OP59  MODELLING ACCELEROMETER DATA FROM 7-YEAR OLD BRITISH CHILDREN USING FUNCTIONAL ANALYSIS OF VARIANCE

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Background  There is increasing evidence of the impact of physical activity (PA) in childhood on future health and well-being. The use of accelerometers in population-based studies provides objectively measured activity levels, although there are very few studies using this technology to collect data from young children. The resulting data are highly irregular trajectories and contains periods of activity reflecting multiple seasonal patterns, for example, daily, weekly and yearly. Functional Data Analysis (FDA) methods model temporal trajectories and extract detailed information from such complex datasets. In particular, FDA can identify the times of day when children are most active, and detects covariate effects varying throughout these temporal patterns.

Objectives  To evaluate the feasibility and usefulness of using FDA to study accelerometer data within a large population-based study. We analyse data from the Millennium Cohort Study (MCS) to model trajectories of PA measurements.
Methods  The MCS is a longitudinal study of socioeco-
nomic and health-related characteristics of UK-born children.
Between May 2008 and August 2009 children aged 7 enrolled
in the MCS were asked to wear Actigraph GT1M accelerome-
ters for seven consecutive days during waking hours. To date,
data from 10,682 children have been received. We analysed
a random sample of 501 children contributing to 1815 valid
daily minute-by-minute PA profiles (median 4 days, range 1-9
days). Valid days had at least 10 h of non-zero PA daily mea-
surements between 09:00 and 19:59. We used the R package
fda to fit Functional Analysis of Variance (fANOVA) models
based on smoothed penalised splines in order to analyse the
effects of day of the week, weekend and season on the varia-
tion of the functional response consisting of accelerometer
trajectories.

Results  fANOVA established significant effects of day of
the week and season. Workdays had peaks of PA around
10:30, 13:00, 14:30 and 15:30. No differences by weekdays
were observed after 15:30. Weekend trajectories were more
homogeneous and had higher PA levels, especially before
15:00 and on Saturdays, than workday trajectories. The
highest recorded accelerometer measures excluding school
playtime were observed during spring; summer had sig-
nificantly higher PA levels after 18:00 than any season,
and the lowest levels of PA took place in winter, especially
after 13:00.

Conclusion  We showed the potential of functional mod-
els have for analysing a large database of PA trajectories.
This approach can also be used to evaluate the temporal
effects of environmental and socioeconomic factors on PA
in children.