

Supplementary Material

Biological Insights Into Muscular Strength: Genetic Findings in the UK Biobank

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Supplementary Table S1. Genetic loci associated with grip strength in discovery and replication datasets.

SNP	CHR	position (GRCh37)	Nearest gene	Effect allele	Other allele	Discovery				Replication		
						EAF	Beta	Se	P-value	Beta	Se	P-value
rs1421085	16	53800954	FTO	C	T	0.4	-0.004	0.0003	5.4e-38	-0.004	0.0005	4.9e-22
rs12928404	16	28847246	ATXN2L	C	T	0.41	-0.003	0.0003	1.0e-25	-0.002	0.0004	1.1e-07
rs13107325	4	103188709	SLC39A8	T	C	0.075	-0.006	0.0006	4.4e-23	-0.005	0.0008	2.0e-10
rs10203386	2	25136866	ADCY3	A	T	0.45	-0.003	0.0003	1.6e-20	-0.003	0.0004	2.7e-09
rs543874	1	177889480	ENSG00000254154	G	A	0.21	-0.004	0.0004	3.8e-20	-0.003	0.0005	3.0e-07
rs77226405	18	58077260	MC4R	A	C	0.02	0.01	0.0011	5.4e-19	0.007	0.0016	2.1e-05
rs6752706	2	629831	TMEM18	C	T	0.82	-0.004	0.0004	3.9e-18	-0.003	0.0006	2.9e-09
rs2744475	6	50784880	TFAP2B	G	C	0.29	-0.003	0.0003	6.5e-17	-0.003	0.0005	3.9e-09
rs2814949	6	34656722	C6orf106	G	A	0.36	-0.003	0.0003	6.8e-17	-0.002	0.0005	0.001
rs10871777	18	57851763	ENSG00000267620	G	A	0.24	-0.003	0.0004	7.6e-17	-0.003	0.0005	7.2e-08
rs3821269	2	70698590	TGFA	G	A	0.5	0.002	0.0003	3.5e-15	0.002	0.0004	0.00038
rs12225051	11	47571967	CELF1	T	C	0.28	0.003	0.0004	7.2e-15	0.003	0.0005	2.2e-08
rs62106258	2	417167	LINC01874	C	T	0.048	0.006	0.0007	3.3e-14	0.007	0.001	1.6e-12
rs3810291	19	47569003	ZC3H4	A	G	0.68	-0.002	0.0003	1.3e-13	-0.002	0.0005	0.00038
rs1243188	10	21908803	MLLT10	C	T	0.3	-0.003	0.0003	1.6e-13	-0.002	0.0005	1.1e-06
rs2431112	5	103931707	RP11-6N13.1	A	G	0.44	-0.002	0.0003	1.7e-13	-0.002	0.0004	2.4e-06
rs10788958	1	54040670	GLIS1	G	C	0.65	0.002	0.0003	1.2e-12	0.002	0.0005	0.001
rs78648104	6	50683009	TFAP2D	C	T	0.086	0.004	0.0006	1.3e-12	0.002	0.0008	0.0016
rs660010	18	53310969	TCF4	C	G	0.14	0.003	0.0004	1.8e-12	0.003	0.0006	9.6e-07
rs13130484	4	45175691	ENSG00000248744	T	C	0.43	-0.002	0.0003	2.0e-12	-0.002	0.0004	0.00021
rs4549685	7	39326478	POU6F2	T	C	0.33	0.002	0.0003	2.0e-12	0.002	0.0005	8.1e-06
rs17391694	1	78623626	RNFT1P2	T	C	0.14	-0.003	0.0005	2.8e-12	-0.003	0.0006	1.2e-06
rs6499240	16	69686912	NFAT5	G	A	0.59	-0.002	0.0003	3.7e-12	-0.002	0.0004	5.6e-08
rs80135947	17	65836001	BPTF	C	A	0.2	-0.003	0.0004	4.8e-12	-0.003	0.0006	3.7e-09
rs2430740	12	15041938	C12orf60	G	T	0.39	-0.002	0.0003	6.0e-12	-0.002	0.0005	0.00039
rs2260051	6	31591918	PRRC2A	T	A	0.56	-0.002	0.0003	7.1e-12	-0.002	0.0004	3.0e-08

rs1556659	10	130834698	ENSG00000232985	T	C	0.38	0.002	0.0003	1.1e-11	0.002	0.0005	4.6e-06
rs7165759	15	80988600	ABHD17C	A	G	0.3	0.002	0.0003	1.4e-11	0.002	0.0005	5.1e-06
rs9257280	6	28833507	HCG14	T	C	0.23	0.003	0.0004	2.6e-11	0.002	0.0005	0.0034
rs6738113	2	135634581	CCNT2-AS1	A	G	0.36	0.002	0.0003	4.6e-11	0.002	0.0005	7.7e-07
rs10035289	5	153095918	GRIA1	G	A	0.53	0.002	0.0003	9.0e-11	0.001	0.0004	0.0011
rs147730268	12	123024476	KNTC1	T	G	0.088	0.004	0.0006	9.6e-11	0.003	0.0008	0.00022
rs72917544	2	175241566	CIR1	A	G	0.19	0.003	0.0004	1.5e-10	0.003	0.0006	5.6e-06
rs181617194	12	122011598	KDM2B	C	T	0.041	0.005	0.0009	5.4e-10	0.004	0.0012	0.0035
rs6265	11	27679916	BDNF	T	C	0.19	0.002	0.0004	7.1e-10	0.002	0.0006	0.00061
rs11236203	11	74378000	POLD3	G	T	0.5	-0.002	0.0003	8.4e-10	-0.001	0.0004	0.0028
rs2760975	6	32560771	HLA-DRB1	A	G	0.17	-0.003	0.0005	9.7e-10	-0.003	0.0006	7.0e-06
rs12367809	12	50256063	ENSG00000257253	T	C	0.37	-0.002	0.0003	1.2e-09	-0.002	0.0005	1.7e-05
rs4677611	3	71407890	FOXP1	T	C	0.49	0.002	0.0003	1.3e-09	0.001	0.0004	0.0052
rs11121529	1	10271688	KIF1B	G	C	0.11	-0.003	0.0005	2.1e-09	-0.003	0.0007	0.00022
rs113230003	19	18460956	PGPEP1	A	G	0.26	0.002	0.0004	2.2e-09	0.002	0.0005	1.6e-05
rs2439823	10	99778226	CRTAC1	G	A	0.55	-0.002	0.0003	2.6e-09	-0.002	0.0004	2.7e-06
rs6759321	2	136322676	R3HDM1	T	G	0.24	0.002	0.0004	2.7e-09	0.003	0.0005	9.6e-07
rs11766468	7	2082604	MAD1L1	A	G	0.15	0.003	0.0004	2.8e-09	0.003	0.0006	4.1e-06
rs11689199	2	100820421	LINC01104	G	A	0.4	0.002	0.0003	3.1e-09	0.001	0.0005	0.005
rs2307111	5	75003678	POC5	C	T	0.39	0.002	0.0003	3.1e-09	0.002	0.0005	0.00024
rs2053682	5	170599327	RANBP17	A	C	0.68	-0.002	0.0003	3.6e-09	-0.002	0.0005	2.6e-05
rs2206929	20	50899693	RP4-723E3.1	C	T	0.29	0.002	0.0003	5.4e-09	0.001	0.0005	0.0088
rs7955910	12	122654382	LRRC43	T	G	0.48	-0.002	0.0003	5.5e-09	-0.001	0.0004	0.00085
rs11594905	10	77659733	C10orf11	A	G	0.14	-0.003	0.0005	6.3e-09	-0.002	0.0006	0.0094
rs2625387	11	43613426	MIR129-2	A	G	0.61	0.002	0.0003	9.7e-09	0.001	0.0005	0.0029
rs9383061	6	15477610	JARID2	A	C	0.32	0.002	0.0003	1.0e-08	0.002	0.0005	0.00098
rs286818	5	107433446	FBXL17	A	T	0.17	0.002	0.0004	1.1e-08	0.002	0.0006	0.00062
rs12311114	12	124460703	ZNF664:FAM101A	A	C	0.31	-0.002	0.0003	1.2e-08	-0.002	0.0005	8.0e-05
rs1513475	3	35724256	ARPP21	C	T	0.35	0.002	0.0003	1.4e-08	0.002	0.0005	0.00044

rs4692996	4	94992328	RP11-363G15.2	C	T	0.4	0.002	0.0003	1.4e-08	0.001	0.0005	0.002
rs10807138	6	34184938	CYCSP55	A	G	0.8	0.002	0.0004	1.7e-08	0.002	0.0006	0.0014
rs117642368	17	43399058	MAP3K14	C	G	0.11	-0.003	0.0005	2.3e-08	-0.002	0.0007	0.0072
rs12507029	4	80853827	ANTXR2	T	C	0.64	0.002	0.0003	2.7e-08	0.001	0.0005	0.0052
rs12599952	16	72034653	PKD1L3	A	G	0.32	0.002	0.0003	3.1e-08	0.002	0.0005	5.5e-06
rs61872990	10	118649443	ENO4:KIAA1598	C	T	0.17	-0.002	0.0004	3.2e-08	-0.002	0.0006	0.00027
rs12475388	2	27039792	CDKN2AIPNLP2	A	G	0.49	0.002	0.0003	3.4e-08	0.001	0.0004	0.00091
rs28620278	15	56959028	ZNF280D	T	C	0.4	-0.002	0.0003	3.5e-08	-0.002	0.0005	2.9e-05
rs4952499	2	40381921	SLC8A1-AS1	T	C	0.74	-0.002	0.0004	4.5e-08	-0.001	0.0005	0.0045

SNP associations ordered according to significance in discovery analysis.

SNP, single-nucleotide polymorphism; CHR, chromosome, EAF, effect allele frequency

Supplementary Table S2. Functional annotation of replicated single-nucleotide polymorphisms (SNPs).									
SNP	CHR	Position	Nearest Gene	Distance to nearest gene	function	CADD	RDB	eQTL[aligned direction*]	OMIM
rs1421085	16	53800954	FTO	0	intronic	14.77	5		Growth retardation, developmental delay, facial dysmorphism (FTO)
rs12928404	16	28847246	ATXN2L	0	intronic	0.002	1b	TUFM (Whole_Blood, Skin_Sun_Exposed_Lower_leg), SULT1A2 (Whole_Blood)	Combined oxidative phosphorylation deficiency 4 (TUFM)
rs13107325	4	103188709	SLC39A8	0	exonic	34	5		Congenital disorder of glycosylation, type Iin (SLC39A8)
rs10203386	2	25136866	ADCY3	0	intronic	4.996	5	ADCY3 (Whole_Blood, Nerve_Tibial), DNAJC27 (Whole_Blood)	
rs543874	1	177889480	ENSG00000254154	8443	intergenic	9.231	7		
rs77226405	18	58077260	MC4R			NA	NA		
rs6752706	2	629831	TMEM18	37504	intergenic	5.877	6		
rs2744475	6	50784880	TFAP2B	1556	intergenic	3.794	5		Char syndrome, Patent ductus arteriosus 2 (TFAP2B)
rs2814949	6	34656722	C6orf106	0	intronic	1.61	6	UHRF1BP1 (Artery_Tibial, Cells_Transformed_fibroblasts, Adipose_Subcutaneous)	
rs10871777	18	57851763	ENSG00000267620	12025	intergenic	0.967	6		
rs3821269	2	70698590	TGFA	0	intronic	2.824	NA	TGFA (Testis)	Alstrom syndrome, Orofacial cleft-2 (TGFA)
rs12225051	11	47571967	CELF1	0	intronic	3.125	5	C1QTNF4 (Adipose_Subcutaneous, Skin_Sun_Exposed_Lower_leg), MADD (Artery_Tibial)	Myotonic dystrophy 1 (CELF1)
rs62106258	2	417167	LINC01874	0	downstream	19.65	7		

rs3810291	19	47569003	ZC3H4	0	UTR3	5.093	5		
rs1243188	10	21908803	MLLT10	0	intronic	1.58	7		Leukemia, acute myeloid (MLLT10)
rs2431112	5	103931707	RP11-6N13.1	0	ncRNA_intronic	1.534	NA		
rs10788958	1	54040670	GLIS1	0	intronic	9.244	5		
rs78648104	6	50683009	TFAP2D	0	exonic	12.97	4		
rs660010	18	53310969	TCF4	0	intronic	0.072	7		Corneal dystrophy, Fuchs endothelial, 3, Pitt-Hopkins syndrome (TCF4)
rs13130484	4	45175691	ENSG00000248744	122022	intergenic	6.336	7		
rs4549685	7	39326478	POU6F2	0	intronic	2.552	7		Wilms tumor susceptibility-5 (POU6F2)
rs17391694	1	78623626	RNFT1P2	12539	intergenic	2.61	1f	FUBP1 (Artery_Tibial, Esophagus_Mucosa, Skin_Sun_Exposed_Lower_leg)	
rs6499240	16	69686912	NFAT5	0	intronic	0.681	6	CLEC18A (Whole_Blood, Thyroid, Adipose_Subcutaneous)	
rs80135947	17	65836001	BPTF	0	intronic	0.031	6		Alzheimer disease (BPTF)
rs2430740	12	15041938	C12orf60	0	intronic	NA	NA	ERP27 (Skin_Sun_Exposed_Lower_leg, Thyroid), RP11-233G1.4 (Testis)	
rs2260051	6	31591918	PRRC2A	0	intronic	NA	NA		
rs1556659	10	130834698	ENSG00000232985	76372	intergenic	4.304	5		
rs7165759	15	80988600	ABHD17C	0	intronic	7.572	4		
rs9257280	6	28833507	HCG14	1100	intergenic	4.58	4	TRIM27 (Whole_Blood, Esophagus_Mucosa, Muscle_Skeletal)	
rs6738113	2	135634581	CCNT2-AS1	0	ncRNA_intronic	2.154	6	TMEM163 (Testis, Esophagus_Muscularis, Artery_Tibial)	

rs10035289	5	153095918	GRIA1	0	intronic	2.982	5		
rs147730268	12	123024476	KNTC1	0	intronic	0.894	6		
rs72917544	2	175241566	CIR1	0	intronic	12.16	6		
rs181617194	12	122011598	KDM2B	0	intronic	1.754	6		
rs6265	11	27679916	BDNF	0	exonic	24.1	6	BDNF (Nerve_Tibial, Thyroid)	Central hypoventilation syndrome, congenital (BDNF)
rs11236203	11	74378000	POLD3	0	intronic	1.664	5		
rs2760975	6	32560771	HLA-DRB1	3146	upstream	NA	NA		
rs12367809	12	50256063	ENSG00000257253	0	ncRNA_intronic	0.633	7	FAIM2 (Testis)	
rs4677611	3	71407890	FOXP1	0	intronic	4.89	3a		Mental retardation with language impairment and with or without autistic features (FOXP1)
rs11121529	1	10271688	KIF1B	0	UTR5	18.01	4	KIF1B (Whole_Blood), PGD (Cells_Transformed_fibroblasts, Muscle_Skeletal)	Charcot-Marie-Tooth disease, type 2A1, Pheochromocytoma, Neuroblastoma, susceptibility to, 1 (KIF1B)
rs113230003	19	18460956	PGPEP1	0	intronic	0.291	6		
rs2439823	10	99778226	CRTAC1	0	intronic	0.3	5		
rs6759321	2	136322676	R3HDM1	0	intronic	1.432	7	DARS (Thyroid), MCM6 (Cells_Transformed_fibroblasts), UBXM4 (Pancreas)	Hypomyelination with brainstem and spinal cord involvement and leg spasticity (DARS), Lactase persistence/nonpersistence (MCM6)
rs11766468	7	2082604	MAD1L1	0	intronic	3.622	4		Lymphoma, somatic, Prostate cancer, somatic (MAD1L1)
rs11689199	2	100820421	LINC01104	4295	intergenic	4.346	5	AFF3 (Artery_Aorta)	

rs2307111	5	75003678	POC5	0	exonic	0.049	5	ANKDD1B (Nerve_Tibial, Thyroid), GCNT4 (Testis)	
rs2053682	5	170599327	RANBP17	0	intronic	14.6	7		
rs2206929	20	50899693	RP4-723E3.1	0	ncRNA_intronic	0.935	NA	ZFP64 (Cells_Transformed_fibroblasts, Artery_Tibial)	
rs7955910	12	122654382	LRRC43	0	intronic	0.54	7	LRRC43 (Nerve_Tibial)	
rs11594905	10	77659733	C10orf11	0	intronic	16.59	4		Albinism, oculocutaneous, type VII (C10orf11)
rs2625387	11	43613426	MIR129-2	10393	intergenic	2.083	NA	HSD17B12 (Skin_Sun_Exposed_Lower_leg, Thyroid, Artery_Tibial)	
rs9383061	6	15477610	JARID2	0	intronic	0.807	5		
rs286818	5	107433446	FBXL17	0	intronic	4.126	7		
rs12311114	12	124460703	ZNF664:FAM101A	0	intronic	3.424	6	CCDC92 (Heart_Left_Ventricle, Adipose_Subcutaneous), ZNF664 (Thyroid)	
rs1513475	3	35724256	ARPP21	0	intronic	2.243	7	ARPP21 (Artery_Tibial, Artery_Aorta)	
rs4692996	4	94992328	RP11-363G15.2	46615	intergenic	0.646	7		
rs10807138	6	34184938	CYCSP55	2278	intergenic	2.707	7		
rs117642368	17	43399058	MAP3K14	4644	intergenic	1.227	4	CRHR1 (Cells_Transformed_fibroblasts, Adipose_Subcutaneous, Lung)	
rs12507029	4	80853827	ANTXR2	0	intronic	2.539	7		Hyaline fibromatosis syndrome (ANTXR2)
rs12599952	16	72034653	PKD1L3	0	upstream	0.467	7	DHODH (Artery_Tibial, Nerve_Tibial, Cells_Transformed_fibroblasts)	Miller syndrome (DHODH)
rs61872990	10	118649443	ENO4:KIAA1598	0	intronic	2.942	6	KIAA1598 (Whole_Blood, Cells_Transformed_fibroblasts)	
rs12475388	2	27039792	CDKN2AIPNLP2	10245	intergenic	1.724	4	KHK (Skin_Sun_Exposed_Lower_leg), MAPRE3 (Skin_Sun_Exposed_Lower_leg),	Fructosuria (KHK)

								DPYSL5 (Brain_Cerebellum)	
rs28620278	15	56959028	ZNF280D	0	exonic	2.125	7		
rs4952499	2	40381921	SLC8A1-AS1	0	ncRNA_intronic	12.86	7		
<p>* The direction of effect to gene expression after aligning risk increasing allele of GWAS and tested allele of eQTLs; "+" when the risk increasing allele increase the expression of the gene, "-" when the risk increasing allele decrease the expression of the gene. CHR, chromosome; CADD, Combined Annotation Dependent Depletion; RBD, Regulome database score; NA, information not available for this SNP.</p>									

Supplementary Table S3. Genetic loci associated with grip strength in meta-analysis.

SNP	CHR	position	Nearest gene	Effect allele	Other allele	EAF	Beta	Se	P-value
rs11642015	16	53802494	FTO	T	C	0.4023	-0.004	0.0003	7.5e-49
rs62037364	16	28868695	SH2B1	A	G	0.4076	-0.003	0.0003	2.2e-26
rs13135092	4	103198082	SLC39A8	A	G	0.9169	0.005	0.0005	3.2e-26
rs10203386	2	25136866	ADCY3	A	T	0.452	-0.003	0.0003	1.6e-23
rs35142762	2	636790	TMEM18	T	C	0.8282	-0.004	0.0004	5.4e-22
rs539515	1	177889025	SEC16B	A	C	0.7924	0.003	0.0003	3.1e-21
rs62107261	2	422144	FAM150B	T	C	0.9518	-0.006	0.0007	7.8e-21
rs2744475	6	50784880	TFAP2B	C	G	0.7084	0.003	0.0003	1.5e-20
rs2726036	16	28347140	NPIP6	A	C	0.5991	0.003	0.0003	3.4e-20
rs34633411	18	57854694	MC4R	T	C	0.2374	-0.003	0.0003	2.1e-19
rs11039266	11	47532395	CELF1	T	G	0.7219	-0.003	0.0003	2.7e-18
rs8073510	17	65839210	BPTF	A	G	0.8045	0.003	0.0004	1.3e-16
rs1243182	10	21916728	MLLT10	T	C	0.3108	-0.002	0.0003	3.5e-16
rs11645565	16	69896248	WWP2	A	G	0.4308	-0.002	0.0003	7.1e-16
rs2260051	6	31591918	PRRC2A	A	T	0.4425	0.002	0.0003	1.0e-15
rs2431112	5	103931707	NUDT12	A	G	0.4407	-0.002	0.0003	2.2e-15
rs9469899	6	34793124	UHRF1BP1	A	G	0.3572	-0.002	0.0003	2.5e-15
rs1642294	18	53374913	TCF4	C	G	0.145	0.003	0.0004	5.9e-15
rs3771498	2	70720070	TGFA	T	C	0.5169	0.002	0.0003	1.4e-14
rs4549685	7	39326478	POU6F2	T	C	0.3305	0.002	0.0003	4.5e-14
rs6711390	2	135629439	ACMSD	T	C	0.3604	0.002	0.0003	6.0e-14
rs11873305	18	58049192	MC4R	A	C	0.9608	-0.005	0.0007	8.9e-14
rs1556659	10	130834698	MGMT	T	C	0.3832	0.002	0.0003	1.0e-13
rs7165759	15	80988600	ABHD17C	A	G	0.2981	0.002	0.0003	1.3e-13
rs62512210	8	116623548	TRPS1	T	C	0.9142	-0.004	0.0005	1.9e-13
rs7571826	2	230623127	DNER	T	C	0.3275	-0.002	0.0003	3.7e-13

rs11671304	19	47564643	TMEM160	T	C	0.6729	-0.002	0.0003	4.1e-13
rs72917544	2	175241566	CIR1	A	G	0.1861	0.003	0.0004	9.3e-13
rs13130484	4	45175691	GNPDA2	T	C	0.4333	-0.002	0.0003	1.0e-12
rs2287226	12	14987096	ART4	A	G	0.6019	0.002	0.0003	1.2e-12
rs6759321	2	136322676	R3HDM1	T	G	0.2402	0.002	0.0003	2.4e-12
rs34517439	1	78450517	GIPC2	A	C	0.1247	-0.003	0.0004	2.5e-12
rs563296	10	99772404	CRTAC1	A	G	0.5598	-0.002	0.0003	3.4e-12
rs10788958	1	54040670	GLIS1	C	G	0.3512	-0.002	0.0003	3.7e-12
rs10846071	12	15016236	NA	T	C	0.3949	-0.002	0.0003	3.8e-12
rs2760975	6	32560771	HLA-DRB1	A	G	0.168	-0.003	0.0004	5.1e-12
rs11766468	7	2082604	MAD1L1	A	G	0.1467	0.003	0.0004	7.8e-12
rs113315602	6	32574575	HLA-DRB1	A	C	0.9027	0.003	0.0005	9.1e-12
rs245774	5	170530930	RANBP17	A	G	0.2717	0.002	0.0003	1.2e-11
rs12367809	12	50256063	BCDIN3D	T	C	0.3684	-0.002	0.0003	1.2e-11
rs147730268	12	123024476	KNTC1	T	G	0.0883	0.003	0.0005	1.8e-11
rs113230003	19	18460956	PGPEP1	A	G	0.2596	0.002	0.0003	1.9e-11
rs2213581	6	32388546	BTNL2	T	C	0.2346	0.002	0.0003	2.4e-11
rs7755875	6	28854059	TRIM27	A	G	0.3193	0.002	0.0003	2.6e-11
rs12910459	15	56998196	ZNF280D	T	C	0.4326	-0.002	0.0003	3.1e-11
rs2126165	5	153167595	GRIA1	A	G	0.4889	-0.002	0.0003	3.8e-11
rs41268905	6	32097611	FKBPL	A	G	0.1048	-0.003	0.0005	4.1e-11
rs56068671	6	50597378	TFAP2D	T	G	0.0832	0.003	0.0005	5.5e-11
rs12599952	16	72034653	DHODH	A	G	0.3217	0.002	0.0003	7.3e-11
rs62253653	3	53013267	SFMBT1	A	G	0.7036	-0.002	0.0003	9.5e-11
rs4575361	12	124410529	CCDC92	A	T	0.689	0.002	0.0003	1.2e-10
rs879620	16	4015729	ADCY9	T	C	0.6152	-0.002	0.0003	1.2e-10

rs1454687	3	94038085	DHFRL1	C	G	0.4846	-0.002	0.0003	1.9e-10
rs11121542	1	10393920	KIF1B	A	G	0.122	-0.003	0.0004	2.8e-10
rs34916901	6	26286149	HIST1H4H	T	G	0.5116	0.002	0.0003	3.2e-10
rs3847479	10	118833263	NA	A	G	0.1744	-0.002	0.0004	4.2e-10
rs12691307	16	29939877	KCTD13	A	G	0.4398	0.002	0.0003	5.6e-10
rs62004866	15	74223118	LOXL1	C	G	0.8865	0.003	0.0004	5.6e-10
rs12195114	6	26708207	NA	A	G	0.7513	-0.002	0.0003	6.5e-10
rs35511257	6	32545392	HLA-DRB1	C	G	0.0956	-0.003	0.0005	7.2e-10
rs2237149	6	15412065	JARID2	A	C	0.4131	0.002	0.0003	7.5e-10
rs34341	5	74934009	ANKDD1B	A	T	0.4242	0.002	0.0003	8.4e-10
rs11030104	11	27684517	BDNF	A	G	0.7964	-0.002	0.0003	8.7e-10
rs115131074	7	69238493	AUTS2	A	T	0.0481	-0.004	0.0007	9.0e-10
rs72977282	11	74300441	POLD3	A	T	0.4132	-0.002	0.0003	9.0e-10
rs73728611	6	32589363	HLA-DQA1	A	G	0.8765	0.003	0.0004	9.9e-10
rs181617194	12	122011598	KDM2B	T	C	0.9588	-0.005	0.0008	1.2e-09
rs7955910	12	122654382	LRRC43	T	G	0.4825	-0.002	0.0003	1.4e-09
rs1513475	3	35724256	ARPP21	T	C	0.6516	-0.002	0.0003	1.5e-09
rs40067	5	107439012	FBXL17	A	G	0.1702	0.002	0.0004	1.6e-09
rs4776614	15	73082468	ADPGK	C	G	0.3268	0.002	0.0003	1.9e-09
rs7249	19	18391171	JUND	T	C	0.3669	0.002	0.0003	2.0e-09
rs1951716	14	94007075	UNC79	T	C	0.634	-0.002	0.0003	2.4e-09
rs62442203	7	28829253	CREB5	C	G	0.4039	0.002	0.0003	2.7e-09
rs58383713	4	80796055	ANTXR2	A	C	0.196	-0.002	0.0004	3.1e-09
rs11223444	11	133221928	OPCML	A	G	0.4476	-0.002	0.0003	3.2e-09
rs4677611	3	71407890	FOXP1	T	C	0.4877	0.002	0.0003	3.2e-09
rs10807136	6	34178558	HMGA1	T	C	0.1197	-0.003	0.0004	3.3e-09

rs1627854	2	26953540	KCNK3	A	G	0.528	0.002	0.0003	3.5e-09
rs202941	14	27686205	NOVA1	T	C	0.6156	0.002	0.0003	4.2e-09
rs12447992	16	64518662	CDH11	A	C	0.8651	-0.002	0.0004	4.7e-09
rs76808502	2	145631179	ZEB2	C	G	0.0291	0.005	0.0009	5.2e-09
rs117108573	6	32489679	HLA-DRB5	T	C	0.0816	-0.003	0.0005	5.6e-09
rs11689199	2	100820421	AFF3	A	G	0.5978	-0.002	0.0003	5.7e-09
rs4755720	11	43628749	HSD17B12	T	C	0.6084	0.002	0.0003	6.2e-09
rs1039716	1	215566593	KCTD3	T	C	0.7829	0.002	0.0003	6.5e-09
rs10279237	7	69868489	AUTS2	T	C	0.8003	0.002	0.0004	6.5e-09
rs7658243	4	94995978	SMARCAD1	A	C	0.5768	-0.002	0.0003	6.6e-09
rs529200	3	173114305	NLGN1	A	G	0.4741	0.002	0.0003	6.7e-09
rs61873510	10	102626510	FAM178A	T	G	0.3287	-0.002	0.0003	7.7e-09
rs4858934	3	88224304	CGGBP1	T	C	0.1147	0.002	0.0004	8.7e-09
rs3134986	6	32644553	NA	T	C	0.2899	-0.002	0.0003	9.1e-09
rs66679256	4	18351898	LCORL	T	C	0.4461	-0.002	0.0003	9.2e-09
rs13132853	4	38680015	KLF3	A	G	0.6352	-0.002	0.0003	9.3e-09
rs207299	4	19096263	LCORL	T	C	0.2738	0.002	0.0003	9.6e-09
rs61992671	14	101531854	NA	A	G	0.5063	-0.002	0.0003	9.7e-09
rs1523766	3	77670448	ROBO2	A	G	0.4979	-0.002	0.0003	1.0e-08
rs17249398	4	102507114	BANK1	A	G	0.0272	-0.005	0.0009	1.2e-08
rs77012907	2	24794214	NCOA1	A	G	0.9098	0.003	0.0005	1.2e-08
rs7231880	18	57967186	MC4R	T	G	0.7065	0.002	0.0003	1.2e-08
rs1529883	15	47916872	SEMA6D	C	G	0.3453	0.002	0.0003	1.3e-08
rs3113767	4	181536946	TENM3	T	C	0.845	0.002	0.0004	1.3e-08
rs6904571	6	40349366	LRFN2	T	C	0.2588	0.002	0.0003	1.3e-08
rs887013	7	39427769	POU6F2	A	T	0.6818	0.002	0.0003	1.4e-08

rs9320823	6	98429337	MMS22L	T	C	0.3981	0.002	0.0003	1.4e-08
rs9579775	13	20616557	ZMYM2	A	C	0.8646	0.002	0.0004	1.4e-08
rs9877408	3	81974558	GBE1	A	G	0.5984	0.002	0.0003	1.4e-08
rs17024393	1	110154688	GNAT2	T	C	0.9742	0.005	0.0009	1.5e-08
rs2206929	20	50899693	ZFP64	T	C	0.7096	-0.002	0.0003	1.5e-08
rs11084110	19	52220077	NA	T	C	0.7068	0.002	0.0003	1.6e-08
rs453325	6	29906313	HLA-A	A	C	0.7549	-0.002	0.0003	1.6e-08
rs5750673	22	39110124	GTPBP1	A	G	0.2776	-0.002	0.0003	1.7e-08
rs805343	2	54193193	PSME4	T	C	0.475	-0.002	0.0003	1.7e-08
rs12680855	8	95582655	KIAA1429	A	G	0.6826	-0.002	0.0003	1.8e-08
rs10758232	9	33775652	PRSS3	C	G	0.6653	0.002	0.0003	2.0e-08
rs303760	18	21083738	C18orf8	T	C	0.346	-0.002	0.0003	2.0e-08
rs329120	5	133861756	JADE2	T	C	0.418	0.002	0.0003	2.2e-08
rs3843540	7	99126640	ZKSCAN5	T	C	0.8514	-0.002	0.0004	2.3e-08
rs17769552	17	43927290	SPPL2C	A	G	0.2235	-0.002	0.0003	2.3e-08
rs6905419	6	12945093	PHACTR1	T	C	0.2814	-0.002	0.0003	2.4e-08
rs4886869	15	77799657	HMG20A	A	G	0.3902	0.002	0.0003	2.5e-08
rs6424971	1	185110367	TRMT1L	T	C	0.4829	0.002	0.0003	2.5e-08
rs73077175	3	49774658	IP6K1	A	G	0.3329	0.002	0.0003	2.6e-08
rs901850	3	4758586	ITPR1	T	G	0.256	0.002	0.0003	2.9e-08
rs9641509	7	113622594	PPP1R3A	T	G	0.6135	0.002	0.0003	3.1e-08
rs4452060	19	45347911	PVRL2	A	C	0.42	0.002	0.0003	3.3e-08
rs2044469	2	174961488	OLA1	A	G	0.6525	0.002	0.0003	3.3e-08
rs117642368	17	43399058	SPATA32	C	G	0.1073	-0.002	0.0005	3.4e-08
rs4952499	2	40381921	SLC8A1	T	C	0.7403	-0.002	0.0003	3.4e-08
rs12055409	6	33801510	MLN	A	G	0.3428	-0.002	0.0003	3.5e-08

rs143373756	5	153467446	MFAP3	C	G	0.9812	-0.006	0.0011	3.7e-08
rs13017251	2	44221160	LRPPRC	A	G	0.494	0.002	0.0003	3.8e-08
rs74550407	18	58058029	MC4R	A	T	0.0375	0.004	0.0007	3.8e-08
rs830643	3	71667063	FOXP1	A	G	0.4138	0.002	0.0003	4.0e-08
rs1521624	15	79412399	RASGRF1	A	C	0.4716	0.002	0.0003	4.0e-08
rs6428601	1	91231085	BARHL2	A	C	0.4549	0.002	0.0003	4.3e-08
rs1329733	9	92208227	GADD45G	A	G	0.5243	0.002	0.0003	4.3e-08
rs12162265	19	13955161	NANOS3	A	G	0.2384	-0.002	0.0003	4.6e-08
rs9968060	3	62471282	CADPS	T	C	0.6456	-0.002	0.0003	4.7e-08
SNP, single-nucleotide polymorphism; CHR, chromosome, EAF, effect allele frequency									

Supplementary Table S4. Results from two-sample Mendelian Randomization analysis for grip strength and coronary heart disease.

Method	All SNPs		Heterogenic SNPs removed	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Simple median	0.61 (0.51 , 0.74)	<0.0001	0.65 (0.53 , 0.78)	<0.0001
Weighted median	0.52 (0.43 , 0.63)	<0.0001	0.65 (0.54 , 0.79)	<0.0001
Penalized weighted median	0.52 (0.43 , 0.63)	<0.0001	0.64 (0.53 , 0.77)	<0.0001
IVW	0.59 (0.49 , 0.71)	<0.0001	0.69 (0.60 , 0.79)	<0.0001
Penalized IVW	0.59 (0.52 , 0.67)	<0.0001	0.66 (0.58 , 0.76)	<0.0001
Robust IVW	0.58 (0.49 , 0.68)	<0.0001	0.68 (0.59 , 0.78)	<0.0001
Penalized robust IVW	0.59 (0.51 , 0.68)	<0.0001	0.66 (0.58 , 0.76)	<0.0001
MR-Egger	0.36 (0.19 , 0.69)	0.002	0.52 (0.31 , 0.87)	0.013
Penalized MR-Egger	0.41 (0.26 , 0.65)	<0.0001	0.50 (0.31 , 0.82)	0.006
Robust MR-Egger	0.41 (0.25 , 0.67)	<0.0001	0.50 (0.30 , 0.81)	0.006
Penalized robust MR-Egger	0.41 (0.26 , 0.63)	<0.0001	0.49 (0.31 , 0.76)	0.002

Abbreviations: SNP, single nucleotide polymorphism; IVW, inverse-variance weighted; MR, Mendelian Randomization; OR, odds ratio; CI, confidence interval.

Supplementary Table S5. Results from two-sample Mendelian Randomization analysis for grip strength and atrial fibrillation.

Method	All SNPs		Heterogenic SNPs removed	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Simple median	0.69 (0.53 , 0.89)	0.005	0.75 (0.58 , 0.97)	0.028
Weighted median	0.64 (0.49 , 0.82)	<0.0001	0.67 (0.52 , 0.86)	0.002
Penalized weighted median	0.64 (0.50 , 0.83)	0.001	0.67 (0.52 , 0.86)	0.002
IVW	0.69 (0.57 , 0.84)	<0.0001	0.75 (0.62 , 0.90)	0.003
Penalized IVW	0.74 (0.62 , 0.88)	<0.0001	0.77 (0.65 , 0.92)	0.002
Robust IVW	0.71 (0.58 , 0.88)	0.002	0.75 (0.62 , 0.91)	0.005
Penalized robust IVW	0.73 (0.61 , 0.88)	0.001	0.76 (0.63 , 0.91)	0.004
MR-Egger	0.35 (0.17 , 0.70)	0.003	0.40 (0.19 , 0.84)	0.015
Penalized MR-Egger	0.32 (0.17 , 0.58)	<0.0001	0.42 (0.21 , 0.82)	0.011
Robust MR-Egger	0.30 (0.12 , 0.76)	0.011	0.38 (0.14 , 1.00)	0.05
Penalized robust MR-Egger	0.28 (0.11 , 0.71)	0.007	0.39 (0.15 , 1.03)	0.058
Abbreviations: SNP, single nucleotide polymorphism; IVW, inverse-variance weighted; MR, Mendelian Randomization; OR, odds ratio; CI, confidence interval.				