

Table S2. List of enriched pathways in circulating leukocytes of monozygotic twin pairs with discordant sleep durations. False Discovery Rate (FDR) cutoff of < 0.05 was used to designate significance.

Gene Sets Up-regulated in Shorter Sleep Duration	Number of member genes	FDR
KEGG_RIBOSOME	78	0
REACTOME_SRP_DEPENDENT_COTRANSLATIONAL_PROTEIN_TARGETING_TO_MEMBRANE	101	0
REACTOME_PEPTIDE_CHAIN_ELONGATION	80	0
REACTOME_TRANSLATION	130	0
REACTOME_3_UTR_MEDIATED_TRANSLATIONAL_REGULATION	96	0
REACTOME_INFLUENZA_VIRAL_RNA_TRANSCRIPTION_AND_REPLICATION	89	0
REACTOME_INFLUENZA_LIFE_CYCLE	112	0
REACTOME_NONSENSE_MEDIATED_DECAY_ENHANCED_BY_THE_EXON_JUNCTION_COMPLEX	96	0
REACTOME_METABOLISM_OF_RNA	197	0
REACTOME_ACTIVATION_OF_THE_MRNA_UPON_BINDING_OF_THE_CAP_BINDING_COMPLEX	50	0
REACTOME_FORMATION_OF_THE_TERNARY_COMPLEX_AND_SUBSEQUENTLY_THE_43S_COMPLEX	43	0
REACTOME_METABOLISM_OF_MRNA	173	0
REACTOME_METABOLISM_OF_PROTEINS	258	0
REACTOME_RESPIRATORY_ELECTRON_TRANSPORT_ATP_SYNTHESIS_BY_CHEMIOSMOTIC_COUPLING	63	0
REACTOME_RESPIRATORY_ELECTRON_TRANSPORT	49	0
KEGG_OXIDATIVE_PHOSPHORYLATION	80	0.009
REACTOME_TCA_CYCLE_AND_RESPIRATORY_ELECTRON_TRANSPORT	87	0.009
KEGG_PARKINSONS_DISEASE	77	0.023
REACTOME_METABOLISM_OF_NON_CODING_RNA	26	0.025
KEGG_RNA_DEGRADATION	40	0.037
Gene Sets Down-regulated in Shorter Sleep Duration	Number of member genes	FDR
KEGG_FC_GAMMA_R_MEDIATED_PHAGOCYTOSIS	59	0
KEGG_REGULATION_OF_ACTIN_CYTOSKELETON	88	0
KEGG_LEUKOCYTE_TRANSENDOTHELIAL_MIGRATION	55	0
KEGG_FC_EPSILON_RI_SIGNALING_PATHWAY	36	0
REACTOME_INTERFERON_ALPHA_BETA_SIGNALING	44	0
REACTOME_IL_3_5_AND_GM-CSF_SIGNALING	26	0
KEGG_FOCAL_ADHESION	69	0
REACTOME_INTEGRIN_CELL_SURFACE_INTERACTIONS	35	0
PID_AMB2_NEUTROPHILS_PATHWAY	21	0
PID_ALPHASYNUCLEIN_PATHWAY	22	0
REACTOME_SEMAPHORIN_INTERACTIONS	34	0
REACTOME_SIGNALING_BY_SCF_KIT	47	0
REACTOME_REGULATION_OF_SIGNALING_BY_CBL	13	0
ST_INTEGRIN_SIGNALING_PATHWAY	39	0
PID_RHOA_REG_PATHWAY	21	0.001
KEGG_CHEMOKINE_SIGNALING_PATHWAY	91	0.001
REACTOME_REGULATION_OF_KIT_SIGNALING	10	0.001
PID_FGF_PATHWAY	24	0.001
ST_B_CELL_ANTIGEN_RECEPTOR	27	0.001
REACTOME_EXTRACELLULAR_MATRIX_ORGANIZATION	13	0.001
PID_PTP1BPATHWAY	27	0.001
REACTOME_PLATELET_ACTIVATION_SIGNALING_AND_AGGREGATION	109	0.001
REACTOME_DEVELOPMENTAL_BIOLOGY	151	0.001
PID_P38ALPHABETAPATHWAY	20	0.001
BIOCARTA_INTEGRIN_PATHWAY	25	0.001
PID_KITPATHWAY	31	0.002
REACTOME_GPVI_MEDIATED_ACTIVATION_CASCADE	21	0.002
SIG_BCR_SIGNALING_PATHWAY	31	0.004
REACTOME_AXON_GUIDANCE	94	0.005
PID_RAC1_PATHWAY	33	0.005
PID_RETINOIC_ACID_PATHWAY	19	0.005
REACTOME_IL_2_SIGNALING	26	0.005
REACTOME_HEMOSTASIS	209	0.005
PID_GMCSF_PATHWAY	27	0.005

REACTOME_SEMA4D_IN_SEMAPHORIN_SIGNALING	16	0.005
SA_PTEN_PATHWAY	10	0.007
PID_EPOPATHWAY	24	0.007
ST_ERK1_ERK2_MAPK_PATHWAY	20	0.007
REACTOME_GROWTH_HORMONE_RECEPTOR_SIGNALING	14	0.007
PID_THROMBIN_PAR1_PATHWAY	26	0.008
REACTOME_PLATELET_AGGREGATION_PLUG_FORMATION	21	0.009
PID_TCPTP_PATHWAY	22	0.009
SA_B_CELL_RECEPTOR_COMPLEXES	15	0.012
PID_VEGFR1_2_PATHWAY	43	0.012
BIOCARTA_ERK5_PATHWAY	12	0.012
PID_INTEGRIN2_PATHWAY	14	0.012
BIOCARTA_IL2_PATHWAY	15	0.013
PID_IL6_7PATHWAY	29	0.013
ST_DIFFERENTIATION_PATHWAY_IN_PC12_CELLS	21	0.013
REACTOME_INTEGRIN_ALPHAIIB_BETA3_SIGNALING	17	0.014
REACTOME_RESPONSE_TO_ELEVATED_PLATELET_CYTOSOLIC_CA2_	43	0.014
REACTOME_IL_RECEPTOR_SHC_SIGNALING	14	0.015
PID_IL8CXCR2_PATHWAY	27	0.017
KEGG_ADHERENS_JUNCTION	33	0.017
KEGG_B_CELL_RECEPTOR_SIGNALING_PATHWAY	51	0.017
BIOCARTA_NKCELLS_PATHWAY	14	0.017
PID_IL8CXCR1_PATHWAY	21	0.018
REACTOME_INTERFERON_GAMMA_SIGNALING	44	0.018
BIOCARTA_HER2_PATHWAY	12	0.018
PID_IFNGPATHWAY	29	0.019
BIOCARTA_IL6_PATHWAY	15	0.019
BIOCARTA_IL2RB_PATHWAY	27	0.019
SIG_IL4RECEPTOR_IN_B_LYPHOCYTES	16	0.019
REACTOME_CD28_DEPENDENT_VAV1_PATHWAY	9	0.02
BIOCARTA_GH_PATHWAY	16	0.02
REACTOME_SIGNALING_BY_ILS	67	0.02
REACTOME_SEMA4D_INDUCED_CELL_MIGRATION_AND_GROWTH_CONE_COLLAPSE	12	0.02
KEGG_JAK_STAT_SIGNALING_PATHWAY	57	0.02
BIOCARTA_EPO_PATHWAY	13	0.02
PID_CXCR4_PATHWAY	69	0.021
REACTOME_SEMA3A_PLEXIN_REPULSION_SIGNALING_BY_INHIBITING_INTEGRIN_ADHESION	5	0.022
KEGG_NATURAL_KILLER_CELL_MEDIATED_CYTOTOXICITY	75	0.025
BIOCARTA_IL3_PATHWAY	10	0.026
KEGG_CYTOKINE_CYTOKINE_RECEPTOR_INTERACTION	81	0.026
PID_PDGFBRBPATHWAY	86	0.027
KEGG_NON_SMALL_CELL_LUNG_CANCER	33	0.028
PID_MET_PATHWAY	48	0.028
KEGG_TIGHT_JUNCTION	45	0.028
PID_SYNDECAN_4_PATHWAY	16	0.029
BIOCARTA_ECM_PATHWAY	17	0.029
KEGG_COMPLEMENT_AND_COAGULATION_CASCADES	16	0.029
PID_FCR1PATHWAY	44	0.029
REACTOME_ANTIGEN_ACTIVATES_B_CELL_RECEPTOR	26	0.029
SA_MMP_CYTOKINE_CONNECTION	10	0.029
BIOCARTA_PML_PATHWAY	11	0.03
REACTOME_SIGNALING_BY_RHO_GTPASES	53	0.03
PID_ILK_PATHWAY	28	0.03
PID_IL4_2PATHWAY	37	0.03
REACTOME_DEGRADATION_OF_THE_EXTRACELLULAR_MATRIX	7	0.03
PID_MAPKTRKPATHWAY	23	0.03
KEGG_AXON_GUIDANCE	45	0.031
PID_ECADHERIN_KERATINOCYTE_PATHWAY	10	0.031
SIG_PIP3_SIGNALING_IN_B_LYMPHOCYTES	22	0.032
BIOCARTA_RARRXR_PATHWAY	11	0.033
REACTOME_RORA_ACTIVATES_CIRCADIAN_EXPRESSION	16	0.033

REACTOME_CELL_SURFACE_INTERACTIONS_AT_THE_VASCULAR_WALL	44	0.033
REACTOME_L1CAM_INTERACTIONS	34	0.033
PID_ECADHERIN_STABILIZATION_PATHWAY	17	0.034
PID_AVB3_OPN_PATHWAY	20	0.034
BIOCARTA_BIOPEPTIDES_PATHWAY	25	0.034
KEGG_INOSITOL_PHOSPHATE_METABOLISM	23	0.036
BIOCARTA_MAPK_PATHWAY	57	0.036
PID_CXCR3PATHWAY	24	0.036
REACTOME_CIRCADIAN_REPRESSION_OF_EXPRESSION_BY_REV_ERBA	15	0.037
BIOCARTA_BARRESTIN_SRC_PATHWAY	10	0.038
PID_EPHA_FWDPATHWAY	16	0.039
PID_INTEGRIN_CS_PATHWAY	11	0.039
PID_LYMPHANGIOGENESIS_PATHWAY	14	0.04
KEGG_MELANOGENESIS	30	0.04
BIOCARTA_CARM1_PATHWAY	8	0.04
REACTOME_CYTOKINE_SIGNALING_IN_IMMUNE_SYSTEM	173	0.04
REACTOME_YAP1_AND_WWTR1_TAZ_STIMULATED_GENE_EXPRESSION	11	0.041
BIOCARTA_GRANULOCYTES_PATHWAY	8	0.041
KEGG_SULFUR_METABOLISM	8	0.041
PID_RHOA_PATHWAY	24	0.041
PID_UPA_UPAR_PATHWAY	14	0.041
PID_NCADHERINPATHWAY	16	0.041
BIOCARTA_CREB_PATHWAY	14	0.041
REACTOME_SIGNALING_BY_FGFR_IN_DISEASE	56	0.042
BIOCARTA_PYK2_PATHWAY	22	0.043
ST_G_ALPHA_I_PATHWAY	13	0.044
PID_ERBB1_RECEPTOR_PROXIMAL_PATHWAY	25	0.044
REACTOME_TRANSCRIPTIONAL_REGULATION_OF_WHITE_ADIPOCYTE_DIFFERENTIATION	37	0.049
BIOCARTA_UCALPAIN_PATHWAY	11	0.049