

Table 1: Summary of statistical technique, rules to exclude individuals due accelerometer and imputation method adopted in papers using UK Biobank accelerometer dataset. CR is the acronym for Circadian Rhythm and the dash (–) represents no information provided

Paper	CR	Study	Statistical analysis	Excluding criteria	Imputation method
Doherty et al. (2017)	✗	Effect of factors (sex, season, time of day) in physical activities	Non-parametric tests and ANOVA	Non-wear for > 60 min in a day and < 72% h of wear data	Average of similiar times on other days (van Hees et al. 2011, Sabia et al. 2014)
Ramakrishnan et al. (2021)	✗	Physical activities in incidents of cardiovascular disease	Proportional hazards regression	High outliers; > 1% clipped values, non-wear for > 60 min in a day and < 72% hours of wear data (Doherty et al. 2017)	–
Lyall et al. (2018)	✓	Association between CR and mood disorders	Logistic regression, Linear regression and Negative binomial regression	Non-wear for > 60 min in a day and < 72% h of wear data (Doherty et al. 2017)	–
Jones et al. (2019)	✓	Association between genomes, sleep parameters, quality, characteristics and diseases/syndromes	BOLT-REML (Loh et al. 2015) and LD-score regression (Zheng et al. 2017)	Quality check (Doherty et al. 2017), interrupted recording periods, duration of interrupted recording period $> Q_3 + 1.5 \times IQR$, average sleep duration < 3 h or > 12 h	–
Dashti et al. (2019)	✓	Association between short/long sleep and genomes	BOLT-LMM	Non-zero or missing value in problem indicator field, good wear time flag equal to ‘No’, good calibration flag equal to ‘No’, calibrated on own data flag equal to ‘No’ and overall wer duration < 5 days	–

References

- Dashti, H. S., Jones, S. E., Wood, A. R., Lane, J. M., van Hees, V. T., Wang, H., Rhodes, J. A., Song, Y., Patel, K., Anderson, S. G., Beaumont, R. N., Bechtold, D. A., Bowden, J., Cade, B. E., Garaulet, M., Kyle, S. D., Little, M. A., Loudon, A. S., Luik, A. I., Scheer, F. A., Spiegelhalter, K., Tyrrell, J., Gottlieb, D. J., Tiemeier, H., Ray, D. W., Purcell, S. M., Frayling, T. M., Redline, S., Lawlor, D. A., Rutter, M. K., Weedon, M. N. & Saxena, R. (2019), ‘Genome-wide association study identifies genetic loci for self-reported habitual sleep duration supported by accelerometer-derived estimates’, *Nature Communications* **10**.
- Doherty, A., Jackson, D., Hammerla, N., Plötz, T., Olivier, P., Granat, M. H., White, T., Hees, V. T. V., Trenell, M. I., Owen, C. G., Preece, S. J., Gillions, R., Sheard, S., Peakman, T., Brage, S. & Wareham, N. J. (2017), ‘Large scale population assessment of physical activity using wrist worn accelerometers: The uk biobank study’, *PLoS ONE* **12**.
- Jones, S. E., van Hees, V. T., Mazzotti, D. R., Marques-Vidal, P., Sabia, S., van der Spek, A., Dashti, H. S., Engmann, J., Kocavska, D., Tyrrell, J., Beaumont, R. N., Hillsdon, M., Ruth, K. S., Tuke, M. A., Yaghootkar, H., Sharp, S. A., Ji, Y., Harrison, J. W., Freathy, R. M., Murray, A., Luik, A. I., Amin, N., Lane, J. M., Saxena, R., Rutter, M. K., Tiemeier, H., Kutalik, Z., Kumari, M., Frayling, T. M., Weedon, M. N., Gehrman, P. R. & Wood, A. R. (2019), ‘Genetic studies of accelerometer-based sleep measures yield new insights into human sleep behaviour’, *Nature Communications* **10**.
- Loh, P. R., Tucker, G., Bulik-Sullivan, B. K., Vilhjálmsson, B. J., Finucane, H. K., Salem, R. M., Chasman, D. I., Ridker, P. M., Neale, B. M., Berger, B., Patterson, N. & Price, A. L. (2015), ‘Efficient bayesian mixed-model analysis increases association power in large cohorts’, *Nature Genetics* **47**, 284–290.
- Lyall, L. M., Wyse, C. A., Graham, N., Ferguson, A., Lyall, D. M., Cullen, B., Morales, C. A. C., Biello, S. M., Mackay, D., Ward, J., Strawbridge, R. J., Gill, J. M., Bailey, M. E., Pell, J. P. & Smith, D. J. (2018), ‘Association of disrupted circadian rhythmicity with mood disorders, subjective wellbeing, and cognitive function: a cross-sectional study of 91 105 participants from the uk biobank’, *The Lancet Psychiatry* **5**, 507–514.
- Ramakrishnan, R., Doherty, A., Smith-Byrne, K., Rahimi, K., Bennett, D., Woodward, M., Walmsley, R. & Dwyer, T. (2021), ‘Accelerometer measured physical activity and the incidence of cardiovascular disease: Evidence from the uk biobank cohort study’, *PLoS Medicine* **18**.
- Sabia, S., Hees, V. T. V., Shipley, M. J., Trenell, M. I., Hagger-Johnson, G., Elbaz, A., Kivimaki, M. & Singh-Manoux, A. (2014), ‘Association between questionnaire-and accelerometer-assessed physical activity: The role of sociodemographic factors’, *American Journal of Epidemiology* **179**, 781–790.
- van Hees, V. T., Renström, F., Wright, A., Gradmark, A., Catt, M., Chen, K. Y., Löf, M., Bluck, L., Pomeroy, J., Wareham, N. J., Ekelund, U., Brage, S. & Franks, P. W. (2011), ‘Estimation of daily energy expenditure in pregnant and non-pregnant women using a wrist-worn tri-axial accelerometer’, *PLoS ONE* **6**.
- Zheng, J., Erzurumluoglu, A. M., Elsworth, B. L., Kemp, J. P., Howe, L., Haycock, P. C., Hemani, G., Tansey, K., Laurin, C., Pourcain, B. S., Warrington, N. M., Finucane, H. K., Price, A. L., Bulik-Sullivan, B. K., Anttila, V., Paternoster, L., Gaunt, T. R., Evans, D. M. & Neale, B. M. (2017), ‘Ld hub: A centralized database and web interface to perform ld score regression that maximizes the potential of summary level gwas data for snp heritability and genetic correlation analysis’, *Bioinformatics* **33**, 272–279.