

# Appendix V Physical activity assessment

## V.1 Recent Physical Activity Questionnaire (RPAQ)

Participants aged 16 years and over were invited to complete a physical activity assessment using the Recent Physical Activity Questionnaire ([University of Cambridge Physical Activity Downloads](#)). The RPAQ, a self-completion questionnaire, is designed to assess an individual's physical activity over the previous 4 weeks and contains questions about physical activity in 4 domains: at home, at work, during commuting and during leisure time.

The RPAQ has been validated against doubly labelled water (DLW) and individually calibrated heart rate and movement sensing to assess physical activity energy expenditure (PAEE) in adults.<sup>i,ii</sup>

The RPAQ has been included in NDNS since year 2 (2009) with some minor adaptations and variations in questions between years. In years 2 to 11 (2009 to 2019), the RPAQ information was collected via a paper questionnaire. From year 12 (2019) the RPAQ moved to an online version. Television watching and computer use were separate questions in the paper version whereas in the online version a single question was asked about overall screen time to better reflect current screen use habits. Variables for other household activities (e.g. vacuuming), skiing and active computer games were added to the online version. None of the changes between the paper and online versions affect the calculation of PAEE.

Further changes made to the online version since it was introduced were as follows:

- adaptation to improve optimisation for with smaller screens
- from year 13, the work section of the questionnaire was amended to specifically include education (as the questionnaire could be completed by those aged 16 to 18 years who were still in full time education and not working)

The RPAQ version used in years 14 and 15 is provided in appendix F (earlier versions are available on request).

### V.1.1 Calculating energy expenditure from physical activity

Total PAEE was calculated by summing PAEE for all activities across all domains. Total PAEE was expressed in kilojoules per kilogram of body weight per day (kJ/kg/day) where 1 metabolic equivalent (MET) equates to 71.2 J/min/kg (3.5 ml O<sub>2</sub>/min/kg).

To compute PAEE from the RPAQ, reported time spent on activities was multiplied by the metabolic cost of each activity (in metabolic equivalents, METs) obtained from the physical activity compendium<sup>iii,iv</sup> minus 1 MET for resting metabolic rate, to

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provide activity-specific PAEE estimates.<sup>i</sup> Variables household (e.g. vacuuming), skiing and active computer games were removed from output variables to ensure harmonisation to earlier RP years

Modifications to this scoring regime were made for occupational activity which was quantified according to the approach outlined by Golubic and others<sup>ii</sup> and derived from a cohort of 12,435 UK adults in the Fenland Study who had completed the RPAQ concurrently with objective assessment of PAEE, estimated from individually calibrated combined heart rate and movement sensing.<sup>v</sup> The average intensity estimates for reported work duration were 1.54 METs for sedentary occupations, 1.74 METs for standing occupations, 1.93 METs for manual work, and 2.20 METs for heavy manual work. If total reported time spent across all activities was greater than 18 hours per day (assuming 6 hours sleep), all reported durations of activity were scaled back to 18 hours for that person.

Total PAEE was calculated for males and females and sex-combined for the age groups 16 to 34 years, 35 to 54 years and 55 years and over. These age groups were chosen to ensure there were at least 50 participants within each age and sex group.

Descriptive statistics for PAEE in Northern Ireland are presented in Appendix V Excel table 1.1 for 2017 to 2023 combined. There are no UK guidelines or recommendations for PAEE.

## V.2 Child Physical Activity Questionnaires

Participants aged 5 (or aged 4 and have started school) to 15 years were invited to complete a physical activity assessment using the online Child Physical Activity Questionnaire (CPAQ). The CPAQ is a self-completion questionnaire designed to assess a child's individual physical activity over the last 7 days ([University of Cambridge Physical Activity Downloads](#)). It contains questions about physical activity in 2 domains: school and out of school, alongside time spent sitting. The CPAQ has been used in the NDNS RP since year 12 and was adapted by the Epidemiology Unit at the University of Cambridge (Epidemiology Unit) from the questionnaire developed for NDNS years 6 to 11 (which was based on questions asked in the Health Survey for England). Data from the CPAQ cannot be harmonised with the child physical activity questionnaire data collected in NDNS years 6 to 11 due to questionnaire differences.

Since its launch in year 12, small updates have been made to the online CPAQ to improve usability and optimisation for small screens. Output variables and response options have remained the same.

The CPAQ was self-completed by participants aged 11 to 15 years and for younger children, completed by the parent or guardian. There were small differences in question response options for age-appropriateness (e.g. soft play activities appeared only for those aged 4 to 10 years and gym or weights and housework only for those aged 11 to 15 years). The CPAQ is provided in appendix F.

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For pre-school children (aged 2 to 4 years) physical activity data was collected using a separate questionnaire (see appendix F). Data is not included in the report. More detail can be provided on request.

**V.2.1 Calculating moderate to vigorous physical activity**

Total moderate to vigorous physical activity (MVPA) time was calculated from CPAQ by first assigning any activities to be included. MVPA activities were classified after comparison with the Child METs compendium<sup>vi</sup> to gain an insight into the given energy cost of each activity. Most of the activity variables were included within MVPA time calculation. The only variables excluded from this time calculation were:

- motorised transport to and from school
- housework
- any additional activities entered as free text under `Other`
- sitting

Once the grouping had been organised, MVPA time for each activity (in minutes) was calculated by combining these numbers to get a total MVPA in minutes per day. Due to the questionnaire being completed online, no prior data cleaning to the variables was required.

As CPAQ was only introduced in year 12, total MPVA for children aged 4 to 15 in Northern Ireland is not presented in this appendix due to small sample sizes. Data will be available via the UK Data Service.

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<sup>i</sup> Besson H, Brage S, Jakes RW, Ekelund U, Wareham NJ. 'Estimating physical activity energy expenditure, sedentary time, and physical activity intensity by self-report in adults'. *American Journal of Clinical Nutrition* 2010 91(1):106-14

<sup>ii</sup> Golubic R, May AM, Benjaminsen Borch K, Overvad K, Charles M-A, Diaz MJT and others. 'Validity of Electronically Administered Recent Physical Activity Questionnaire (RPAQ) in Ten European Countries'. *PLoS ONE* 2014. 9(3): e92829

<sup>iii</sup> Ainsworth BE, Haskell WL, Herrmann SD, Meckes N, Bassett DR Jr, Tudor-Locke C, Greer JL, Vezina J, Whitt-Glover MC, Leon AS. 'Compendium of Physical Activities: a second update of codes and MET values'. *Medicine and Science in Sports and Exercise* 2011. 43(8):1575-81

<sup>iv</sup> Ainsworth BE, Haskell WL, Herrmann SD, Meckes N, Bassett Jr DR, Tudor-Locke C, Greer JL, Vezina J, Whitt-Glover MC, Leon AS. 'The Compendium of Physical Activities Tracking Guide'. Healthy Lifestyles Research Center, College of Nursing & Health Innovation, Arizona State University

<sup>v</sup> Lindsay T, Westgate K, Wijndaele K, Hollidge S, Kerrison N, Forouhi N, Griffin S, Wareham N, Brage S. *Descriptive epidemiology of physical activity energy expenditure in UK adults (The Fenland study)*. *International Journal of Behavioral Nutrition and Physical Activity* 2019. 9;16(1):126

<sup>vi</sup> Butte NF, Watson KB, Ridley K, et al. A youth compendium of physical activities: activity codes and metabolic intensities. 2017; doi: 10.1249/MSS.0000000000001430. Epub 2017 Sep 21.

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