Simple median	146	-0.15332657	-0.4742361	0.16758295	0.3490346			
		Weighted median	146	0.05255978	-0.2752537	0.38037325	0.753327			
		Inverse variance weighted	146	-0.17208125	-0.3881419	0.04397935	0.1185143			
		Weighted mode	146	0.48980702	-0.2667574	1.24637145	0.2065018			
sleep duration		Maximum likelihood	73	0.000437901	-0.006272913	0.007148715	0.8982313	0.8472432	<0.001	FALSE
		MR Egger	73	0.015595084	-0.009162914	0.040353082	0.2210478			
		Simple median	73	0.00012987	-0.009663922	0.009923662	0.9792649			
		Weighted median	73	0.002850743	-0.006551374	0.012252859	0.5523273			
		Inverse variance weighted	73	0.000436758	-0.006204126	0.007077641	0.8974326			
		Weighted mode	73	0.009073155	-0.009197065	0.027343375	0.3336364			
short sleep		Maximum likelihood	24	-0.3320744	-2.035295	1.371146	0.7023587	0.5407865	0.5221678	TRUE

		MR Egger	24	2.3561544	-5.546891	10.2592	0.5649365			
		Simple median	24	-0.5397544	-2.830103	1.750594	0.644151			
		Weighted median	24	-0.5259448	-2.882161	1.830272	0.6617466			
		Inverse variance weighted	24	-0.3441328	-2.026498	1.338233	0.6884763			
		Weighted mode	24	-0.3801887	-5.211719	4.451342	0.8787733			
long sleep		Maximum likelihood	8	2.17319489	-2.190435	6.536825	0.329001			
		MR Egger	8	-4.60386255	-20.688411	11.480686	0.5951063			
		Simple median	8	0.03846693	-6.000631	6.077565	0.9900391			
		Weighted median	8	3.06144563	-2.741025	8.863916	0.3010815	0.1778807	0.03959719	TRUE
		Inverse variance weighted	8	2.1153588	-3.088743	7.319461	0.4256258			
		Weighted mode	8	4.14786692	-3.364043	11.659777	0.3150048			
insomnia		Maximum likelihood	38	0.7553078	-0.1255932	1.636209	0.09284922			
		MR Egger	38	2.728889	-0.1493429	5.607121	0.07131838			
		Simple median	38	0.5952036	-0.6216282	1.812035	0.34275249			
		Weighted median	38	0.8753234	-0.4253137	2.175961	0.19381762	0.4995814	0.1296738	FALSE
		Inverse variance weighted	38	0.7238381	-0.1463337	1.59401	0.10301829			
		Weighted mode	38	0.7854676	-1.2623615	2.833297	0.42847995			
chronotype	LH	Maximum likelihood	146	-0.10642614	-0.325091	0.1122387	0.3401091			
		MR Egger	146	0.22303091	-0.4865064	0.9325682	0.5388061			
		Simple median	146	-0.02829086	-0.3500383	0.2934566	0.8695219	0.1195467	<0.001	FALSE
		Weighted median	146	0.14694207	-0.181871	0.4757551	0.3769895			
		Inverse variance weighted	146	-0.1049959	-0.3356493	0.1256575	0.3722789			

sleep duration		Weighted mode	146	0.3895191	-0.373913	1.1529512	0.3121009			
		Maximum likelihood	73	0.000397446	-0.006346581	0.007141473	0.9080419			
		MR Egger	73	-0.013354421	-0.041014533	0.01430569	0.3472069			
		Simple median	73	-0.001694915	-0.011397238	0.008007408	0.7356842	0.07508754	<0.001	FALSE
		Weighted median	73	-0.003698913	-0.013825233	0.006427407	0.4721368			
		Inverse variance weighted	73	0.000395258	-0.007025228	0.007815744	0.9168512			
short sleep		Weighted mode	73	-0.008482222	-0.028680817	0.011716374	0.3946003			
		Maximum likelihood	24	-0.08637602	-1.791962	1.61921	0.9209316			
		MR Egger	24	-3.06996801	-11.291058	5.151122	0.4719461			
		Simple median	24	-0.14642325	-2.600975	2.308128	0.904243			
		Weighted median	24	0.36548607	-2.064461	2.795434	0.7719779	0.3830498	0.7164944	FALSE
		Inverse variance weighted	24	-0.08726786	-1.819352	1.644816	0.921336			
long sleep		Weighted mode	24	0.27002401	-4.514953	5.055001	0.9075081			
		Maximum likelihood	8	2.505773	-1.845128	6.856674	0.2589805			
		MR Egger	8	4.900166	-8.190681	17.991013	0.4908137			
		Simple median	8	2.904449	-2.671103	8.480001	0.3052166			
		Weighted median	8	2.096845	-3.425046	7.618737	0.4774433	0.6540774	0.00439421	TRUE
		Inverse variance weighted	8	2.466836	-1.845744	6.779416	0.262229			
insomnia		Weighted mode	8	2.152959	-5.226894	9.532811	0.5894842			
		Maximum likelihood	38	0.5204945	-0.3595335	1.400522	0.24635578			
	FSH	MR Egger	38	3.0504139	0.1722168	5.928611	<b>0.04496994</b>	0.6128147	0.248036	FALSE
		Simple median	38	0.4341167	-0.7250093	1.593243	0.51206024			

chronotype	Weighted median	38	0.6293185	-0.5840399	1.842677	0.32502581			
	Inverse variance weighted	38	0.4991088	-0.3709687	1.369186	0.26087352			
	Weighted mode	38	0.9423023	-1.0828398	2.967444	0.38794194			
	Maximum likelihood	146	-0.22326212	-0.4418336	-0.004690668	<b>0.04527799</b>			
	MR Egger	146	0.0691891	-0.6245205	0.76289868	0.84528792			
	Simple median	146	-0.01078002	-0.3158147	0.294254641	0.9462321			
	Weighted median	146	0.03715012	-0.2788864	0.35318667	0.82655878	0.2197795	<0.001	FALSE
sleep duration	Inverse variance weighted	146	-0.21985589	-0.4452461	0.005534314	0.05589243			
	Weighted mode	146	0.35960754	-0.4935409	1.212756009	0.36481676			
	Maximum likelihood	73	0.002693125	-0.004042186	0.009428436	0.4332108			
	MR Egger	73	-0.003483643	-0.030137019	0.023169734	0.7985562			
	Simple median	73	0.00090812	-0.008856667	0.010672906	0.8543911	0.1855255	<0.001	FALSE
	Weighted median	73	-0.00017109	-0.010842308	0.010500127	0.9743137			
	Inverse variance weighted	73	0.002647982	-0.004462856	0.009758819	0.4654648			
short sleep	Weighted mode	73	-0.001388072	-0.020305672	0.017529529	0.8946748			
	Maximum likelihood	24	-0.6519239	-2.356543	1.052695	0.4534998			
	MR Egger	24	0.7365344	-7.211969	8.685038	0.8575439			
	Simple median	24	-0.111897	-2.362818	2.139024	0.9239153			
	Weighted median	24	0.0205257	-2.342009	2.38306	0.9867306	0.497508	0.8967243	FALSE
	Inverse variance weighted	24	-0.6759077	-2.358478	1.006663	0.4310745			
	Weighted mode	24	0.1315614	-4.104309	4.367432	0.9490043			

long sleep	Maximum likelihood	8	2.390886	-1.941467	6.72324	0.2794032			
	MR Egger	8	1.867782	-11.230351	14.965914	0.7892503			
	Simple median	8	2.816255	-2.808763	8.441272	0.3141368			
	Weighted median	8	2.824103	-2.575427	8.223632	0.2998677	0.996088	<0.001	TRUE
	Inverse variance weighted	8	2.381802	-1.933166	6.69677	0.2793003			
	Weighted mode	8	2.735918	-4.017283	9.48912	0.455087			
insomnia	Maximum likelihood	38	0.2178399	-0.6570439	1.092724	0.6255313			
	MR Egger	38	-1.3037561	-4.1821074	1.574595	0.3805488			
	Simple median	38	0.4533247	-0.7484192	1.655069	0.4479742			
	Weighted median	38	0.2947294	-0.9104198	1.499879	0.6409821	0.9984428	0.689	TRUE
	Inverse variance weighted	38	0.2102363	-0.6599907	1.080463	0.6358477			
	Weighted mode	38	0.7408816	-1.7546095	3.236373	0.5725287			
chronotype	Maximum likelihood	146	0.17053579	-0.04799265	0.3890642	0.1261282			
	MR Egger	146	0.05801132	-0.62789457	0.7439172	0.868571			
	TSH Simple median	146	0.21086557	-0.10108267	0.5228138	0.1995896			
	Weighted median	146	0.22418241	-0.1038104	0.5521752	0.1913325	0.2979422	<0.001	FALSE
	Inverse variance weighted	146	0.16737869	-0.05495155	0.3897089	0.1400613			
	Weighted mode	146	0.29467017	-0.38348504	0.9728254	0.4189011			
sleep duration	Maximum likelihood	73	0.001984854	-0.00473942	0.008709129	0.5628943			
	MR Egger	73	0.00739228	-0.01773244	0.032517004	0.5659811	0.4342393	<0.001	FALSE
	Simple median	73	-0.001442911	-0.01131109	0.008425267	0.7630783			
	Weighted median	73	-0.000877101	-0.01129332	0.00953912	0.8651033			





	Simple median	146	-0.07039051	-0.3868755	0.2460945	0.6764612			
	Weighted median	146	0.04831613	-0.2690203	0.3656525	0.7756773			
	Inverse variance weighted	146	-0.03569214	-0.2541281	0.1827439	0.7487703			
	Weighted mode	146	0.12663033	-0.8033163	1.056577	0.7864113			
sleep duration	Maximum likelihood	73	0.002611878	-0.004116802	0.009340558	0.4467676			
	MR Egger	73	-0.008421786	-0.033948561	0.017104988	0.5199482			
	Simple median	73	0.001425287	-0.008404901	0.011255476	0.7813155	0.3419978	<0.001	FALSE
	Weighted median	73	-5.45428E-05	-0.010101003	0.009991918	0.9916543			
	Inverse variance weighted	73	0.002582539	-0.004253869	0.009418947	0.4590484			
	Weighted mode	73	-0.004293799	-0.021613865	0.013026266	0.6409016			
short sleep	Maximum likelihood	24	1.485119	-0.215975	3.186212	0.08705276			
	MR Egger	24	2.843364	-5.0593964	10.746124	0.48808826			
	Simple median	24	1.399132	-0.8210493	3.619314	0.24394722			
	Weighted median	24	1.219389	-1.1245664	3.563344	0.28648795	0.8678669	0.2713178	TRUE
	Inverse variance weighted	24	1.429065	-0.2533032	3.111433	0.09593359			
	Weighted mode	24	1.26084	-2.825749	5.347428	0.56466585			
long sleep	Maximum likelihood	8	1.59388604	-2.741783	5.929555	0.4711934			
	MR Egger	8	-2.3324558	-15.423303	10.758391	0.7388521			
	Simple median	8	-0.09769281	-5.678389	5.483003	0.971764	0.8302873	<0.001	TRUE
	Weighted median	8	0.93908746	-4.748732	6.626907	0.727208			
	Inverse variance weighted	8	1.56938527	-2.743194	5.881965	0.4756842			

insomnia		Weighted mode	8	0.09753293	-7.068522	7.263588	0.9790362			
		Maximum likelihood	38	-0.08263896	-0.9642593	0.7989814	0.8542322			
		MR Egger	38	1.98568364	-1.015805	4.9871723	0.2029949			
		Simple median	38	-0.15149508	-1.5474983	1.2445082	0.8315607			
		Weighted median	38	0.16460963	-1.1743913	1.5036106	0.8095924	0.2867622	0.07883855	FALSE
		Inverse variance weighted	38	-0.08594157	-1.0057796	0.8338965	0.8546998			
chronotype		Weighted mode	38	1.12635921	-1.2435309	3.4962493	0.3576096			
		Maximum likelihood	146	-0.01067871	-0.2288462	0.2074888	0.9235709			
		MR Egger	146	-0.02063678	-0.6850674	0.6437939	0.9515421			
		Simple median	146	-0.15455493	-0.456651	0.1475412	0.3159802			
		Weighted median	146	-0.1767951	-0.4994477	0.1458575	0.2828373	0.7232479	<0.001	TRUE
		Inverse variance weighted	146	-0.0106475	-0.2266949	0.2053999	0.923048			
sleep duration	PRL	Weighted mode	146	-0.27598161	-1.0400542	0.4880909	0.4801137			
		Maximum likelihood	73	0.000725122	-0.005977121	0.007427365	0.8320648			
		MR Egger	73	-0.000934505	-0.025693633	0.023824622	0.9412359			
		Simple median	73	0.001649746	-0.007610283	0.010909775	0.7269472	0.9578431	0.008007403	FALSE
		Weighted median	73	-0.002070892	-0.012093728	0.007951943	0.6854995			
		Inverse variance weighted	73	0.000708486	-0.005933031	0.007350002	0.8343831			
short sleep		Weighted mode	73	-0.000118291	-0.018558419	0.018321836	0.9900031			
		Maximum likelihood	24	0.996409	-0.7052652	2.698083	0.2511045			
		MR Egger	24	-1.988418	-9.8914724	5.914637	0.6268013	0.7503541	0.3383637	TRUE
		Simple median	24	1.275697	-1.0387122	3.590107	0.2799874			

		Weighted median	24	1.1206	-1.1909497	3.432149	0.3420235			
		Inverse variance weighted	24	0.958489	-0.7237915	2.64077	0.2641135			
		Weighted mode	24	2.233929	-2.2420707	6.709928	0.3381447			
long sleep		Maximum likelihood	8	-2.637431	-6.978914	1.704051	0.2337748			
		MR Egger	8	-5.04125	-18.132097	8.049596	0.478943			
		Simple median	8	-3.798074	-9.441444	1.845296	0.1871324			
		Weighted median	8	-2.945911	-8.365489	2.473667	0.2866977	0.9766114	<0.001	TRUE
		Inverse variance weighted	8	-2.624631	-6.937211	1.687948	0.2329266			
		Weighted mode	8	-4.223689	-11.138089	2.690712	0.2701667			
insomnia		Maximum likelihood	38	0.6256795	-0.2512366	1.502596	0.16197507			
		MR Egger	38	3.4330148	0.5548038	6.311226	<b>0.02507247</b>			
		Simple median	38	0.4787571	-0.7259469	1.683461	0.44077321			
		Weighted median	38	0.9955545	-0.2305061	2.221615	0.11186534	0.9479442	0.6917892	FALSE
		Inverse variance weighted	38	0.6032175	-0.266899	1.473334	0.17421287			
		Weighted mode	38	1.9974837	-0.2367184	4.231686	0.10898432			
chronotype	Oxytocin-neurophysi	Maximum likelihood	146	-0.03111105	-0.2496044	0.1873823	0.7801815			
	n 1	MR Egger	146	-0.0818662	-0.7696997	0.6059673	0.8158753			
		Simple median	146	-0.01804398	-0.3371162	0.3010282	0.9128548			
		Weighted median	146	-0.06964571	-0.3956208	0.2563294	0.6807366	0.2824906	<0.001	FALSE
		Inverse variance weighted	146	-0.03057009	-0.2534791	0.1923389	0.7880855			
		Weighted mode	146	-0.12590632	-1.1023112	0.8504985	0.7796767			
sleep		Maximum likelihood	73	0.003824005	-0.002893137	0.01054115	0.2645037	0.4789325	<0.001	FALSE

duration	MR Egger	73	0.014977994	-0.009799316	0.0397553	0.2400361			
	Simple median	73	0.003798671	-0.005717476	0.01331482	0.452532			
	Weighted median	73	0.003073671	-0.007279344	0.01342669	0.553832			
	Inverse variance weighted	73	0.003813821	-0.002826256	0.0104539	0.2602699			
	Weighted mode	73	-0.000784516	-0.02073061	0.01916158	0.9369876			
	short sleep	Maximum likelihood	24	1.0607734	-0.6405666	2.762113	0.2216902		
MR Egger		24	3.0963223	-4.8064022	10.999047	0.4506894			
Simple median		24	0.2941876	-1.8887293	2.477105	0.8022132			
Weighted median		24	1.1670644	-1.1284151	3.462544	0.342131	0.7435823	0.319753	TRUE
Inverse variance weighted		24	1.021181	-0.6609554	2.703317	0.2340996			
Weighted mode		24	-0.4435848	-4.7494577	3.862288	0.8350058			
long sleep	Maximum likelihood	8	0.02254516	-4.353277	4.398367	0.9919428			
	MR Egger	8	0.48491068	-19.415566	20.385387	0.9634584			
	Simple median	8	0.55530762	-5.225856	6.336472	0.8487301			
	Weighted median	8	0.36898274	-5.477588	6.215553	0.9005139	0.05352139	0.0908075	TRUE
	Inverse variance weighted	8	0.02139324	-6.049216	6.092002	0.9944889			
	Weighted mode	8	0.24473135	-6.396712	6.886174	0.9485691			

Italics that appear in the table indicate that the analysis is statistically significant ( $p < 0.05$ )

Supplementary table 5. Full result of MR estimation of associations between sleep traits and thyroid function.

Exposure	Outcome	Mr methods	No. of SNP	$\beta$	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
insomnia		Maximum likelihood	19	0.1670807	-0.19531108	0.5294724	0.366176933			
		MR Egger	19	-3.3486105	-7.63844566	0.9412246	0.144421324			
		Simple median	19	0.7262239	0.18738808	1.2650598	<b>0.008251088</b>			
		Weighted median	19	0.577392	0.04970864	1.1050754	<b>0.031982024</b>	0.03070881	<0.001	TRUE
		Inverse variance weighted	19	0.1607232	-0.30205141	0.6234978	0.496052032			
		Weighted mode	19	0.9417838	-0.09510805	1.9786757	0.091926498			
chronotype	FT4	Maximum likelihood	67	-0.000306352	-0.08655719	0.08594449	0.9944454			
		MR Egger	67	-0.034494057	-0.36112005	0.29213193	0.8366647			
		Simple median	67	-0.01135222	-0.14817741	0.12547297	0.8708186			
		Weighted median	67	0.026162177	-0.10934747	0.16167182	0.7051279	0.000239154	<0.001	TRUE
		Inverse variance weighted	67	-0.000306352	-0.11150497	0.11089226	0.9956916			
		Weighted mode	67	0.130388439	-0.19810233	0.45887921	0.4393571			
sleep duration		Maximum likelihood	44	-0.00435004	-0.006798757	-1.90E-03	<b>0.000497954</b>			
		MR Egger	44	-0.010612565	-0.025479854	4.25E-03	0.169129058			
		Simple median	44	-0.003660705	-0.007260565	-6.08E-05	<b>0.046247448</b>	0.000164457	<0.001	TRUE
		Weighted median	44	-0.003655761	-0.007279496	-3.20E-05	<b>0.048005269</b>			
		Inverse variance weighted	44	-0.004310886	-0.007661855	-9.60E-04	<b>0.011686899</b>			
		Weighted mode	44	-0.00548322	-0.013464007	2.50E-03	0.185157092			
short sleep		Maximum likelihood	10	0.870266	0.1050578	1.635474	<b>0.02580763</b>	0.04437527	<0.001	TRUE

		MR Egger	10	-2.4652276	-7.497442	2.566987	0.3650807			
		Simple median	10	0.8168048	-0.1805925	1.814202	0.1084685			
		Weighted median	10	0.7621024	-0.2982365	1.822441	0.15891797			
		Inverse variance weighted	10	0.8265291	-0.1992305	1.852289	0.11426393			
		Weighted mode	10	0.1629106	-1.436258	1.762079	0.84617775			
long sleep		Maximum likelihood	3	1.971012	0.2402428	3.701781	<b>0.02561089</b>			
		MR Egger	3	11.397169	2.5208451	20.273493	0.24078566			
		Simple median	3	2.931025	0.564367	5.297684	<b>0.01520777</b>			
		Weighted median	3	2.640073	0.5045443	4.775601	<b>0.0153898</b>	0.08362252	<0.001	TRUE
		Inverse variance weighted	3	1.886964	-0.7167557	4.490683	0.1554772			
		Weighted mode	3	3.078795	0.4496693	5.70792	0.14863431			
insomnia		Maximum likelihood	19	-0.2507185	-0.5855765	0.08413953	0.1422368			
		MR Egger	19	-0.7463464	-4.1539166	2.66122379	0.6731027			
		Simple median	19	-0.2170264	-0.6787044	0.24465148	0.3568622			
		Weighted median	19	-0.2660764	-0.7305145	0.19836171	0.2614871	0.3459409	<0.001	TRUE
		Inverse variance weighted	19	-0.2564603	-0.6020534	0.08913286	0.1458102			
		Weighted mode	19	-0.2577126	-1.0439888	0.52856363	0.5287012			
chronotype	TSH	Maximum likelihood	67	-0.045885047	-0.1264213	0.03465124	0.2641236			
		MR Egger	67	-0.204202075	-0.5196938	0.11128965	0.2091046			
		Simple median	67	0.007746954	-0.1155734	0.13106727	0.9020067	2.39969E-05	<0.001	TRUE
		Weighted median	67	-0.04015992	-0.1718971	0.09157721	0.5501711			
		Inverse variance weighted	67	-0.044308854	-0.1523161	0.06369844	0.4213569			

sleep duration		Weighted mode	67	-0.167302173	-0.4119932	0.07738885	0.1848059			
		Maximum likelihood	44	0.001880449	-0.000381173	0.004142071	0.1031729			
		MR Egger	44	0.006264382	-0.005887219	0.018415984	0.3180812			
		Simple median	44	0.000565282	-0.002701627	0.00383219	0.7345014	0.01401262	<0.001	TRUE
		Weighted median	44	0.000714008	-0.002685454	0.004113469	0.6805817			
		Inverse variance weighted	44	0.001843375	-0.000907724	0.004594475	0.1890823			
short sleep		Weighted mode	44	-0.001788823	-0.009113459	0.005535812	0.6345975			
		Maximum likelihood	10	0.2627982	-0.4344186	0.9600149	0.4600453			
		MR Egger	10	0.6687307	-2.8456661	4.1831276	0.7188698			
		Simple median	10	0.1389836	-0.7339447	1.0119119	0.7549933			
		Weighted median	10	0.1138883	-0.7650467	0.9928233	0.7995206	0.6930375	<0.001	TRUE
		Inverse variance weighted	10	0.2541131	-0.4360078	0.9442341	0.4704776			
long sleep		Weighted mode	10	-0.2542906	-1.7556837	1.2471025	0.7475162			
		Maximum likelihood	3	0.7360344	-0.8104768	2.282546	0.3509093			
		MR Egger	3	-0.3141243	-9.2798273	8.651579	0.9563512			
		Simple median	3	1.2382406	-0.6911731	3.167654	0.2084388			
		Weighted median	3	1.2392461	-0.6246219	3.103114	0.1925194	0.5357956	<0.001	TRUE
		Inverse variance weighted	3	0.7281592	-0.8043695	2.260688	0.3517159			
insomnia		Weighted mode	3	1.2576126	-0.8538703	3.369095	0.3634022			
		Maximum likelihood	38	-0.1238453	-1.0022133	0.7545227	0.78227939			
	TPO	MR Egger	38	2.6741668	-0.2040669	5.5524005	0.07692097	0.7900454	0.445927	FALSE
		Simple median	38	-0.522271	-1.776806	0.7322641	0.41452271			

chronotype	Weighted median	38	-0.5011861	-1.6900836	0.6877115	0.40866321			
	Inverse variance weighted	38	-0.1248255	-0.9950451	0.7453941	0.77859917			
	Weighted mode	38	-1.2944927	-4.4056403	1.8166548	0.41999324			
	Maximum likelihood	146	0.1361345	-0.08193622	0.3542053	0.2211165			
	MR Egger	146	0.1175812	-0.54692706	0.7820895	0.7292391			
	Simple median	146	0.0881414	-0.22635277	0.4026356	0.5827876			
	Weighted median	146	0.1406934	-0.17336209	0.4547488	0.3799121	0.8663316	<0.001	FALSE
sleep duration	Inverse variance weighted	146	0.1338972	-0.08216516	0.3499596	0.2245025			
	Weighted mode	146	0.2854436	-0.45763938	1.0285265	0.4527288			
	Maximum likelihood	73	0.003543239	-0.003180995	0.01026747	0.3017003			
	MR Egger	73	0.003376626	-0.022309311	0.02906256	0.7974162			
	Simple median	73	0.003608737	-0.006221835	0.01343931	0.4718311	0.3381969	<0.001	FALSE
	Weighted median	73	0.004092349	-0.006076638	0.01426134	0.4302457			
	Inverse variance weighted	73	0.003533414	-0.003309102	0.01037593	0.3114776			
short sleep	Weighted mode	73	0.006362398	-0.012708432	0.02543323	0.5152632			
	Maximum likelihood	24	0.5385458	-1.159541	2.236633	0.5341977			
	MR Egger	24	3.6656473	-4.238299	11.569594	0.3732025			
	Simple median	24	0.7102925	-1.399384	2.819969	0.5093187			
	Weighted median	24	0.6967287	-1.541824	2.935282	0.5418409	0.8702961	0.1624422	TRUE
	Inverse variance weighted	24	0.5183333	-1.16449	2.201157	0.5460381			
	Weighted mode	24	1.2370511	-2.47397	4.948072	0.5200051			



long sleep	Maximum likelihood	8	-5.338876	-9.755583	-0.9221694	<b>0.01782513</b>			
	MR Egger	8	3.039292	-10.256432	16.3350158	0.66984846			
	Simple median	8	-6.409133	-12.647389	-0.1708776	<b>0.04404229</b>			
	Weighted median	8	-5.219895	-11.108397	0.6686083	0.08230735	0.3416165	0.08316805	TRUE
	Inverse variance weighted	8	-5.205568	-9.78661	-0.6245258	<b>0.02593368</b>			
	Weighted mode	8	-3.512757	-11.435208	4.409695	0.41362227			
insomnia	Maximum likelihood	38	0.2524302	-0.6284935	1.133354	0.5743603			
	MR Egger	38	-1.255844	-4.1887538	1.677066	0.4068659			
	Simple median	38	0.7786122	-0.4923418	2.049566	0.2298537			
	Weighted median	38	0.3907952	-0.8826608	1.664251	0.5475202	0.4003928	0.1319951	FALSE
	Inverse variance weighted	38	0.2420329	-0.6458823	1.129948	0.5931562			
	Weighted mode	38	0.3227188	-1.8372545	2.482692	0.7712797			
chronotype	Maximum likelihood	146	-0.09377721	-0.3118639	0.12430944	0.39934056			
	MR Egger	146	0.31887655	-0.3456842	0.98343733	0.34855258			
	Tg Simple median	146	-0.38702398	-0.6955571	-0.07849086	<b>0.01394705</b>			
	Weighted median	146	-0.05073905	-0.3680633	0.26658519	0.75397889	0.8442441	<0.001	FALSE
	Inverse variance weighted	146	-0.09340101	-0.3094754	0.12267339	0.39686366			
	Weighted mode	146	0.27485874	-0.4497108	0.99942829	0.45837731			
sleep duration	Maximum likelihood	73	0.006227044	-0.000473448	0.01292753	0.06852952			
	MR Egger	73	7.26063E-05	-0.024684796	0.02483001	0.99542982	0.8461508	<0.001	FALSE
	Simple median	73	0.01055409	0.000596338	0.02051184	<b>0.03776667</b>			
	Weighted median	73	0.004284352	-0.005307892	0.0138766	0.38134043			

	Inverse variance								
	weighted	73	0.006185883	-0.00045548	0.01282724	0.06791374			
	Weighted mode	73	0.00328917	-0.016186098	0.02276444	0.74158814			
short sleep	Maximum likelihood	24	-0.9111584	-2.61654213	0.7942253	0.29500934			
	MR Egger	24	7.8660793	-0.03668108	15.7688397	0.06391979			
	Simple median	24	-1.0159938	-3.34673401	1.3147465	0.39289212			
	Weighted median	24	-0.8577911	-3.21368112	1.4980988	0.47544632	0.4920667	0.5507739	TRUE
	Inverse variance	24	-0.9467464	-2.62911475	0.7356219	0.27003472			
	weighted								
	Weighted mode	24	-1.0340813	-5.36333799	3.2951753	0.64407399			
long sleep	Maximum likelihood	8	-1.1174648	-5.475459	3.240529	0.6152611			
	MR Egger	8	-2.11472	-16.249015	12.019575	0.779211			
	Simple median	8	-0.164181	-5.713814	5.385452	0.9537607			
	Weighted median	8	-0.9170466	-6.32993	4.495837	0.7398427	0.427544	0.00745687	TRUE
	Inverse variance	8	-1.0972684	-5.416193	3.221656	0.6185131			
	weighted								
	Weighted mode	8	-1.1746084	-8.110826	5.761609	0.7496705			

Italics that appear in the table indicate that the analysis is statistically significant ( $p < 0.05$ )

Supplementary table 6. Full result of MR estimation of associations between sleep traits and adrenal function.

Exposure	Outcome	Mr methods	No. of SNP	$\beta$	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
insomnia		Maximum likelihood	23	0.03803934	-0.6156624	0.6917411	0.9091952	0.437979	0.2879795	TRUE
		MR Egger	23	-0.31174951	-7.0727168	6.4492178	0.9288449			
		Simple median	23	-0.23216691	-1.1894014	0.7250676	0.6443205			
		Weighted median	23	-0.20383497	-1.1259579	0.7182879	0.6454013			
		Inverse variance weighted	23	0.03636542	-0.6137793	0.6865102	0.9127018			
		Weighted mode	23	-0.31236068	-1.8939463	1.2692249	0.7055779			
chronotype		Maximum likelihood	62	-0.2207635	-0.3978828	-0.04364421	<b>0.0145671</b>	0.1128979	0.4365012	FALSE
		MR Egger	62	-0.7172232	-1.3581664	-0.07628007	<b>0.03217503</b>			
		Simple median	62	-0.1776841	-0.4346575	0.07928921	0.19719786			
		Weighted median	62	-0.1729567	-0.4299876	0.08407416	0.199798			
		Inverse variance weighted	62	-0.2166846	-0.4100155	-0.02335364	<b>0.02803756</b>			
		Weighted mode	62	-0.1609874	-0.6385959	0.31662118	0.52533509			
sleep duration	Plasma cortisol	Maximum likelihood	26	1.76E-03	-0.004638001	0.008155869	0.589934	0.00528020 6	0.008718735	FALSE
		MR Egger	26	1.52E-02	-0.039797045	0.070142284	0.5934972			
		Simple median	26	2.19E-03	-0.007492369	0.011878958	0.6501105			
		Weighted median	26	8.92E-06	-0.009086971	0.009104808	0.9984814			
		Inverse variance weighted	26	1.72E-03	-0.006805643	0.010250903	0.6921778			
		Weighted mode	26	-1.76E-04	-0.015590372	0.015238269	0.9818926			
short sleep		Maximum likelihood	13	-1.425964	-2.626342	-0.22558623	<b>0.01989397</b>	0.5959645	<0.001	TRUE
		MR Egger	13	0.7637364	-5.119942	6.64741476	0.80386482			
		Simple median	13	-1.6658117	-3.369566	0.03794298	<b>0.04794556</b>			
		Weighted median	13	-1.6455935	-3.215101	-0.07608565	<b>0.04906724</b>			
		Inverse variance weighted	13	-1.4430481	-2.626589	-0.25950699	<b>0.01685958</b>			

long sleep		Weighted mode	13	-1.6283951	-4.28097	1.02418017	0.2564192			
		Maximum likelihood	2	-0.03994982	-4.584858	4.504959	0.9862544			
		MR Egger	NA	NA	NA	NA	NA			
		Simple median	NA	NA	NA	NA	NA	0.1828314	0.003540557	TRUE
		Weighted median	NA	NA	NA	NA	NA			
insomnia		Inverse variance weighted	2	-0.03910677	-6.007675	5.929462	0.9897537			
		Weighted mode	NA	NA	NA	NA	NA			
		Maximum likelihood	36	-0.01950539	-0.5850665	0.5460557	0.946106			
		MR Egger	36	-0.28028851	-2.5453101	1.9847331	0.8098165			
		Simple median	36	-0.1455523	-0.995189	0.7040844	0.7389772	0.04292362	0.01378162	FALSE
chronotype		Weighted median	36	-0.45650556	-1.3186154	0.4056043	0.2857746			
		Inverse variance weighted	36	-0.02077813	-0.6889779	0.6474216	0.951401			
		Weighted mode	36	-0.91403483	-2.4340727	0.6060031	0.2425813			
		Maximum likelihood	139	-0.08518071	-0.2230161	0.0526547	0.2257967			
		MR Egger	139	-0.34815009	-0.7723247	0.07602453	0.1099817			
ALD		Simple median	139	-0.01704852	-0.2178268	0.18372974	0.8669144	0.5738988	<0.001	TRUE
		Weighted median	139	-0.07949285	-0.275422	0.11643625	0.4427111			
		Inverse variance weighted	139	-0.08410118	-0.2205152	0.05231287	0.2269059			
		Weighted mode	139	-0.04963166	-0.4936816	0.39441826	0.8294518			
	sleep duration		Maximum likelihood	73	0.000417352	-0.00374251	0.004577215	0.8441064		
		MR Egger	73	0.006052231	-0.010886116	0.022990579	0.486012			
		Simple median	73	0.000975442	-0.005038595	0.006989478	0.7517574	0.1210391	<0.001	FALSE
		Weighted median	73	0.000626557	-0.00620392	0.007457034	0.8492026			
		Inverse variance weighted	73	0.000407669	-0.004076586	0.004891924	0.8585771			
short sleep		Weighted mode	73	0.00294332	-0.007946657	0.013833297	0.6100974			
		Maximum likelihood	24	-0.2754116	-1.310329	0.7595056	0.6019529	0.6012551	0.3574092	TRUE

	MR Egger	24	1.9525825	-2.821029	6.7261941	0.4312944			
	Simple median	24	-0.7120536	-2.069119	0.6450117	0.3101581			
	Weighted median	24	-0.4155007	-1.847129	1.0161272	0.5586858			
	Inverse variance weighted	24	-0.2876202	-1.310741	0.7355008	0.5816364			
	Weighted mode	24	-0.372948	-2.758287	2.012391	0.7508433			
long sleep	Maximum likelihood	6	-0.4867153	-3.522357	2.548926	0.7533283			
	MR Egger	6	-4.0983568	-23.929754	15.733041	0.7061652			
	Simple median	6	0.3274637	-3.544513	4.199441	0.8614923	0.8263644	<0.001	TRUE
	Weighted median	6	-0.3520553	-4.119748	3.415637	0.8508491			
	Inverse variance weighted	6	-0.4830794	-3.505155	2.538996	0.7540479			
	Weighted mode	6	-0.2036826	-4.923322	4.515957	0.9356046			

Italics that appear in the table indicate that the analysis is statistically significant ( $p < 0.05$ )

Supplementary table 7. Full result of MR estimation of associations between sleep traits and gonadal function (without distinguishing gender).

Exposure	Outcome	Mr methods	No. of SNP	$\beta$	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
insomnia		Maximum likelihood	39	-0.01791137	-0.04823507	0.012412336	0.2469794	0.01913333	<0.001	TURE
		MR Egger	39	-0.10323296	-0.22510091	0.018634992	0.1053083			
		Simple median	39	0.01476238	-0.03432279	0.063847553	0.5373354			
		Weighted median	39	-0.03742539	-0.08398626	0.009135471	0.1135083			
		Inverse variance weighted	39	-0.01730929	-0.0541216	0.019503021	0.3567375			
		Weighted mode	39	-0.02440933	-0.102211	0.053392338	0.5449589			
chronotype		Maximum likelihood	146	-0.005714832	-0.01317503	0.001745362	0.1332405	0.010529836	<0.001	TRUE
		MR Egger	146	-0.003098534	-0.02843039	0.022233322	0.8108707			
		Simple median	146	-0.008724589	-0.01985224	0.002403067	0.1213284			
		Weighted median	146	-0.004012558	-0.0151671	0.007141988	0.4781209			
		Inverse variance weighted	146	-0.005683835	-0.01404525	0.002677579	0.1827457			
		Weighted mode	146	0.001808799	-0.0252384	0.028855994	0.8974371			
sleep duration	E2	Maximum likelihood	74	-0.000171732	-0.000400192	5.67269E-05	0.1406627	0.1287559	<0.001	TRUE
		MR Egger	74	-0.000189833	-0.001114403	0.000734738	0.6885623			
		Simple median	74	-0.00016183	-0.000492603	0.000168944	0.3563876			
		Weighted median	74	6.24826E-05	-0.000268303	0.000393268	0.7171437			
		Inverse variance weighted	74	-0.000170868	-0.000416715	7.49777E-05	0.1731212			
		Weighted mode	74	0.000246315	-0.000413844	0.000906474	0.491046			
short sleep		Maximum likelihood	24	-0.01097777	-0.06941016	0.04745461	0.7127033	0.2524757	<0.001	TRUE
		MR Egger	24	-0.21933044	-0.5035019	0.06484102	0.1445704			
		Simple median	24	0.00245908	-0.08218868	0.08710684	0.952151			
		Weighted median	24	-0.01790268	-0.10072271	0.06491736	0.6660877			
		Inverse variance weighted	24	-0.01105881	-0.07349737	0.05137975	0.7284819			

long sleep	Weighted mode	24	-0.08254636	-0.22967275	0.06458002	0.3007875			
	Maximum likelihood	9	0.02094631	-0.1257676	0.1676603	0.7796089			
	MR Egger	9	0.3453047	-0.1046563	0.7952657	0.1762598			
	Simple median	9	0.10379206	-0.1172364	0.3248205	0.3557691	0.5131219	<0.001	TRUE
	Weighted median	9	0.10433111	-0.078853	0.2875152	0.2709749			
	Inverse variance weighted	9	0.02049531	-0.1248686	0.1658593	0.782282			
insomnia	Weighted mode	9	0.11998334	-0.1284283	0.368395	0.3543088			
	Maximum likelihood	36	0.02405568	-0.4683147	0.5164261	0.9237116			
	MR Egger	36	0.16808422	-1.5127993	1.8489677	0.8457807			
	Simple median	36	-0.28622444	-0.9894405	0.4169916	0.41983	0.400191	0.1878843	FALSE
	Weighted median	36	-0.03581988	-0.7735445	0.7019047	0.9239293			
	Inverse variance weighted	36	0.02269808	-0.4739903	0.5193865	0.9286291			
chronotype	Weighted mode	36	-0.630266	-1.8158031	0.5552711	0.3218703			
	Maximum likelihood	139	-0.0245683	-0.14531	0.09617341	0.6900279			
	MR Egger	139	0.02436291	-0.3500218	0.39874766	0.8986952			
	Simple median	139	-0.04126603	-0.2155543	0.13302226	0.6541918	0.4406196	<0.001	FALSE
	Weighted median	139	-0.10022146	-0.2714798	0.07103685	0.2561925			
	Inverse variance weighted	139	-0.02460333	-0.144852	0.09564535	0.688403			
sleep duration	Weighted mode	139	-0.07073381	-0.4331172	0.29164962	0.7018187			
	Maximum likelihood	73	-0.003756578	-0.00738784	-0.000125316	<b>0.04259697</b>			
	MR Egger	73	-0.006114949	-0.02030495	0.008075052	0.40115463			
	Simple median	73	-0.002572424	-0.007819834	0.002674985	0.34368705	0.3033175	<0.001	TRUE
	Weighted median	73	-0.001499494	-0.006999599	0.004000611	0.58909598			
	Inverse variance weighted	73	-0.00373919	-0.007466478	-1.19015E-05	<b>0.04926876</b>			
short sleep	Weighted mode	73	-0.000969822	-0.010919792	0.008980147	0.84891949			
	Maximum likelihood	24	1.1018929	0.1912548	2.012531	<b>0.0177091</b>	0.5720261	0.9564324	TRUE

		MR Egger	24	0.9695932	-3.23027	5.169456	0.65534533			
		Simple median	24	0.6629186	-0.5900272	1.915864	0.29875629			
		Weighted median	24	0.545556	-0.701005	1.792117	0.40465454			
		Inverse variance weighted	24	1.0580915	0.161611	1.954572	<b>0.02070425</b>			
		Weighted mode	24	0.2686674	-2.2481776	2.785512	0.84154871			
long sleep		Maximum likelihood	6	0.49826794	-2.170991	3.167527	0.7144611			
		MR Egger	6	-0.04926835	-17.458535	17.359999	0.9958399			
		Simple median	6	-0.21355054	-3.73426	3.307159	0.9002343	0.8384978	<0.001	TRUE
		Weighted median	6	-0.37737443	-3.551435	2.796686	0.8171856			
		Inverse variance weighted	6	0.49207151	-2.160979	3.145122	0.7162099			
		Weighted mode	6	-0.4933955	-4.420525	3.433734	0.8076315			
insomnia		Maximum likelihood	39	-0.03474406	-0.08233988	0.01285176	0.1524981			
		MR Egger	39	-0.1248372	-0.43471855	0.18504414	0.4347952			
		Simple median	39	-0.02601846	-0.10906947	0.05703255	0.5400127	<0.001	<0.001	TRUE
		Weighted median	39	0.01178287	-0.06343347	0.08699922	0.7606422			
		Inverse variance weighted	39	-0.03519744	-0.12675564	0.05636076	0.4511634			
		Weighted mode	39	0.07712472	-0.04192762	0.19617707	0.2025117			
chronotype		Maximum likelihood	146	-0.03669634	-0.04821653	-0.02517616	<b>4.28E-10</b>			
	TT	MR Egger	146	-0.0780863	-0.13103345	-0.025139146	<b>4.44E-03</b>			
		Simple median	146	-0.03405433	-0.05204373	-0.016064931	<b>2.15E-04</b>	<0.001	<0.001	TRUE
		Weighted median	146	-0.03700066	-0.0560091	-0.017992213	<b>1.07E-04</b>			
		Inverse variance weighted	146	-0.03636181	-0.05397917	-0.018744451	<b>5.22E-05</b>			
		Weighted mode	146	-0.04300582	-0.0888054	0.002793768	6.80E-02			
sleep duration		Maximum likelihood	74	8.85735E-05	-0.000270971	0.000448118	0.62920593			
		MR Egger	74	-0.000157076	-0.002649107	0.002334955	0.90202292	<0.001	<0.001	TRUE
		Simple median	74	0.000491338	-0.000100616	0.001083292	0.08642156			



		Weighted median	74	0.000322387	-0.000234307	0.000879081	0.26716967			
		Inverse variance weighted	74	8.67767E-05	-0.000576781	0.000750334	0.79770455			
		Weighted mode	74	-1.31004E-06	-0.001010618	0.001007998	0.99799176			
short sleep		Maximum likelihood	24	0.04015392	-0.05032032	0.1306282	0.3843663			
		MR Egger	24	0.53644007	-0.09421712	1.1670973	0.1096518			
		Simple median	24	0.05478233	-0.08104099	0.1906057	0.4061814			
		Weighted median	24	0.07073028	-0.06457404	0.2060346	0.2981502	<0.001	<0.001	TRUE
		Inverse variance weighted	24	0.03844679	-0.1009924	0.177886	0.5889075			
		Weighted mode	24	0.06791998	-0.16501765	0.3008576	0.5402256			
long sleep		Maximum likelihood	9	0.1803252	-0.05030126	0.4109516	0.1253966			
		MR Egger	9	-0.2708586	-1.4494763	0.9077591	0.6660213			
		Simple median	9	0.1438215	-0.23080862	0.5184516	0.4484183			
		Weighted median	9	0.1465066	-0.17544798	0.4684612	0.3623427	0.00362451	<0.001	TRUE
		Inverse variance weighted	9	0.1744511	-0.19806452	0.5469667	0.3586824			
		Weighted mode	9	0.2306555	-0.18675158	0.6480625	0.2737437			
insomnia		Maximum likelihood	39	0.06996653	-0.004829844	0.1447629	0.06673769			
		MR Egger	39	-0.04574836	-0.56560725	0.4741105	0.86399791			
		Simple median	39	0.05140936	-0.068334397	0.1711531	0.40710812			
		Weighted median	39	0.0528107	-0.064931785	0.1705532	0.37245576	<0.001	<0.001	TRUE
		Inverse variance weighted	39	0.0678552	-0.085390594	0.221101	0.38546991			
	BT	Weighted mode	39	0.05588336	-0.147106948	0.2588737	0.5431236			
chronotype		Maximum likelihood	146	-0.06726924	-0.08529841	-0.04924006	<b>2.61E-13</b>			
		MR Egger	146	-0.06837166	-0.16142085	0.02467753	1.52E-01			
		Simple median	146	-0.05552326	-0.08406939	-0.02697714	<b>1.67E-04</b>	<0.001	<0.001	TRUE
		Weighted median	146	-0.05595883	-0.08608019	-0.02583748	<b>2.91E-04</b>			
		Inverse variance weighted	146	-0.0664256	-0.09710917	-0.03574204	<b>2.20E-05</b>			

	Weighted mode	146	-0.06347475	-0.14329167	0.01634218	1.10E-01			
sleep duration	Maximum likelihood	74	0.000590793	3.93539E-05	0.001142231	<b>0.03573967</b>			
	MR Egger	74	-0.000406472	-0.003882275	0.003069332	0.81935656			
	Simple median	74	0.000809599	-4.03812E-05	0.001659579	0.06466939	<0.001	<0.001	TRUE
	Weighted median	74	0.000859895	-4.69368E-05	0.001766727	0.06721254			
	Inverse variance weighted	74	0.000575689	-0.000351491	0.001502868	0.22361552			
	Weighted mode	74	0.001226586	-0.000366966	0.002820138	0.14247948			
short sleep	Maximum likelihood	24	0.045296598	-0.09711107	0.1877043	0.5330014			
	MR Egger	24	-0.003749213	-1.21510599	1.2076076	0.9952145			
	Simple median	24	0.123820343	-0.09897197	0.3466127	0.2743923	<0.001	<0.001	TRUE
	Weighted median	24	0.107301172	-0.10364954	0.3182519	0.3355977			
	Inverse variance weighted	24	0.043329438	-0.2104137	0.2970726	0.7378577			
	Weighted mode	24	0.238008766	-0.19316956	0.6691871	0.3160051			
long sleep	Maximum likelihood	9	0.17032	-0.178243949	0.5188839	0.33820325			
	MR Egger	9	0.6490926	-0.563154255	1.8613395	0.32883649			
	Simple median	9	0.2396908	-0.322149273	0.8015308	0.41863186	0.2629947	<0.001	TRUE
	Weighted median	9	0.438495	-0.001768756	0.8787587	0.06851126			
	Inverse variance weighted	9	0.164842	-0.219213096	0.5488971	0.40020208			
	Weighted mode	9	0.4872182	-0.05675331	1.0311896	0.09895206			
insomnia	Maximum likelihood	39	-0.042110038	-0.07723838	-0.006981698	<b>0.01879629</b>			
	MR Egger	39	-0.124798508	-0.38441892	0.134821906	0.35221991			
	Simple median	39	-0.013310259	-0.07485679	0.048236275	0.6595575	<0.001	<0.001	TRUE
	Weighted median	39	-0.014142759	-0.07687064	0.048585125	0.65947337			
	Inverse variance weighted	39	-0.041749543	-0.11861158	0.035112496	0.28704651			
	Weighted mode	39	-0.003177142	-0.09125887	0.084904583	0.94295991			
chronotype	Maximum likelihood	146	0.005991991	-0.002939601	0.01492358	0.1885378	<0.001	<0.001	TRUE

		MR Egger	146	-0.038266315	-0.109927317	0.03339469	0.2970276			
		Simple median	146	0.007529139	-0.006173558	0.02123184	0.300374			
		Weighted median	146	0.008111776	-0.006391919	0.02261547	0.254967			
		Inverse variance weighted	146	0.005482428	-0.018308425	0.02927328	0.6515084			
		Weighted mode	146	0.007743118	-0.016366569	0.03185281	0.5123816			
sleep duration		Maximum likelihood	74	-5.34E-04	-0.000804748	-0.000263174	<b>0.000111136</b>			
		MR Egger	74	1.10E-03	-0.001383183	0.003591613	0.387142634			
		Simple median	74	-7.48E-05	-0.000504806	0.000355304	0.732014703	<0.001	<0.001	TRUE
		Weighted median	74	-2.26E-04	-0.000672249	0.000219696	0.336268883			
		Inverse variance weighted	74	-4.86E-04	-0.001155927	0.000184176	0.155241424			
		Weighted mode	74	-1.38E-04	-0.000834324	0.000557527	0.722484998			
short sleep		Maximum likelihood	24	-0.07797563	-0.1447359	-0.01121533	<b>0.02206377</b>			
		MR Egger	24	0.09715752	-0.491987	0.68630204	0.7495739			
		Simple median	24	-0.05846992	-0.1596771	0.04273722	0.26499773	<0.001	<0.001	TRUE
		Weighted median	24	-0.05079837	-0.1510096	0.04941282	0.30755548			
		Inverse variance weighted	24	-0.08051975	-0.2050152	0.04397574	0.20491723			
		Weighted mode	24	-0.03723941	-0.1967024	0.12222361	0.6843623			
long sleep		Maximum likelihood	9	0.30957458	0.1234155	0.4957337	<b>0.001116499</b>			
		MR Egger	9	-0.46014741	-2.0009176	1.0806227	0.576687727			
		Simple median	9	0.22426566	-0.0592066	0.5077379	0.119660886	<0.001	<0.001	TRUE
		Weighted median	9	0.02165576	-0.2222934	0.2656049	0.861162421			
		Inverse variance weighted	9	0.27176447	-0.2234952	0.7670241	0.28214499			
		Weighted mode	9	0.01446932	-0.2371556	0.2660942	0.901589997			
insomnia	DHEA-sulphate	Maximum likelihood	19	0.4340476	-0.01977657	0.8878719	0.06084944			
		MR Egger	19	1.0537166	-0.27203667	2.37947	0.13769648	0.1205449	0.7415649	TRUE
		Simple median	19	0.8297585	0.11740915	1.5421078	<b>0.02242763</b>			

	Weighted median	19	0.7718105	0.1021613	1.4414597	<b>0.02388236</b>			
	Inverse variance weighted	19	0.4158449	-0.11151594	0.9432057	0.12221629			
	Weighted mode	19	0.8928206	0.08578786	1.6998534	<b>0.0437778</b>			
chronotype	Maximum likelihood	78	-0.06204712	-0.163041	0.03894674	0.228529313			
	MR Egger	78	-0.45106162	-0.7851213	-0.11700197	<b>0.009881939</b>			
	Simple median	78	-0.21809108	-0.3915591	-0.04462303	<b>0.013732265</b>	6.79677E-07	0.02003953	FALSE
	Weighted median	78	-0.25771471	-0.4268511	-0.08857837	<b>0.002822174</b>			
	Inverse variance weighted	78	-0.05979192	-0.1990019	0.07941806	0.399878984			
	Weighted mode	78	-0.45257868	-0.7314553	-0.17370206	<b>0.002117253</b>			
sleep duration	Maximum likelihood	41	0.00160786	-0.001529309	0.00474503	0.315119299			
	MR Egger	41	-0.011301892	-0.024633142	0.002029359	0.104604394			
	Simple median	41	0.008741259	0.003323585	0.014158933	<b>0.001564731</b>	0.003470484	0.01915167	FALSE
	Weighted median	41	0.005082342	0.000127075	0.010037609	<b>0.04440336</b>			
	Inverse variance weighted	41	0.001595929	-0.002424248	0.005616105	0.43652167			
	Weighted mode	41	0.010124366	0.001570959	0.018677774	<b>0.025528602</b>			
short sleep	Maximum likelihood	14	-0.09363311	-0.8737913	0.6865251	0.81402597			
	MR Egger	14	2.32743555	-2.1883618	6.8432329	0.33234434			
	Simple median	14	-1.24802125	-2.4012825	-0.09476	<b>0.03391782</b>	0.01172189	0.08814594	TRUE
	Weighted median	14	-0.49233287	-1.6599611	0.6752953	0.40855562			
	Inverse variance weighted	14	-0.09639891	-1.1982975	1.0054997	0.8638547			
	Weighted mode	14	-1.34458417	-3.3989431	0.7097748	0.22195347			
long sleep	Maximum likelihood	6	-0.9740309	-2.970816	1.022754	0.3390282			
	MR Egger	6	6.1877558	-10.123211	22.498722	0.4984507			
	Simple median	6	0.1031285	-3.073815	3.280072	0.9492691	0.1299049	<0.001	TRUE
	Weighted median	6	-1.1271359	-3.795227	1.540955	0.407669			
	Inverse variance weighted	6	-0.9328951	-3.459781	1.593991	0.4693066			

Weighted mode	6	-1.1971777	-4.129338	1.734983	0.4598806
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Italics that appear in the table indicate that the analysis is statistically significant ( $p < 0.05$ )

Supplementary table 8. Full result of MR estimation of associations between sleep traits and gonadal function (stratified by gender).

Exposure	Outcome	Mr methods	No. of	$\beta$ -value	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
	(Male)		SNP							
insomnia		Maximum likelihood	36	-0.3801722	-0.8538008	0.09345647	0.11566036	0.05681375	<0.001	TRUE
		MR Egger	36	-1.7081807	-3.5235489	0.10718752	0.07387158			
		Simple median	36	-0.5065681	-1.2148375	0.20170122	0.15956723			
		Weighted median	36	-0.6628945	-1.3889307	0.06314165	0.07316429			
		Inverse variance weighted	36	-0.3760094	-0.9274214	0.17540263	0.18137628			
		Weighted mode	36	-0.8267229	-2.0502958	0.39685006	0.16676417			
chronotype		Maximum likelihood	121	-0.08121006	-0.2052003	0.04278021	0.1992317	0.03262591	<0.001	TRUE
		MR Egger	121	-0.02643491	-0.440204	0.38733422	0.9005602			
		Simple median	121	-0.04614344	-0.2322764	0.13998956	0.6270684			
		Weighted median	121	-0.03265196	-0.2183833	0.15307936	0.7285764			
		Inverse variance weighted	121	-0.07982092	-0.2166934	0.05705155	0.2530272			
		Weighted mode	121	0.05716435	-0.3723511	0.48667979	0.7826055			
sleep duration	E2	Maximum likelihood	66	-2.93E-04	-0.003947306	0.003362037	0.8752922	0.4569116	<0.001	TRUE
		MR Egger	66	-2.26E-03	-0.015468494	0.010940036	0.7378986			
		Simple median	66	6.41E-05	-0.005069399	0.005197595	0.9803486			
		Weighted median	66	1.81E-03	-0.003715367	0.0073428	0.5060147			
		Inverse variance weighted	66	-2.91E-04	-0.003916941	0.003334005	0.8747931			
		Weighted mode	66	3.80E-03	-0.006146742	0.013744303	0.4233148			
short sleep		Maximum likelihood	20	-0.03230696	-0.9960867	0.9314728	0.9476156	0.2886627	<0.001	TRUE
		MR Egger	20	-2.35946614	-7.1047371	2.3858048	0.3426944			
		Simple median	20	-0.01068929	-1.3101598	1.2887812	0.9871683			
		Weighted median	20	-0.53622248	-1.9021186	0.8296737	0.4235394			
		Inverse variance weighted	20	-0.03333811	-1.0533002	0.986624	0.9489194			

long sleep	Weighted mode	20	-1.21468596	-3.4950371	1.0656651	0.2866184			
	Maximum likelihood	8	0.7183858	-1.546342	2.983113	0.5341232			
	MR Egger	8	3.870505	-3.641656	11.382666	0.3515414			
	Simple median	8	1.3822194	-1.637518	4.401956	0.3592305	0.3001722	<0.001	TRUE
	Weighted median	8	1.5787321	-1.4215	4.578964	0.2982402			
	Inverse variance weighted	8	0.7019091	-1.750114	3.153932	0.574754			
insomnia	Weighted mode	8	1.8531133	-1.32415	5.030377	0.3152092			
	Maximum likelihood	36	0.4454408	-0.09649902	0.9873806	0.10718016			
	MR Egger	36	2.1558999	0.35339477	3.9584051	<b>0.02504504</b>			
	Simple median	36	0.3735392	-0.36127614	1.1083545	0.32315634	0.9252434	0.1247276	FALSE
	Weighted median	36	0.4057365	-0.37457063	1.1860437	0.29572676			
	Inverse variance weighted	36	0.4278677	-0.10913385	0.9648692	0.11836511			
chronotype	Weighted mode	36	0.4750123	-0.93132267	1.8813473	0.46731834			
	Maximum likelihood	139	-0.043077912	-0.1764124	0.0902566	0.5265771			
	MR Egger	139	-0.293559199	-0.709148	0.12202957	0.1684611			
	Simple median	139	-0.005989328	-0.1934828	0.18150419	0.9495435	0.9774966	<0.001	TRUE
	Weighted median	139	-0.06301083	-0.2522274	0.12620573	0.5202607			
	Inverse variance weighted	139	-0.043007808	-0.1752564	0.08924082	0.5238642			
sleep duration	Weighted mode	139	-0.056301498	-0.475805	0.36320199	0.7861354			
	Maximum likelihood	73	-0.003958986	-0.0079749	5.69284E-05	0.0533329			
	MR Egger	73	-0.006543322	-0.0240301	0.01094346	0.46572549			
	Simple median	73	-0.004605349	-0.010417582	0.001206884	0.11976883	0.02514589	<0.001	TRUE
	Weighted median	73	-0.004737073	-0.011230021	0.001755875	0.16012009			
	Inverse variance weighted	73	-0.003930781	-0.008530141	0.000668579	0.09391701			
short sleep	Weighted mode	73	-0.006368333	-0.017910831	0.005174165	0.28691783			
	Maximum likelihood	24	0.930808	-0.07220671	1.933823	0.06892666	0.4921156	0.2721789	FALSE

		MR Egger	24	2.7291866	-1.90235626	7.360729	0.26050145			
		Simple median	24	1.1726365	-0.17282977	2.518103	0.09901951			
		Weighted median	24	1.1833686	-0.23027495	2.597012	0.10322907			
		Inverse variance weighted	24	0.8892631	-0.09847377	1.877	0.07763183			
		Weighted mode	24	1.4085084	-1.10244794	3.919465	0.28331746			
long sleep		Maximum likelihood	6	-0.1270377	-3.074641	2.820565	0.9326801			
		MR Egger	6	-5.7011093	-24.922926	13.520707	0.5922033			
		Simple median	6	-1.264576	-5.128151	2.598998	0.5175617	0.6964111	0.04581202	FALSE
		Weighted median	6	-1.1470568	-4.700277	2.406163	0.5490133			
		Inverse variance weighted	6	-0.1241402	-3.047696	2.799416	0.9336722			
		Weighted mode	6	-1.5499058	-6.325429	3.225617	0.5296196			
insomnia		Maximum likelihood	39	-0.04337423	-0.1576056	0.07085716	0.4567423			
		MR Egger	39	-0.19114806	-1.033511	0.65121487	0.65908344			
		Simple median	39	-0.17834121	-0.3744885	0.01780608	0.08679454	<0.001	<0.001	TRUE
		Weighted median	39	-0.15182732	-0.3328799	0.02922529	0.10610887			
		Inverse variance weighted	39	-0.0445215	-0.2929214	0.2038784	0.72536553			
		Weighted mode	39	0.11297192	-0.2251611	0.45110489	0.50577693			
chronotype		Maximum likelihood	146	-0.05734206	-0.08481603	-0.029868084	<b>4.29894E-05</b>			
	TT	MR Egger	146	-0.11588486	-0.26828292	0.036513198	0.1383058			
		Simple median	146	-0.06655824	-0.11341047	-0.019706002	<b>0.003820656</b>	<0.001	<0.001	TRUE
		Weighted median	146	-0.06165849	-0.10941358	-0.013903394	<b>0.009181828</b>			
		Inverse variance weighted	146	-0.05740115	-0.10782237	-0.006979922	<b>0.02565947</b>			
		Weighted mode	146	-0.01281294	-0.16007944	0.134453561	0.8587136			
sleep duration		Maximum likelihood	74	-0.000860208	-0.001722839	2.42266E-06	<b>0.05064266</b>			
		MR Egger	74	0.001525054	-0.005386691	0.008436799	0.66669411	<0.001	<0.001	TRUE
		Simple median	74	3.91206E-05	-0.001282451	0.001360692	0.95577691			



		Weighted median	74	-0.00033587	-0.001766543	0.001094802	0.65766179			
		Inverse variance weighted	74	-0.000840249	-0.002685814	0.001005317	0.37220628			
		Weighted mode	74	-7.66976E-05	-0.002371656	0.002218261	0.94635675			
short sleep		Maximum likelihood	24	-0.199038999	-0.4166915	0.01861354	0.07307184			
		MR Egger	24	0.248712711	-1.6935406	2.19096606	0.80415486			
		Simple median	24	-0.006624991	-0.3565515	0.34330148	0.97164556	<0.001	<0.001	TRUE
		Weighted median	24	0.103426739	-0.234798	0.44165151	0.55991221			
		Inverse variance weighted	24	-0.197344689	-0.6068494	0.21216004	0.34489129			
		Weighted mode	24	0.245031518	-0.2892432	0.7793062	0.43250827			
long sleep		Maximum likelihood	9	0.4977882	-0.08710597	1.082682	0.09529489			
		MR Egger	9	-0.9218327	-5.42112405	3.577459	0.69997586			
		Simple median	9	0.6735419	-0.33125727	1.678341	0.17476145	<0.001	<0.001	TRUE
		Weighted median	9	0.2848059	-0.50729401	1.076906	0.47666805			
		Inverse variance weighted	9	0.3986755	-0.99375374	1.791105	0.57467455			
		Weighted mode	9	0.2784519	-0.61385342	1.170757	0.55962268			
insomnia		Maximum likelihood	39	0.114157398	-0.003446998	0.23176179	0.057099			
		MR Egger	39	0.000815497	-0.959380325	0.96101132	0.9986808			
		Simple median	39	-0.142743566	-0.325966602	0.04047947	0.1422106	<0.001	<0.001	TRUE
		Weighted median	39	0.02924869	-0.157475646	0.21597303	0.7549059			
		Inverse variance weighted	39	0.112486442	-0.170038558	0.39501144	0.4351744			
	BT	Weighted mode	39	0.191917562	-0.164879514	0.54871464	0.2992085			
chronotype		Maximum likelihood	146	-0.07286567	-0.100173	-0.04555834	<b>1.69531E-07</b>			
		MR Egger	146	-0.07198214	-0.2044927	0.06052844	0.2887904			
		Simple median	146	-0.05764647	-0.1014993	-0.01379361	<b>0.007968278</b>	<0.001	<0.001	TRUE
		Weighted median	146	-0.0602265	-0.1042347	-0.01621833	<b>0.008781858</b>			
		Inverse variance weighted	146	-0.07312827	-0.1168643	-0.02939221	<b>0.001048454</b>			



	Outcome	Mr methods	No. of	$\beta$ -value	lo_95% CI	up_95% CI	P-value	Q_pval	steiger_pval	Correct causal direction
sleep duration		MR Egger	146	-0.033369943	-0.101058183	0.0343183	0.3355293			
		Simple median	146	0.003606923	-0.013868883	0.02108273	0.6838242			
		Weighted median	146	0.003999213	-0.013975147	0.02197357	0.6606916			
		Inverse variance weighted	146	0.00507012	-0.017403923	0.02754416	0.6583634			
		Weighted mode	146	0.031868769	-0.010392505	0.07413004	0.1745318			
		Maximum likelihood	74	-0.000293886	-0.000638198	5.04266E-05	0.09433782			
		MR Egger	74	0.00097871	-0.001512577	0.003469997	0.4438235			
short sleep		Simple median	74	-4.96694E-05	-0.000566131	0.000466792	0.85593922	<0.001	<0.001	TRUE
		Weighted median	74	-0.000199111	-0.000767714	0.000369493	0.51609691			
		Inverse variance weighted	74	-0.000286722	-0.000954272	0.000380829	0.39987404			
		Weighted mode	74	-0.000275592	-0.001131157	0.000579973	0.51919963			
		Maximum likelihood	24	-0.05306783	-0.13863628	0.03250061	0.2241554			
		MR Egger	24	0.21904419	-0.30768597	0.74577436	0.4237636			
		Simple median	24	0.04730952	-0.07813012	0.17274916	0.4540209	0.008564053	<0.001	TRUE
long sleep		Weighted median	24	0.05596868	-0.06455327	0.17649063	0.3596129			
		Inverse variance weighted	24	-0.0549102	-0.16812843	0.05830804	0.3418132			
		Weighted mode	24	0.09501926	-0.11039763	0.30043615	0.3813208			
		Maximum likelihood	9	0.238823328	0.01336936	0.4642773	<b>0.03787292</b>			
		MR Egger	9	-0.003688951	-1.57509241	1.5677145	0.99645717			
		Simple median	9	0.097634128	-0.28450706	0.4797753	0.59650637	<0.001	<0.001	TRUE
		Weighted median	9	0.013899745	-0.3044996	0.3322991	0.93224553			
insomnia	E2	Inverse variance weighted	9	0.216785548	-0.25831454	0.6918856	0.37114151			
		Weighted mode	9	0.008901591	-0.34566997	0.3634732	0.95966622			
		Maximum likelihood	36	-0.013701117	-0.4540486	0.4266464	0.9513719	0.2412416	<0.001	TRUE

	MR Egger	36	0.076485812	-1.4979221	1.6508937	0.9247006			
	Simple median	36	-0.003419624	-0.6449811	0.6381418	0.9916796			
	Weighted median	36	-0.269555463	-0.9566279	0.4175169	0.4319337			
	Inverse variance weighted	36	-0.013325868	-0.4806053	0.4539536	0.9554253			
	Weighted mode	36	-0.31916013	-1.3921708	0.7538506	0.5405469			
chronotype	Maximum likelihood	121	-0.120998638	-0.236846	-0.005151292	<b>0.04064299</b>			
	MR Egger	121	-0.384823283	-0.7398531	-0.029793478	<b>0.03569931</b>			
	Simple median	121	-0.008074901	-0.1831688	0.167018988	0.92646295	0.3165679	<0.001	TRUE
	Weighted median	121	-0.030894921	-0.2073956	0.145605771	0.72518333			
	Inverse variance weighted	121	-0.119875322	-0.2376392	-0.002111469	<b>0.04602737</b>			
	Weighted mode	121	0.061485928	-0.3409723	0.463944161	0.77404898			
sleep duration	Maximum likelihood	67	-0.000214349	-0.003613315	0.003184617	0.9016292			
	MR Egger	67	-0.003204425	-0.016452241	0.01004339	0.6370236			
	Simple median	67	-0.002454525	-0.00737215	0.0024631	0.3505306	0.1697931	<0.001	TRUE
	Weighted median	67	-0.00255493	-0.007502952	0.002393093	0.3139279			
	Inverse variance weighted	67	-0.000209759	-0.003825291	0.003405772	0.9094663			
	Weighted mode	67	-0.004771599	-0.015254453	0.005711255	0.3803606			
short sleep	Maximum likelihood	20	-0.7552043	-1.660771	0.1503627	0.10214203			
	MR Egger	20	-0.7433397	-5.465391	3.9787118	0.76121316			
	Simple median	20	-1.097816	-2.345498	0.149866	0.09437796	0.2336092	<0.001	TRUE
	Weighted median	20	-0.8616166	-2.204785	0.4815519	0.18568356			
	Inverse variance weighted	20	-0.7738958	-1.754358	0.2065661	0.1218482			
	Weighted mode	20	-1.3005487	-3.999749	1.3986514	0.33232649			
long sleep	Maximum likelihood	8	-0.1566956	-2.297931	1.984539	0.8859483			
	MR Egger	8	-0.3057841	-8.265417	7.653849	0.9424262	0.2244327	<0.001	TRUE
	Simple median	8	0.4255886	-2.78198	3.633158	0.7887298			

		Weighted median	8	-0.8360996	-3.676862	2.004663	0.5661273			
		Inverse variance weighted	8	-0.1526249	-2.586886	2.281637	0.9021947			
		Weighted mode	8	-1.3672494	-4.92129	2.186791	0.4703211			
insomnia		Maximum likelihood	36	-0.5818246	-1.523769	0.36011979	0.226025			
		MR Egger	36	-2.7895559	-6.147424	0.56831252	0.11269946			
		Simple median	36	-0.9906514	-2.378741	0.39743862	0.16945864	0.1635432	<0.001	TRUE
		Weighted median	36	-1.3064811	-2.686536	0.07357409	0.06623774			
		Inverse variance weighted	36	-0.6066532	-1.636256	0.42294972	0.24815052			
		Weighted mode	36	-2.0116583	-4.296405	0.27308881	0.07641467			
chronotype		Maximum likelihood	140	-0.009215721	-0.2379416	0.2195102	0.9370553			
		MR Egger	140	0.416453408	-0.2813143	1.1142211	0.2440979			
		Simple median	140	-0.04928673	-0.3858058	0.2872324	0.7731433	0.3181515	<0.001	TRUE
		Weighted median	140	-0.053655353	-0.3987777	0.291467	0.74984			
		Inverse variance weighted	140	-0.009185371	-0.2412937	0.2229229	0.9381746			
	P4	Weighted mode	140	-0.107126542	-0.8515015	0.6372484	0.7692523			
sleep duration		Maximum likelihood	73	-0.003929473	-0.01085435	0.002995406	0.2660574			
		MR Egger	73	-0.004091021	-0.03009795	0.02191591	0.7587433			
		Simple median	73	-0.005328219	-0.01528808	0.004631645	0.3039339	0.9059213	<0.001	TRUE
		Weighted median	73	-0.001317565	-0.01134659	0.008711465	0.8050515			
		Inverse variance weighted	73	-0.003900308	-0.01076057	0.002959956	0.2651373			
		Weighted mode	73	0.002820718	-0.01503813	0.020679568	0.7766522			
short sleep		Maximum likelihood	24	1.5988393	-0.1397256	3.337404	0.07147022			
		MR Egger	24	-2.3127248	-10.3369518	5.711502	0.57785266			
		Simple median	24	0.8639427	-1.6291432	3.357029	0.47795842	0.6798744	0.1322473	FALSE
		Weighted median	24	0.6555895	-1.7082927	3.019472	0.6037462			
		Inverse variance weighted	24	1.5367551	-0.1788629	3.252373	0.07914667			

long sleep		Weighted mode	24	-0.8918695	-5.7067644	3.923025	0.72472734			
		Maximum likelihood	6	1.666185	-3.419312	6.751682	0.5207668			
		MR Egger	6	10.526407	-22.62816	43.680974	0.5674676			
		Simple median	6	2.736075	-3.528787	9.000937	0.3892463	0.9766896	0.07133074	FALSE
		Weighted median	6	2.024152	-4.176043	8.224347	0.5150211			
		Inverse variance weighted	6	1.65919	-3.409379	6.727758	0.5211306			
insomnia		Weighted mode	6	2.496684	-4.926011	9.91938	0.5209225			
		Maximum likelihood	39	-0.05007972	-0.151665	0.05150557	0.3339218			
		MR Egger	39	-0.32635322	-0.8458575	0.19315104	0.2259894			
		Simple median	39	-0.03886362	-0.193677	0.11594974	0.620103	<0.001	<0.001	TRUE
		Weighted median	39	-0.01338834	-0.1672179	0.14044118	0.8681523			
		Inverse variance weighted	39	-0.05058073	-0.2058841	0.10472268	0.5232446			
chronotype		Weighted mode	39	-0.0128513	-0.2454215	0.21971891	0.913285			
		Maximum likelihood	146	-0.07732002	-0.10250245	-0.052137597	<b>1.76611E-09</b>			
		MR Egger	146	-0.16467865	-0.2863981	-0.042959202	<b>0.008904877</b>			
		Simple median	146	-0.03906748	-0.08101624	0.002881288	0.06221227	<0.001	<0.001	TRUE
		Weighted median	146	-0.04994593	-0.09227952	-0.007612337	<b>0.01853139</b>			
		Inverse variance weighted	146	-0.07507888	-0.1155102	-0.034647559	<b>0.000273042</b>			
sleep duration		Weighted mode	146	-0.04563833	-0.1738936	0.082616936	0.4577044			
		Maximum likelihood	74	0.000836725	6.45935E-05	0.001608857	<b>0.03367301</b>			
		MR Egger	74	-0.001138793	-0.005874418	0.003596832	0.63883136			
		Simple median	74	0.000663514	-0.000564749	0.001891778	0.29255172	<0.001	<0.001	TRUE
		Weighted median	74	6.71523E-05	-0.001235675	0.001369979	0.91670671			
		Inverse variance weighted	74	0.000815809	-0.000452425	0.002084042	0.20738205			
short sleep		Weighted mode	74	-0.000986121	-0.003163532	0.00119129	0.42958875			
		Maximum likelihood	24	0.2766455	0.07852493	0.474766	<b>0.006203158</b>	<0.001	<0.001	TRUE

		MR Egger	24	1.3737418	-0.01277082	2.7602545	0.065056253			
		Simple median	24	0.2102255	-0.072068	0.4925189	0.160568314			
		Weighted median	24	0.2039718	-0.08720097	0.4951445	0.187417014			
		Inverse variance weighted	24	0.2609413	-0.04575757	0.5676403	0.095399088			
		Weighted mode	24	0.1279942	-0.35785567	0.613844	0.622298544			
long sleep		Maximum likelihood	9	0.2828789	-0.2011838	0.7669415	0.2520459			
		MR Egger	9	-0.2137407	-1.691148	1.2636665	0.7849518			
		Simple median	9	0.4408252	-0.2796305	1.161281	0.2124353	0.796466	<0.001	TRUE
		Weighted median	9	0.4414103	-0.1932288	1.0760495	0.1625541			
		Inverse variance weighted	9	0.2749532	-0.2050719	0.7549782	0.261579			
		Weighted mode	9	0.4055893	-0.4478366	1.2590153	0.408092			
insomnia		Maximum likelihood	39	0.02588994	-0.06521119	0.11699106	0.5775203			
		MR Egger	39	-0.08884934	-0.5012813	0.32358262	0.6752944			
		Simple median	39	-0.07809634	-0.22560184	0.06940917	0.2907931	<0.001	<0.001	TRUE
		Weighted median	39	-0.06688498	-0.209592	0.07582203	0.3596209			
		Inverse variance weighted	39	0.0248879	-0.09695058	0.14672638	0.6888852			
		Weighted mode	39	-0.12966151	-0.36085686	0.10153385	0.2499415			
chronotype		Maximum likelihood	146	-0.05030911	-0.07328152	-0.027336702	<b>1.76784E-05</b>			
	BT	MR Egger	146	-0.06478476	-0.19440772	0.064838192	0.3289285			
		Simple median	146	-0.06389548	-0.10071453	-0.027076417	<b>0.000367638</b>	<0.001	<0.001	TRUE
		Weighted median	146	-0.08255253	-0.11915499	-0.045950059	<b>1.89663E-05</b>			
		Inverse variance weighted	146	-0.05016831	-0.09290653	-0.007430089	<b>0.02140586</b>			
		Weighted mode	146	-0.11552386	-0.19507323	-0.03597449	<b>0.001626817</b>			
sleep duration		Maximum likelihood	74	0.001440353	0.00074517	0.002135537	<b>4.88773E-05</b>			
		MR Egger	74	7.04936E-06	-0.004129297	0.004143396	0.997344	<0.001	<0.001	TRUE
		Simple median	74	0.001515015	0.000384672	0.002645357	<b>0.004331445</b>			

		Weighted median	74	0.001572143	0.000420633	0.002723654	<b>0.005846747</b>			
		Inverse variance weighted	74	0.001425547	0.00031976	0.002531334	<b>0.01151163</b>			
		Weighted mode	74	0.002061779	-1.15391E-05	0.004135097	<b>0.04574852</b>			
short sleep		Maximum likelihood	24	0.2165086	0.03589388	0.3971234	<b>0.01879793</b>			
		MR Egger	24	0.3348712	-1.16686826	1.8366108	0.66632915			
		Simple median	24	0.1760969	-0.09627332	0.4484672	0.2131011	<0.001	<0.001	TRUE
		Weighted median	24	0.1463024	-0.1424724	0.4350771	0.28507261			
		Inverse variance weighted	24	0.1977774	-0.11671334	0.5122682	0.21772217			
		Weighted mode	24	0.143138	-0.33985844	0.6261344	0.58772338			
long sleep		Maximum likelihood	9	0.0610509	-0.38838287	0.5104847	0.79005007			
		MR Egger	9	1.7246724	-0.09911956	3.5484644	0.10622357			
		Simple median	9	0.52867507	-0.21298887	1.270339	0.14066787	0.012017	<0.001	TRUE
		Weighted median	9	0.61574995	0.02783876	1.2036611	<b>0.03869976</b>			
		Inverse variance weighted	9	0.05682341	-0.62276529	0.7364121	0.86982228			
		Weighted mode	9	0.61915885	0.02888676	1.2094309	0.06784479			
insomnia		Maximum likelihood	39	-0.04141687	-0.09349476	0.01066102	0.1190526			
		MR Egger	39	-0.17040557	-0.49002774	0.1492166	0.302817			
		Simple median	39	-0.03601269	-0.11887415	0.04684876	0.4053931	<0.001	<0.001	TRUE
		Weighted median	39	-0.03334873	-0.12159351	0.05489605	0.4473736			
		Inverse variance weighted	39	-0.04212378	-0.13712576	0.0528782	0.3848132			
	SHBG	Weighted mode	39	-0.03631255	-0.15732903	0.08470393	0.558711			
chronotype		Maximum likelihood	146	0.005091709	-0.007981119	0.01816454	0.44522707			
		MR Egger	146	-0.035178371	-0.121051082	0.05069434	0.42333959			
		Simple median	146	0.020203354	-0.000325956	0.04073267	0.05628266	<0.001	<0.001	TRUE
		Weighted median	146	0.010818454	-0.011024343	0.03266125	0.31115015			
		Inverse variance weighted	146	0.004934599	-0.023479021	0.03334822	0.73356016			



sleep duration	Weighted mode	146	0.020590949	-0.018415373	0.05959727	0.32903588			
	Maximum likelihood	74	-0.000850561	-0.001248368	-4.53E-04	<b><i>2.7808E-05</i></b>			
	MR Egger	74	0.00151032	-0.001465585	4.49E-03	<b><i>0.3231982</i></b>			
	Simple median	74	-0.000715985	-0.0013897	-4.23E-05	<b><i>0.02515924</i></b>	<0.001	<0.001	TRUE
	Weighted median	74	2.03508E-05	-0.000644735	6.85E-04	0.9542575			
	Inverse variance weighted	74	-0.000795274	-0.001602096	1.15E-05	0.05336589			
short sleep	Weighted mode	74	0.000410732	-0.000726635	1.55E-03	0.4397475			
	Maximum likelihood	24	-0.08768617	-0.1878169	0.01244457	0.08608795			
	MR Egger	24	-0.22346265	-0.9682575	0.52133223	0.56247829			
	Simple median	24	-0.1185447	-0.2606237	0.02353432	0.1284589	<0.001	<0.001	TRUE
	Weighted median	24	-0.08440664	-0.2339331	0.06511986	0.26186904			
	Inverse variance weighted	24	-0.08223548	-0.2386892	0.07421825	0.30290741			
long sleep	Weighted mode	24	-0.13465847	-0.4044731	0.13515615	0.35039649			
	Maximum likelihood	9	0.4352779	0.1644176	0.7061382	<b><i>0.001634054</i></b>			
	MR Egger	9	-0.80821178	-2.3554896	0.7390661	0.34000437			
	Simple median	9	0.09434516	-0.2765125	0.4652029	0.635273351	<0.001	<0.001	TRUE
	Weighted median	9	0.08346259	-0.2360584	0.4029836	0.612361542			
	Inverse variance weighted	9	0.37208904	-0.1726108	0.9167889	0.180605658			
	Weighted mode	9	0.02993103	-0.3022673	0.3621294	0.878036377			

Italics that appear in the table indicate that the analysis is statistically significant ( $p < 0.05$ )