**README**

**INTRODUCTION**

This study was approved by the University Research Ethics Committee (Reference 17/SPS/031) and formed part of the process evaluation of the Skill Acquisition Methods fostering Physical Literacy in Early Primary Education (SAMPLE-PE) cluster randomised controlled trial (ClinicalTrials.gov identifier: NCT03551366), which is described in detail elsewhere 1. Briefly, SAMPLE-PE aimed to investigate the efficacy of Physical Education (PE) curricula based upon different pedagogical principles and motor learning theories in promoting physical literacy amongst 5-6-year-old children. One hundred and nineteen primary schools situated in deprived areas of a large metropolitan city in North West England were invited to take part in the study. Head-teachers from 12 primary schools provided gatekeeper consent and written parental consent and child assent were obtained for 360 5–6-year-old children (55% girls) from year 1 classes to participate in the research. Children without informed consent continued to participate in the PE lessons as normal. Children who were not able take part in PE due to reasons such as medical conditions, profound learning disabilities or special educational needs were not eligible to take part in this study. Using a computer-generated procedure, schools were randomly allocated to one of three groups: i) Nonlinear pedagogy PE intervention (*n* = 3 schools); ii) Linear pedagogy PE intervention (*n* = 3 schools); or iii) control group (*n* = 6 schools). Following baseline assessments, intervention schools received a 15-week PE curriculum intervention delivered by trained coaches, while control schools followed usual practice (described in detail below). All groups were asked to provide the same dose of PE (i.e., 2 × 60 min weekly PE lessons, for 15 weeks).

The data for this study were collected between January 2018 and June 2018. The process evaluation methods have been published in the study protocol 1. For feasibility and time constraint reasons, a convenience sample of 50% of the children who provided consent to participate in the SAMPLE-PE project within 9 schools (comprising 3 Nonlinear intervention schools, 3 Linear intervention schools and 3 randomly selected control schools) were recruited for this study. Child anthropometric and demographic data were collected at schools during baseline assessments (between January and February 2018), within a two-week period before the start of the intervention. Children’s Physical activity (PA) levels (accelerometers), teaching practices related to PA (video observation) and pedagogical fidelity (video observation) were assessed during PE lessons as part of the SAMPLE-PE process evaluation between February and June 2018 1. Specifically, three PE lessons in each year 1 class (1 lesson every 5 weeks) were randomly selected for data collection. Each of the intervention groups and the control group included five Year 1 classes. Therefore, 45 lessons (15 per group) were scheduled to be evaluated. Schools were informed about the data collection schedule before the beginning of the trial.

**STUDY DASTASETS**

The csv file titled “study3datasetPAFINALnooutlier” contains data the following columns:

MVPA: Moderate to vigorous physical activity in seconds

lessdur: Lesson duration in seconds

id: Participant identification code

x: Physical education lesson identification code

time: Intervention phase (the intervention lasted 15 weeks divided in 3 phases of 5 weeks each)

teacher: Physical education deliverer identification code

schoolid: School identification code

classid: Class Participant identification code

Group: Group identification code (1: Control, 2: Nonlinear pedagogy, 3: Linear pedagogy)

Sex: The sex of the participants (0: Male, 1:Female)

Ethnicity code: The ethnicity of the participants (0:white British, 1:Not white British)

Deprivation Rank Score: Children’s neighbourhood deprivation rank calculated from household postcode using the English indices of deprivation 2.

Deprivation Decile: Children’s neighbourhood deprivation decile

Decimal Age: Age of the participants

Body Mass Index: Body mass index of the participants

IOTF SDS\_Height: BMI z-scores following International Obesity task force (IOTF) classification 3

IOTF SDS\_Weight: BMI z-scores following International Obesity task force (IOTF) classification 3

IOTF SDS\_BMI: BMI z-scores following International Obesity task force (IOTF) classification 3

BMI weight classification (IOTF): International Obesity task force (IOTF) classification (-3:Thinness grade 3, -2:Thinness grade 2, -1:Thinness grade 1, 0:Healthy weight, 1:Overweight, 2:Obese)

IOTF (nonOW and OW/Obese): Classification of children in Non Obese (0) and Obese (1)

The csv file titled “TeachingFINALdata” contains data the following columns:

x: Physical education lesson identification code

Management: Number of observations of Management teaching practice 4

Knowledge: Number of observations of Knowledge teaching practice 4

Fitness: Number of observations of Fitness teaching practice 4

SkillPractice: Number of observations of Skill Practice teaching practice 4

GamePlay: Number of observations of Game Play teaching practice 4

FreePlay: Number of observations of Free Play teaching practice 4

Discoverypractice: Number of observations of Discovery practice teaching practice 4

IndividualActivity: Number of observations of Individual Activity teaching practice 4

PartnerActivity: Number of observations of Partner Activity teaching practice 4

SmallSidedActivity: Number of observations of Small Sided Activity teaching practice 4

LargeSidedActivity: Number of observations of Large Sided Activity practice 4

WholeClassActivity: Number of observations of Whole Class Activity practice 4

WaitingActivity: Number of observations of Waiting Activity teaching practice 4

EliminationActivity: Number of observations of Elimination Activity teaching practice 4

GirlsOnlyActivity: Number of observations of Girls Only Activity teaching practice 4

ChildrenOffTask: Number of observations of Children Off Task teaching practice 4

Supervises: Number of observations of Supervises teaching practice 4

Instructssinglechild: Number of observations of Instructs single child teaching practice 4

Instructsgroup: Number of observations of Instructs group teaching practice 4

Instructsclass: Number of observations of Instructs class teaching practice 4

PromotesPA: Number of observations of Promotes PA teaching practice 4

PAasPunishment: Number of observations of PA as Punishment teaching practice 4

WithholdingPA: Number of observations of Withholding PA teaching practice 4

PAEngaged: Number of observations of PA Engaged teaching practice 4

OffTask: Number of observations of Off Task teaching practice 4

Signaling: Number of observations of Signalling teaching practice 4

RetrievingequipmentM: Number of observations of Retrieving equipment M teaching practice 4

RetrievingequipmentO: Number of observations of Retrieving equipment O teaching practice 4

InterruptionPublic: Number of observations of Interruption Public teaching practice 4

InterruptionPrivate: Number of observations of Interruption Private teaching practice 4

Motorcontent: Number of observations of Motor content teaching practice 4

Countofnumber: Offset number for Negative binomial analysis of Lesson context and Activity context teaching practices 4

Countofnumber2: Offset number for Negative binomial analysis of Teaching Behavious and Activity managementteaching practices 4

teacher: Physical education deliverer identification code

classid: Class identification code

group: Group identification code (1: Control, 2: Nonlinear pedagogy, 3: Linear pedagogy)

lessdur: Lesson duration in minutes

**DATA ANALYSIS:**

All data analysis was carried out using R Software (Version 4.0.2, www.r-project.org) and RStudio Software (Version 1.3.1056, www.rstudio.com). Multilevel models were used to analyse PA outcomes to account for moderate to vigorous PA (MVPA) data (level 1) being nested within child (level 2), class and teacher (level 3). Multilevel models were fitted using “Lme4” package 5. To assess the association between pedagogy and MVPA during PE, two models were designed with children’s MVPA during PE as the dependent variable: i) an unadjusted model including group (i.e., Linear pedagogy, Nonlinear pedagogy and control) as the independent variable with data nested by child (random intercept), and ii) a fully adjusted model including group (i.e., Linear pedagogy, Nonlinear pedagogy and control) as the independent variable and controlling for sex 6, age 6, lesson duration 7, lesson content (e.g., ball games) 6, lesson environment (i.e., indoor, outdoor) 8 with child id code, school and teacher included as nesting variables. During the modelling process, the research team decided to exclude the nesting level of school class as it did not lead to an improved model fit or led to overfitted models. International Obesity task force (IOTF) BMI z-score, ethnicity and deprivation decile variables were excluded from the fully adjusted multilevel analysis as they did not improve model fit and led to issues with listwise deletion of missing data and the loss of 21 participants and 50 corresponding valid MVPA observations within the multilevel models. The unadjusted and fully adjusted models were fitted using control group or Nonlinear pedagogy group as the ‘group’ reference category to evaluate whether Linear and Nonlinear interventions were associated with increased or decreased MVPA minutes or percentage of MVPA (MVPA%) compared to the control group and each other. Outliers were identified using absolute deviation around the median 9 and then removed from the dataset used for the final analysis.

It was not possible to use multilevel models to analyse the PA teaching practices data as most teaching practices variables did not present a normal distribution of the residuals or led to overfitting problems within the multilevel models. PA teaching practices observations collected using SOFIT+ are count data (representing counts of events over a discrete time span) 10–12. Therefore, Poisson and Negative Binomial were initially considered for data analysis. The dispersion of the data was assessed using Dean’s test 13. Given that all the distributions of teaching practice data were over-dispersed, Negative binomials were used to evaluate differences in PA teaching practices between Linear pedagogy, Nonlinear pedagogy and control group within PE. In some cases (i.e., *Partner Activity* and *Small Sided Activity*), negative binomial models could not fit the data as an elevated proportion of zero counts were observed. In these cases, hurdle negative binomial models were employed to analyse teaching practices data 10–12,14. To account for differences in lesson duration an offset factor was included in Negative binomial and Hurdle Negative binomial models. The statistical model fit of count data models were assessed using McFadden’s pseudo R squared 15. Due to the relatively small number of lessons observed within each group and for each PE deliverer, it was not possible to add covariates to the Negative binomial models as it was leading to overfitting (models failing to converge).

**METADATA**

The following files represent R studio software files used to run the Multilevel models data analysis described within previous section:

“MVPA - Final for paper - MVPA percentage”

“MVPA - Final for paper – MVPA”

In order to open the files it is necessary to install R studio software.

To run the statistical analysis it is necessary to install the packages reported within the file (e.g. install.packages("tidyverse")).

To run the analysis it is necessary to change the dataset directory and replace it to the directory where the csv file “study3datasetPAFINALnooutlier” is stored e.g.:

setwd("C:/Users/Utente/Documents/Matteo PhD/study3/rscript/Data for Publication and repository").

Once all the packages are installed and the directory is set correctly, run the r codes one by one. The last two codes tab\_model(m1,m2) and tab\_model(m3,m4) will provide the final results of the statistical analysis.

The following files represent R markdown files were created with R studio software and were used to run the Negative binomial and Hurdle Negative binomial models data analysis described within previous section:

“lesson context -control group as reference- markdown”

“activity context -control group as reference- markdown”

“teaching behaviours -control group as reference- markdown”

“activity management -control group as reference- markdown”

“lesson context -nonlinear group as reference- markdown”

“activity context -nonlinear group as reference- markdown”

“teaching behaviours -nonlinear group as reference- markdown”

“activity management -nonlinear group as reference- markdown”

In order to open the files it is necessary to install R studio software.

To run the files it is necessary to install R markdown functions: install.packages("rmarkdown").

To run the statistical analysis it is necessary to install the packages reported within the file (e.g. install.packages("tidyverse").

To run the analysis, it is necessary to change the dataset directory and replace it with the directory where the csv file “TeachingFINALdata” is stored e.g.:

setwd("C:/Users/Utente/Documents/Matteo PhD/study3")

data<-read\_csv("C:/Users/Utente/Documents/Matteo PhD/study3/TeachingFINALdata.csv")

Once all the packages are installed and the directory is set correctly, press the command “knit” to run all the codes within the R markdown file. As a result, HTML output files will be created.

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