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Prospective Study of Physical Activity of Preterm Born Children from age 5 to 14 years

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Abstract

OBJECTIVE: To investigate, firstly, whether level of prematurity (very, moderate, late preterm versus full term) is associated with physical activity (PA) from childhood to adolescence. Secondly, to identify factors in childhood that predict moderate-vigorous PA in early adolescence.

STUDY DESIGN: Parents reported on PA at the ages 5, 7 and 11 (N=12222 to 14639) and adolescents self-reported on moderate-vigorous PA at 14 years (N=10974). At age 14 a subgroup was also assessed by wrist accelerometer (N=4046).

RESULTS: Prematurity was associated with a small or no difference in PA at each time point. At 14 years moderate-vigorous PA in self-report and accelerometer was higher in males, those of white ethnicity or higher parental education, having been taken to live sport events at age 5 or 7 years or having taken part in organized PA at 5 or 7 years.

CONCLUSION: In this representative national cohort study in the UK preterm birth was not found to be associated with PA between 5 to 14 years. Organized PA and watching sport events early in life may increase moderate to vigorous physical activity in adolescents.

Abbreviations:

CI−confidence interval

ENMO− Euclidean Norm Minus One

MCS−Millennium Cohort Study

moderate-vigorous PA-AC5− moderate-vigorous PA measured by accelerometer

OR−odds ratio

PA− physical activity

PT−preterm

INTRODUCTION

Participation in physical activity (PA) is deemed to be important for everyone and the World Health Organization recommends 60 minutes of moderate-vigorous PA every day for children aged 5 to 17 years[1]. However, PA declines from childhood onward[2] and adolescents are at high risk of insufficient PA[3].

Preterm born infants, especially those born very premature (<32 weeks gestation) are at an increased risk for neuro-cognitive problems[4], motor problems[5] , reduced lung function [6] or social or behaviour problems[7] that might negatively influence participation in PA. Thus, tailored advice to participate in PA[8] may be needed for individuals born preterm.

There are mixed findings on the association between prematurity and participation in PA. Some studies reported that preterm birth is associated with lower rates of PA at 5-6 years [9] or 6-17 years [10] while others found no differences in PA at age 11 and 15 between those born preterm or full term [11]. However, it is unclear whether all preterm children are at particular risk to participate less in PA or whether it is mainly those who are born very preterm [12, 13] or those who suffer from chronic lung disease[14, 15] or motor impairment[16]. Thus studies that distinguish between different levels of prematurity such as very, moderately and late preterm may provide further insight whether all preterm children or those born earliest are at highest risk of lower levels of PA.

A range of socioeconomic factors such as parental education[17], parenting[18, 19] and individual differences such as gender, obesity[20], intelligence[21] or asthma[22] have been found to influence PA and need to be taken into account when analyzing PA according to gestation.

This study aimed to firstly investigate, whether participation in physical activity at different ages in childhood (5, 7, 11, 14 years) is less frequent in very, moderately or late preterm children compared to full term born in the Millennium Cohort Study using parental report,

self-report and accelerometer data. Secondly, it was investigated whether social, parenting or individual factors assessed before 8 years of age predict PA in early adolescence (i.e. at 14 years).

METHODS

Study design

The Millennium Cohort Study (MCS) is a representative longitudinal study of 18 818 infants born in the UK[23]. A random sample was drawn from Child Benefit registers of all infants born in England and Wales between September 2000 and August 2001, and in Scotland and Northern Ireland between November 2000 and January 2002, who were living in the UK at age 9 months. Over-sampling of ethnic minority and disadvantaged areas was used. Complex sample analysis of the dataset allows controlling for non-response/attrition[24]. Parents were interviewed for the first time when the children were aged 9 months (survey 1) and again at 3 (survey 2), 5 (survey 3), 7 (survey 4), 11 (survey 5) and 14 (survey 6) years. Detailed information was collected on a range of socio-economic and health factors[23]. PA data are available for ages 5, 7, 11 and 14. Ethical approval and written informed consent was obtained for all surveys (London - Hampstead Research Ethics Committee, REC reference 14/LO/0868).

Participants

Of the 18818 cohort members in the MCS we excluded 253 with missing gestational age[25]. To analyze participation in PA at the different age groups all available data at these ages were used. Data of twins and triplets are included in the analysis.

Gestational age

Gestational age in weeks was calculated using the mother's report of the expected due date, which corresponded well with data in routine hospital records[26]. Gestational age was grouped

as very preterm (24+0 to 31+6 weeks of gestation), moderately preterm (32+0 to 33+6 weeks of gestation), late preterm (34+0 to 36+6 weeks of gestation) and term (37+0 weeks of gestation and above).

Physical Activity assessments

Days with organized child PA was reported by parents at the ages 5, 7 and 11. Days with un-organized PA was inquired from parents at the ages 7 and 11. At age 14, adolescents were asked how many days in the last week they engaged in at least 60 minutes of moderate-vigorous PA. The response categories for all variables about PA were "less than once a week", "1-2 days per week", "3-4 days per week" and "more than 5 days per week". Self-reported moderate-vigorous PA was dichotomized with a cut off at "3-4 days per week" to identify those that met at least the subsidiary recommendation in the UK[27] of half the recommended PA ("½ moderate-vigorous PA").

Accelerometer data were collected by GENEActiv Original accelerometer devices on one day during the week and one weekend day calculating ENMO. Moderate-vigorous PA-AC5 was measured as 5 minute time windows that started with a 5-s epoch value equal to or higher than 100 mg Euclidean Norm Minus One and for which 80% of subsequent 5-s epoch values were equal to or higher than the 100-mg threshold[28]. This cut off was chosen since PA in adolescence includes short periods of high PA (e.g. team sports) which would be underestimated by the use of longer bout duration[28]. Data for weekdays and weekend days were analysed separately and then combined so that weekdays were weighted by five, weekend days by two, and the result was divided by seven as previously described[29]. Moderate-vigorous PA-AC5 was grouped as 0-29 min. (less than half the recommended time), 30-59 min. (half, but less than recommended time), 60-119 min. (recommended time), 120 min. and above (more than twice the recommended time).

Factors

A detailed description of all socio-economic, parenting and child factors that were entered as potential predictors of PA at age 14 are listed online (appendix methods online).

Statistical analysis

Statistical analysis was performed using IBM SPSS Statistics (version 24; IBM Corp., Armonk, NY, USA). Bivariate and categorical variables were compared using χ^2 test. Parental and self-reported days of organized and un-organized PA as well as grouping of moderate-vigorous PA-AC5 of the different gestational age groups is shown using complex sample analysis[24] to control for attrition. Correlation between self-reported PA and moderate-vigorous PA-AC5 at age 14 was analyzed using Spearman's Rank-Order Correlation.

Stepwise logistic and linear regression were performed to analyze the association between early childhood predictors and self-reported "½ moderate-vigorous PA" or minutes of "moderate-vigorous PA-AC5" (measured by accelerometer) at age 14. Dependent variables were "½ moderate-vigorous PA" for the logistic regression and "moderate-vigorous PA - AC5" for the linear regression. Model 1 reports unadjusted Odds Ratios (OR) and 95% confidence intervals (CI) for all predictors. Model 2 reports on adjusted OR (CI) for socio-economic factors (ethnicity, parental vocational qualification, number of siblings in household, lone parenthood status[17], income below 60% poverty index, living in safe area[30], parental education[18]), parenting factors (having attended a sporting event with the child[18], Pianta Scale Closeness and Conflict[19]) and individual factors (gender, cognitive development[21], asthma[14], motor problems[16], overweight or obesity at age 5[20], engaging in at least weekly organized PA at 5 and 7 years[31]) that were significant in model 1. In Model 3 all significant factors from the socioeconomic, parenting and individual model 2 were included. The same approach was used in the linear regression showing Coefficient Beta (β) and 95%

confidence interval (CI) and labelled model 4-6. A sensitivity analysis was performed using model 7 and 8 including all factors analyzed in model 1 and model 4 respectively.

RESULTS

A detailed description of the response rates is available[32, 33]. Response rates declined over time with 96% at age 9 month, 81% at age 3, 79% at age 5, 71% at age 7, 66% at age 11 to 59% at age 14 years. A flow chart of study participation and exclusion is shown in Figure 1 (online only). More families at high social risk were lost to follow-up. For all descriptive analysis this was controlled for by using complex sample analysis[24] and predicted percentages are given. A random sub-sample of 10337 cohort members was asked to wear the accelerometer devices, resulting in 4046 valid datasets. Reasons for missing/invalid data were mainly "device not returned" (24%), "device not placed" (11%), "device not worn on specified days" (11%) (figure 1, online only)[33]. Comparison of sociodemographic and –economic variables of cohort members with and without self-reported moderate-vigorous PA or accelerometer data at age 14 is shown in Table 1 (online only), children with severe motor impairment were more likely to be lost to follow-up. The distribution of gestational age groups included in the MCS corresponds well to data for preterm birth rates in the UK[34].

Parental reports on organized PA were available at age 5 in 14639 (79%), at age 7 in 13316 (71%) and at age 11 in 12222 (66%) children. Parental reports on un-organized PA were available at age 7 in 13313 (71%) and at age 11 in 12219 (66%) children. At age 14 self-reported moderate-vigorous PA was available in 10974 (59%) and moderate-vigorous PA-AC5 in 4046 (22%) adolescents.

Organized physical activity age 5 to 11

No differences in organized PA were seen at age 5 (p=0.23), 7 (p=0.29) or 11 (p=0.17) across all gestational age groups (Figure 2).

Gender differences in organized PA were significant for all age groups (Figure 3; online only). At age 5 boys were less likely to participate in any organized sport ($p<0.001$), while at age 11 girls were less likely ($p<0.001$). At age 7 boys reported more days with organized physical activity than girls ($p<0.05$). The gender differences were seen across all gestational age groups.

Un-organized physical activity age 7 and 11

No differences in un-organized PA were seen with regard to gestational age at age 7 ($p=0.17$) but at age 11 ($p<0.05$) (Figure 4). Parents of moderately preterm born children reported the highest rates of un-organized physical activity at age 11.

Gender differences in un-organized PA were significant for all age groups (Figure 5; online only). At age 7 ($p<0.05$) and age 11 ($p<0.001$) boys had more days of un-organized physical activity than girls. The gender differences were seen across all gestational age groups.

Physical activity at age 14

Self-reported PA

The recommended daily moderate-vigorous PA of 60 min. was reported by 19% of term born, 17% late preterm born, 12% moderately preterm born and 11% very preterm born adolescents. Differences in moderate-vigorous PA were significant for the gestational age groups at age 14 ($p< 0.01$) (Figure 6).

Differences in gestational age groups were significant in both genders (both $p<0.05$); moderately preterm born females reported the least physical activity (Figure 7; online only).

Accelerometer data

Twenty-three percent of term born, 25% late preterm born, 34% moderately preterm born and 19% very preterm born adolescents were engaged in the recommended daily 60 min. of moderate to vigorous activity. Differences in moderate-vigorous PA-AC5 as measured by

accelerometer were not significant by gestational age groups at age 14 (p=0.29) (Figure 8; online only). Moderate-vigorous PA-AC5 was highly variable in all gestational age groups ((mean (SD)) 40 (49) min. for term, 45 (75) min. for late preterm, 51 (42) min. for moderate preterm and 37 (33) min. for very preterm). Gender differences were seen in all gestational age groups (Figure 9; online only).

Self-reported moderate-vigorous PA at age 14 correlated with moderate-vigorous PA-AC5 data for all gestational age groups (Spearman's Rank-Order correlation for term: 0.25 ($p<0.001$); late preterm: 0.31($p<0.001$); moderate preterm: 0.22 (p=0.14); very preterm adolescents: 0.42 ($p<0.01$)).

Predictors of activity at age 14

Overall results of both the logistic regression (self-reported moderate-vigorous PA) and linear regression (accelerometer) were similar. At age 14 self-reported "½ moderate-vigorous PA" was more likely met and "moderate-vigorous PA-AC5" was higher in males, having been taken to watch a live sport event at age 7 or having been engaged in organized PA at age 5 or 7 (Table 2). "½ moderate-vigorous PA" was more likely reported in those with highly educated parents while white ethnicity predicted higher "moderate-vigorous PA-AC5". Gestational age was not associated with "moderate-vigorous PA-AC5" but moderately preterm adolescents were less likely to self-report "½ moderate-vigorous PA". Adolescents with severe motor problems were less likely to report "½ moderate-vigorous PA", a similar negative influence was seen in "moderate-vigorous PA-AC5" but only few children with severe motor impairment had valid "moderate-vigorous PA-AC5" (6/4046) compared to the self-reported "½ moderate-vigorous PA" (26/10311). More cohort members of white ethnicity and those having engaged in organized PA at age 5 and 7 had complete datasets and were included in model 3 and 6 (Table 3, online only).

To test for sensitivity, the analysis was repeated including all factors of model 1 in model 7 (logistic regression "½ moderate-vigorous PA") and all of model 4 in model 8 (linear regression "moderate-vigorous PA-AC5") (Table 4; online only). Results of model 7 were similar to model 3. Results of model 8 were similar to model 6 but ethnicity did not influence moderate-vigorous PA-AC5 after controlling for other socio-economic variables while speech impairment was associated with increased activity and overweight with decreased activity.

DISCUSSION

In a large cohort from the UK less than a fourth of adolescents reported the recommended daily amount of moderate-vigorous PA[1]. This was found whether self-reports or accelerometer data were used. This is consistent with findings from Germany[35], other European countries and northern America[36]. The PA assessed with accelerometer in the MCS, however, is significantly lower than found in Brazil[28], but similar to other European countries[29]. Potentially modifiable factors found to increase physical activity are engagement in organized PA at a young age or having been taken to a life sport event during childhood. A positive effect of taking young children to watch a sport event on subsequent PA has been described previously[18]. The finding of early engagement in organized PA to predict PA during adolescence is consistent with other studies[31]. Nevertheless, these predictors only explained an increase of 4-6 minutes of moderate-vigorous PA per day. The direction of these associations need to be interpreted cautiously as active children may have self-selected to have interest to watch live sport events or engage in organized PA at an early age. Primary controlled prevention studies monitoring the effect of promoting live sport events and participation in organized PA during childhood on PA later in life are required. As shown repeatedly previously [2, 3], it was found that female adolescents are less physically active than males.

Preterm birth

In light of the uncertainty within the literature to whether prematurity is related to PA in adolescence, this large representative national cohort from the UK provides evidence that according to parental reports between 5 and 11 years very, moderate and late preterm born children in the MCS engaged as much in organized or un-organized PA as term born peers. These results are supported by other birth cohorts[37-39] or studies linked to neonatal data that exclude chronic motor or lung impairment[40, 41]. Differences in PA participation were reported in preterm infants with impaired lung[14] or motor function[16] and these subgroups of preterm children could profit from individually tailored advice regarding participation in PA. Studies analyzing extremely preterm born children at age 10 reported conflicting results with both similar[42] amounts of PA measured by accelerometer and lower amounts of PA [43] measured via questionnaire but it remains unclear whether any reduction is due to the extremely preterm birth or rather the higher rate of lung impairment or motor dysfunction. Some cross sectional studies[9, 44] or survey studies[10] reported lower participation rates in PA in preterm children; however, these studies have in common, that preterm birth status relied solely on parental report years later.

A reduction of PA has been described in preterm cohort studies during adolescence and early adulthood using questionnaires[8, 43]. Both accelerometer studies during childhood (age 10)[42] or adolescence (age 15)[11] showed no differences in PA between gestational age groups. Analyzing self-reported PA of the MCS, moderately preterm born children reported less PA at age 14 than term born adolescents. However, this was not confirmed by accelerometer data within the same cohort measured shortly thereafter. Thus, moderately preterm born adolescents seem to perceive themselves as less active than other gestational groups. The reason for this biased self-perception is unclear. A similar discrepancy was seen in the "Helsinki Study of VLBW preterm Adults" as well as the "ESTER" study with differences in questionnaire data on PA[45, 46] but no difference in accelerometer data in the early twenties[47, 48]

compared to term born controls. Therefore, a combination of accelerometer and questionnaire data about PA including organized and un-organized activity is required for valid conclusions. These indicate that there is little difference in PA between those born preterm or full term.

Strength and Limitations

Strengths of this study are the sample size of preterm children exceeding most neonatal cohort studies[49]. This allowed for analysis across gestational ages while controlling for a large number of potential confounders. Furthermore, we were able to assess subjective and objective assessment of PA which only correlate moderately.

There are also limitations. Even in this large cohort, extremely preterm born children were rare and statistical power restricted. Analysis splitting the very preterm group into those below 28 weeks of gestation (N= 29 to 39) and 28-31 weeks of gestation (N = 83 to 121) indicated no differences in PA. Assessment of PA changed from parental to self-report in adolescence according to more independence of adolescence. The 14 year assessment did not anymore differentiate between organized and un-organized activity. The accelerometer module measured was limited to 2 days only while 6-7 days are recommended to assess habitual PA[50, 51]. However, the correlations with self-reports are similar to those reported for 6 day monitoring attesting to similar reliability[52]. Cohort members participating in the accelerometer module were more active during childhood and accelerometer data might have overestimated PA compared to the initial MCS sample.

CONCLUSION

In the MCS very, moderate and late preterm born children aged 5 to 14 are as physically active as their term born peers. However, moderately preterm born adolescents perceive themselves as less active at age 14 and may warrant further study. Engaging in organized PA at an early age and being taken to watch live sport event might improve PA in adolescence.

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REFERENCES

[1] WHO. Information sheet: global recommendations on physical activity for health 5 - 17 years old. World Health Organization. 2011.

[2] Farooq MA, Parkinson KN, Adamson AJ, Pearce MS, Reilly JK, Hughes AR, et al. Timing of the decline in physical activity in childhood and adolescence: Gateshead Millennium Cohort Study. Br J Sports Med. 2017.

[3] Corder K, Sharp SJ, Atkin AJ, Griffin SJ, Jones AP, Ekelund U, et al. Change in objectively measured physical activity during the transition to adolescence. Br J Sports Med. 2015;49:730-6.

[4] Jarjour IT. Neurodevelopmental outcome after extreme prematurity: a review of the literature. Pediatr Neurol. 2015;52:143-52.

[5] Roberts G, Anderson PJ, Davis N, De Luca C, Cheong J, Doyle LW, et al. Developmental coordination disorder in geographic cohorts of 8-year-old children born extremely preterm or extremely low birthweight in the 1990s. Dev Med Child Neurol. 2011;53:55-60.

[6] Lum S, Kirkby J, Welsh L, Marlow N, Hennessy E, Stocks J. Nature and severity of lung function abnormalities in extremely pre-term children at 11 years of age. European Respiratory Journal. 2011;37:1199-207.

[7] Johnson S, Wolke D. Behavioural outcomes and psychopathology during adolescence. Early Hum Dev. 2013;89:199-207.

[8] Lowe J, Cousins M, Kotecha SJ, Kotecha S. Physical activity outcomes following preterm birth. Paediatr Respir Rev. 2017;22:76-82.

[9] Olesen LG, Kristensen PL, Korsholm L, Froberg K. Physical activity in children attending preschools. Pediatrics. 2013;132:e1310-8.

[10] Kodjebacheva GD, Sabo T. Influence of premature birth on the health conditions, receipt of special education and sport participation of children aged 6-17 years in the USA. J Public Health (Oxf). 2016;38:e47-54.

[11] Lowe J, Watkins WJ, Kotecha SJ, Edwards MO, Henderson AJ, Kotecha S. Physical activity in school-age children born preterm. The Journal of pediatrics. 2015;166:877-83.

[12] Kilbride HW, Gelatt MC, Sabath RJ. Pulmonary function and exercise capacity for ELBW survivors in preadolescence: effect of neonatal chronic lung disease. The Journal of pediatrics. 2003;143:488-93.

[13] Lowe J, Watkins WJ, Kotecha SJ, Kotecha S. Physical Activity and Sedentary Behavior in Preterm-Born 7-Year Old Children. PLoS One. 2016;11:e0155229.

[14] Joshi S, Powell T, Watkins WJ, Drayton M, Williams EM, Kotecha S. Exercise-induced bronchoconstriction in school-aged children who had chronic lung disease in infancy. The Journal of pediatrics. 2013;162:813-8 e1.

[15] Landry JS, Tremblay GM, Li PZ, Wong C, Benedetti A, Taivassalo T. Lung Function and Bronchial Hyperresponsiveness in Adults Born Prematurely. A Cohort Study. Ann Am Thorac Soc. 2016;13:17-24.

[16] Wocadlo C, Rieger I. Motor impairment and low achievement in very preterm children at eight years of age. Early Hum Dev. 2008;84:769-76.

[17] Griffiths LJ, Cortina-Borja M, Sera F, Pouliou T, Geraci M, Rich C, et al. How active are our children? Findings from the Millennium Cohort Study. BMJ Open. 2013;3:e002893.

[18] Vella SA, Cliff DP, Okely AD. Socio-ecological predictors of participation and dropout in organised sports during childhood. Int J Behav Nutr Phys Act. 2014;11:62.

[19] Marquis WA, Baker BL. Sports participation of children with or without developmental delay: prediction from child and family factors. Res Dev Disabil. 2015;37:45-54.

[20] Metcalf BS, Hosking J, Jeffery AN, Voss LD, Henley W, Wilkin TJ. Fatness leads to inactivity, but inactivity does not lead to fatness: a longitudinal study in children (EarlyBird 45). Arch Dis Child. 2011;96:942-7.

[21] Kumpulainen SM, Heinonen K, Pesonen AK, Salonen MK, Andersson S, Lano A, et al. Childhood Cognitive Ability and Physical Activity in Young Adulthood. Health Psychology. 2017;36:587-97.

[22] Vahlkvist S, Inman MD, Pedersen S. Effect of asthma treatment on fitness, daily activity and body composition in children with asthma. Allergy. 2010;65:1464-71.

[23] Connelly R, Platt L. Cohort profile: UK Millennium Cohort Study (MCS). Int J Epidemiol. 2014;43:1719-25.

[24] Jones E, Ketende S, Sosthenes C. Millennium Cohort Study: User guide to analysing MCS data using SPSS. London: Centre for Longitudinal Studies Institute of Education2010. p. retrieved from: https://cls.ucl.ac.uk/wp-content/uploads/2017/06/Complex-Samples-in-SPSS.pdf.

[25] **MCSVI**. Millennium Cohort Study: Sixth Survey, 2015. . In: Service. UD, editor. University of London Institute of Education Centre for Longitudinal Studies. 2nd Edition. ed. UK Data Service. 2017.

[26] Poulsen G, Kurinczuk JJ, Wolke D, Boyle EM, Field D, Alfirevic Z, et al. Accurate reporting of expected delivery date by mothers 9 months after birth. J Clin Epidemiol. 2011;64:1444-50.

[27] Cavill N, Biddle S, Sallis JF. Health enhancing physical activity for young people: Statement of the United Kingdom Expert Consensus Conference. Pediatr Exerc Sci. 2001;13:12-25.

[28] da Silva IC, van Hees VT, Ramires VV, Knuth AG, Bielemann RM, Ekelund U, et al. Physical activity levels in three Brazilian birth cohorts as assessed with raw triaxial wrist accelerometry. Int J Epidemiol. 2014;43:1959-68.

[29] Konstabel K, Veidebaum T, Verbestel V, Moreno LA, Bammann K, Tornaritis M, et al. Objectively measured physical activity in European children: the IDEFICS study. Int J Obes (Lond). 2014;38 Suppl 2:S135-43.

[30] Allender S, Cowburn G, Foster C. Understanding participation in sport and physical activity among children and adults: a review of qualitative studies. Health Educ Res. 2006;21:826-35.

[31] Telford RM, Telford RD, Cochrane T, Cunningham RB, Olive LS, Davey R. The influence of sport club participation on physical activity, fitness and body fat during childhood and adolescence: The LOOK Longitudinal Study. J Sci Med Sport. 2016;19:400-6.

[32] Mostafa T, Ploubidis GB. Millennium Cohort Study Sixth Survey 2015-2016 (Age 14): technical report on response: Centre for Longitudinal Studies, Bedford Group for Lifecourse and Statistical Studies, Institute of Education, University of London; 2017.

[33] Heywood J. Physical Activity: Accelerometer dataset MCS6(2015). Millenium Cohort Study. Centre for Longitudinal Studies: UCL; 2018. p. retrieved from: http://doc.ukdataservice.ac.uk/doc/8156/mrdoc/pdf/mcs6_2018_accelerometer.pdf.

[34] Li Y, Quigley MA, Dattani N, Gray R, Jayaweera H, Kurinczuk JJ, et al. The contribution of gestational age, area deprivation and mother's country of birth to ethnic variations in infant mortality in England and Wales: A national cohort study using routinely collected data. PLoS ONE. 2018;13:e0195146.

[35] Finger JD, Varnaccia G. Physical activity among children and adolescents in Germany. Results of the cross-sectional KiGGS Wave 2 study and trends. Journal of Health Monitoring. 2018;3.

[36] Kalman M, Inchley J, Sigmundova D, Iannotti RJ, Tynjala JA, Hamrik Z, et al. Secular trends in moderate-to-vigorous physical activity in 32 countries from 2002 to 2010: a cross-national perspective. Eur J Public Health. 2015;25 Suppl 2:37-40.

[37] Nordvall-Lassen M, Hegaard HK, Obel C, Lindhard MS, Hedegaard M, Henriksen TB. Leisure time physical activity in 9- to 11-year-old children born moderately preterm: a cohort study. BMC Pediatrics. 2018;18:163.

[38] Welsh L, Kirkby J, Lum S, Odendaal D, Marlow N, Derrick G, et al. The EPICure study: maximal exercise and physical activity in school children born extremely preterm. Thorax. 2010;65:165-71.

[39] Lowe J, Watkins WJ, Kotecha SJ, Edwards MO, Henderson AJ, Kotecha S. Physical Activity in School-Age Children Born Preterm. Journal of Pediatrics. 2015;166:877-83.

[40] Svien LR. Health-related fitness of seven- to 10-year-old children with histories of preterm birth. Pediatr Phys Ther. 2003;15:74-83.

[41] Kriemler S, Keller H, Saigal S, Bar-Or O. Aerobic and lung performance in premature children with and without chronic lung disease of prematurity. Clinical Journal of Sport Medicine. 2005;15:349-55.

[42] Welsh L, Kirkby J, Lum S, Odendaal D, Marlow N, Derrick G, et al. The EPICure study: maximal exercise and physical activity in school children born extremely preterm. Thorax. 2010;65:165-72.

[43] Clemm H, Roksund O, Thorsen E, Eide GE, Markestad T, Halvorsen T. Aerobic capacity and exercise performance in young people born extremely preterm. Pediatrics. 2012;129:e97-e105.

[44] Finn K, Johannsen N, Specker B. Factors associated with physical activity in preschool children. Journal of Pediatrics. 2002;140:81-5.

[45] Kaseva N, Wehkalampi K, Strang-Karlsson S, Salonen M, Pesonen AK, Raikkonen K, et al. Lower conditioning leisure-time physical activity in young adults born preterm at very low birth weight. PLoS One. 2012;7:e32430.

[46] Tikanmaki M, Kaseva N, Tammelin T, Sipola-Leppanen M, Matinolli HM, Eriksson JG, et al. Leisure Time Physical Activity in Young Adults Born Preterm. Journal of Pediatrics. 2017;189:135-42.e2.

[47] Kaseva N, Martikainen S, Tammelin T, Hovi P, Jarvenpaa AL, Andersson S, et al. Objectively measured physical activity in young adults born preterm at very low birth weight. The Journal of pediatrics. 2015;166:474-6.

[48] Tikanmaki M, Tammelin T, Kaseva N, Sipola-Leppanen M, Matinolli HM, Hakonen H, et al. Objectively measured physical activity and sedentary time in young adults born preterm-The ESTER study. Pediatric Research. 2017;81:550-5.

[49] Pyhälä R, Wolford E, Kautiainen H, Andersson S, Bartmann P, Baumann N, et al. Self-reported mental health problems among adults born preterm: a meta-analysis. Pediatrics. 2017:e20162690.

[50] Strath SJ, Kaminsky LA, Ainsworth BE, Ekelund U, Freedson PS, Gary RA, et al. Guide to the assessment of physical activity: Clinical and research applications: a scientific statement from the American Heart Association. Circulation. 2013;128:2259-79.

[51] Dillon CB, Fitzgerald AP, Kearney PM, Perry IJ, Rennie KL, Kozarski R, et al. Number of Days Required to Estimate Habitual Activity Using Wrist-Worn GENEActiv Accelerometer: A Cross-Sectional Study. PLoS ONE. 2016;11:e0109913.

[52] Nascimento-Ferreira MV, De Moraes ACF, Toazza Oliveira PV, Rendo-Urteaga T, Gracia-Marco L, Forjaz CLM, et al. Assessment of physical activity intensity and duration in the paediatric population: evidence to support an a priori hypothesis and sample size in the agreement between subjective and objective methods. Obes Rev. 2018;19:810-24.

TABLES

Table 1 (online only). Comparison of participants without and with self-reported moderate-vigorous PA and non-valid and valid moderate-vigorous PA-AC5 data at age 14 in the Millennium Cohort Study

Moderate-vigorous PA-AC5: minutes of 5 min. windows with 80% bout activity (ENMO>100mg) measured by wrist accelerometer. Significant differences ($p<0.05$) of non-participants and participants of the different gestational age groups are shown in bold.

Table 2. Factors assessed before 8 years of age that are associated with self-reported "½ moderate-vigorous PA" or accelerometer assessed minutes of "moderate-vigorous PA-AC5" age 14 years

½ moderate-vigorous PA: self-reported moderate to vigorous physical activity of ≥60 min. on at least 3-4 days per week. Moderate-vigorous PA-AC5: minutes of 5 min. windows with 80% bout activity (ENMO>100mg) measured by wrist accelerometer. For gestational age groups term born is reference group; for obesity/overweight normal weight is reference. SD: standard deviation.

Dependent variable is "½ moderate-vigorous PA" for the logistic regression (model 1-3) and "moderate-vigorous PA-AC5" for the linear regression model 4-6. Model 1 shows unadjusted Odds Ratio (OR) and 95% confidence interval (CI). In model 2 OR (CI) are adjusted for socio-economic predictors (N=10570, Cox&Snell r2=0.009), for parenting predictors (N=7748, Cox&Snell r2=0.018), for individual predictors (N=8085, Cox&Snell r2=0.038). Model 3 uses all significant predictors of models 1 (N=9562; Cox&Snell r2=0.044). Model 4 shows unadjusted Coefficient β (β) and 95% confidence interval (CI). In model 5 β (CI) are adjusted for socio-economic predictors (N=4037, adjusted r2=0.004), for parenting predictors (N=3724, adjusted r2=0.014), for individual predictors (N=3720, adjusted r2=0.064). Model 6 uses all significant predictors of models 5 (N=3716; adjusted r2=0.067).

Table 3 (online only). Comparison of cohort members included in the logistic regression model 3 and the linear regression model 6 at age 14 to those with missing data

Table 4 (online only). Sensitivity analysis of influencing factors for self-reported "½ moderate-vigorous PA" or measured minutes of "moderate-vigorous PA-AC5" age 14 years

½ moderate-vigorous PA: self-reported moderate to vigorous physical activity of ≥60 min. on at least 3-4 days per week. Moderate-vigorous PA-AC5: minutes of 5 min. windows with 80% bout activity (ENMO>100mg) measured by wrist accelerometer. For gestational age groups term born is reference group; for obesity/overweight normal weight is reference. SD: standard deviation. Model 7 includes all variables analysed in the logistic regression model 1 (N=6813, Cox&Snell r^2=0.047) with "½ moderate-vigorous PA" as dependent variable. Model 8 (N=2732, r^2=0.059) includes all variables analysed of the linear regression model 4 with "moderate-vigorous PA-AC5" as dependent variable.

FIGURES

Figure 1 (online only). Flow chart of study participation and exclusions. Percentages are of the original sample at 9 months with valid gestational age n=18 565. PA: physical activity.

Figure 2. Participation in **organized** physical activity (club or class) by gestational age groups at age 5, 7 and 11 as reported by parents (days per week). Group differences are not significant. PT: preterm.

Figure 3 (online only). Participation in **organized** physical activity (club or class) by gestational age groups for **males** and **females** at age 5, 7 and 11 as reported by parents (days per week). Group differences are not significant. PT: preterm

Figure 4. Participation in **unorganized** physical activity (with siblings, friends) by gestational groups at age 7 and 11 as reported by parents (days per week). Group differences are significant at age 11 ($p<0.05$). PT: preterm

Figure 5 (online only). Participation in **unorganized** physical activity (with siblings, friends) by gestational groups for **males** and **females** at age 7 and 11 as reported by parents (days per week). Group differences are significant at age 11 ($p<0.05$). PT: preterm

Figure 6. Adolescents (14 years) reporting days with moderate to vigorous activity for more than 60 min. during the prior week by gestational age groups. Differences between gestational age groups are significant ($p<0.01$). PT: preterm.

Figure 7 (online only). Adolescents (14 years) reporting days with moderate to vigorous activity for more than 60 min. during the prior week by gestational groups for **males** and **females**. Differences between gestational age groups are significant ($p<0.05$ for male, $p<0.01$ for female). PT: preterm

Figure 8 (online only). Minutes of moderate-vigorous PA measured by accelerometer (80% bouts in 5 min. time windows) by gestational age groups at age 14. Differences between gestational age groups are not significant. PT: preterm. Complex sample analysis excluded 3 term born adolescents due to missing weight.

Figure 9 (online only). Minutes of moderate-vigorous PA measured by accelerometer (80% bouts in 5 min. time windows) by gestational age groups for **males** and **females** at age 14. Differences between gestational age groups are not significant. PT: preterm.

Comparison of participants without and with self-reported moderate-vigorous PA and non-valid and valid moderate-vigorous PA-AC5 data at age 14 in the Millennium Cohort Study

	No self-reported moderate-vigorous PA	Self-reported moderate-vigorous PA						Non-valid moderate-vigorous PA-AC5 data	valid moderate-vigorous PA-AC5 data					
			p-Value	Very preterm	Moderately preterm	Late preterm	Term			p-Value	Very preterm	Moderately preterm	Late preterm	Term
	N=7591	N=10974		N=113	N=127	N=609	N=10125	N=14519	N=4046		N=46	N=47	N=221	N=3732
Gestational age (weeks)	39 (2)	39 (2)	1.0	29 (2)	33 (1)	36 (1)	**40 (1)**	39 (2)	39 (2)	1.0	29 (2)	33 (1)	36 (1)	**40 (1)**
Birth weight (kg)	3.3 (0.66)	3.3 (0.67)	<0.05	1.3 (0.49)	2.0 (0.52)	2.6 (0.69)	**3.4 (0.59)**	3.3 (0.67)	3.4 (0.65)	<0.05	1.3 (0.59)	2.0 (0.52)	2.6 (0.53)	**3.4 (0.57)**
Gender male	4060(54%)	5447 (50%)	<0.001	60 (53%)	60 (47%)	330 (54%)	**4997 (49%)**	7591 52%)	1916(47%)	<0.001	27 (59%)	22 (47%)	123 (56%)	**1744 (47%)**
Ethnicity white	6276(83%)	9098 (83%)	0.62	85 (75%)	110 (87%)	503 (83%)	8400 (83%)	11869(82%)	3505(87%)	<0.001	35 (76%)	**44 (94%)**	**196 (89%)**	**3230 (87%)**
High parental vocational qualification	1380(18%)	3174 (29%)	<0.001	**32 (28%)**	35 (28%)	**162 (27%)**	**2945 (29%)**	3235 (22%)	1319(33%)	<0.001	**16 (35%)**	13 (28%)	**73 (33%)**	**1217 (33%)**
income below 60% poverty index	3342(44%)	3455 (32%)	<0.001	40 (35%)	**42 (33%)**	**209 (34%)**	**3164 (31%)**	5718 (40%)	1079(27%)	<0.001	19 (41%)	**12 (26%)**	**60 (27%)**	**988 (27%)**
high parental education	2536(34%)	5323 (50%)	<0.001	**55 (49%)**	**62 (49%)**	**269 (45%)**	**4937 (50%)**	5664 (40%)	2195(55%)	<0.001	21 (47%)	26 (55%)	**123 (56%)**	**2025 (55%)**
Families with multiples	239 (3%)	277 (3%)	<0.05	23 (20%)	30 (24%)	**84 (14%)**	140 (1%)	403 (3%)	113 (3%)	0.95	**14 (30%)**	14 (30%)	40 (18%)	45 (1%)
Very preterm	103 (1%)	113 (1%)		113(100%)	0	0	0	170 (1%)	46 (1%)		46 (100%)	0	0	0
Moderate preterm	73 (1%)	127 (1%)	<0.05	0	127(100%)	0	0	153 (1%)	47 (1%)	0.62	0	47 (100%)	0	0
Late preterm	477 (6%)	609 (6%)		0	0	609(100%)	0	865 (6%)	221 (6%)		0	0	221 (100%)	0
Full term	3938(91%)	10125(92%)		0	0	0	10125(100%)	13331(92%)	3732(92%)		0	0	0	3732(100%)
Severe motor impairment	22 (0.5%)	26 (0.3%)	<0.05	**2 (2.0%)**	3 (2.5%)	2 (0.4%)	19 (0.2%)	42 (0.4%)	6 (0.2%)	<0.05	0	2 (4.4%)	0	4 (0.1%)
Watched life sport event age 7	824(26%)	2653(26%)	0.52	21 (22%)	23 (19%)	144 (26%)	2465 (26%)	2246 (26%)	1031(27%)	0.11	10 (26%)	7 (16%)	61 (30%)	953 (27%)
Weekly sport Age 5	1950(45%)	5635 (55%)	<0.001	47 (44%)	**58 (48%)**	296 (52%)	**5234 (55%)**	5305(49%)	2280(59%)	<0.001	23 (51%)	**25 (54%)**	**126 (59%)**	**2106 (59%)**
Age 7	1985(62%)	7051 (70%)	<0.001	62 (64%)	77 (64%)	365 (66%)	**6547 (70%)**	6247 (66%)	2789(73%)	<0.001	21 (55%)	**34 (77%)**	**148 (73%)**	**2586 (73%)**

Moderate-vigorous PA-AC5: minutes of 5 min. windows with 80% bout activity (ENMO>100mg) measured by wrist accelerometer. Significant differences (p<0.05) of non-participants and participants of the different gestational age groups are shown in bold.

Factors assessed before 8 years of age that are associated with self-reported "½ moderate-vigorous PA" or accelerometer assessed minutes of "moderate-vigorous PA-AC5" age 14 years

	Self-reported ½ moderate-vigorous PA			Accelerometer moderate-vigorous PA-AC5					
	Model 1	Model 2	Model 3	Model 4		Model 5		Model 6	
	OR (95%CI)	OR (95%CI)	OR (95%CI)	β	(95%CI)	β	(95%CI)	β	(95%CI)
Socio-economic (age 9 month)									
Ethnicity white	**1.21 (1.09-1.35)**	1.10(0.98-1.24)		**9**	**(5-14)**	**8**	**(4-13)**	**6**	**(2-9)**
High parental vocational qualification	**1.33 (1.21-1.46)**	1.08 (0.97-1.21)		2	(-1-5)				
High parental education	**1.42 (1.30-1.54)**	**1.27 (1.15-1.41)**	**1.19 (1.07-1.31)**	1	(-2-5)				
income below 60% poverty index	**0.73 (0.66-0.79)**	**0.83 (0.74-0.92)**	0.97(0.87-1.08)	**-5**	**(-8-(-1))**	-3	(-7-0.4)		
siblings in household	**0.96 (0.93-1.00)**	1.00 (0.96-1.05)		-1	(-3-0.3)				
lone parenthood status	**1.24 (1.10-1.39)**	0.97 (0.85-1.11)		3	(-2-8)				
living in safe area	**0.87 (0.80-0.95)**	0.93 (0.85-1.01)		-2	(-5-1)				
Parenting									
Pianta Scale Conflict (age 3)	**0.99 (0.98-1.00)**	0.99 (0.98-1.00)		0.1	(-0.2-0.4)				
Pianta Scale Closeness (age 3)	**1.03 (1.01-1.05)**	1.02 (1.00-1.05)		0	(-1-1)				
Having attended a sporting event with the child at age 4-5	**1.73 (1.52-1.97)**	**1.31 (1.13-1.53)**	**1.25 (1.08-1.44)**	**7**	**(3-10)**	2	(-2-6)		
Having attended a sporting event with the child at age 6-7	**1.98 (1.77-2.20)**	**1.80 (1.59-2.04)**	**1.40 (1.24-1.57)**	**11**	**(8-15)**	**10**	**(7-13)**	**4**	**(1-7)**
Individual									
Gender male	**1.94 (1.78-2.11)**	**1.96 (1.77-2.18)**	**1.79 (1.63-1.97)**	**17**	**(14-21)**	**19**	**(16-21)**	**18**	**(15-20)**
Very preterm	**0.62 (0.42-0.90)**	1.09 (0.64-1.88)	0.74 (0.48-1.15)	- 3	(-18-12)				
Moderate preterm	**0.57 (0.40-0.81)**	**0.59 (0.39-0.90)**	**0.59 (0.40-0.86)**	11	(-4-25)				
Late preterm	0.92 (0.77-1.10)	0.88 (0.71-1.09)	0.91 (0.74-1.11)	5	(-1-12)				
Multiple	0.93 (0.72-1.21)			0	(-10-9)				
Normal cognitive development (age 3)	**1.21 (1.06-1.39)**	0.96 (0.81-1.14)		3	(-3-9)				
Normal speech development (age 3)	**1.33 (1.18-1.50)**	1.12 (0.96-1.31)		2	(-3-7)				
Asthma (age 5)	**1.16 (1.03-1.31)**	1.15 (0.99-1.32)		-2	(-6-1)				
Severe motor problems (age 5)	**0.18 (0.08-0.40)**	**0.25 (0.09-0.69)**	**0.19 (0.08-0.44)**	-21	(-53-11)				
Overweight (age 5)	**0.86 (0.76-0.96)**	0.93 (0.81-1.06)		**-4**	**(-8-(-0.5)**	-3	(-7-0.5)		
Obese (age 5)	**0.83 (0.69-1.01)**	0.95 (0.75-1.19)		-2	(-8-4)	0	(-6-6)		
Weekly organised sport (age 5)	**1.46 (1.34-1.59)**	**1.31 (1.17-1.46)**	**1.21 (1.09-1.34)**	**5**	**(2-8)**	**5**	**(2-7)**	**4**	**(1-7)**
Weekly organised sport (age 7)	**1.67 (1.53-1.83)**	**1.52 (1.35-1.71)**	**1.37 (1.23-1.53)**	**9**	**(6-13)**	**6**	**(3-9)**	**5**	**(2-8)**

½ moderate-vigorous PA: self-reported moderate to vigorous physical activity of ≥60 min. on at least 3-4 days per week. Moderate-vigorous PA-AC5: minutes of 5 min. windows with 80% bout activity (ENMO>100mg) measured by wrist accelerometer. For gestational age groups term born is reference group; for obesity/overweight normal weight is reference. SD: standard deviation.

Dependent variable is "½ moderate-vigorous PA" for the logistic regression (model 1-3) and "moderate-vigorous PA-AC5" for the linear regression model 4-6. Model 1 shows unadjusted Odds Ratio (OR) and 95% confidence interval (CI). In model 2 OR (CI) are adjusted for socio-economic predictors (N=10570, Cox&Snell r^2=0.009), for parenting predictors (N=7748, Cox&Snell r^2=0.018), for individual predictors (N=8085, Cox&Snell r^2=0.038). Model 3 uses all significant predictors of models 1 (N=9562; Cox&Snell r^2=0.044). Model 4 shows unadjusted Coefficient β (β) and 95% confidence interval (CI). In model 5 β (CI) are adjusted for socio-economic predictors (N=4037, adjusted r^2=0.004), for parenting predictors (N=3724, adjusted r^2=0.014), for individual predictors (N=3720, adjusted r^2=0.064). Model 6 uses all significant predictors of models 5 (N=3716; adjusted r^2=0.067).

Comparison of cohort members included in the logistic regression model 3 and the linear regression model 6 at age 14 to those with missing data

	Included in model 3 N=9562	Missing data model 3 N=1412	p-Value	Included in model 6 N=3716	Missing data model 6 N=330	p-Value
Ethnicity white	8194 (86%)	904 (64%)	<0.001	3275 (88%)	230 (71%)	<0.001
High parental education	4956 (52%)	367 (31%)	<0.001	2084 (57%)	111 (35%)	<0.001
Having attended a sporting event with the child at age 4-5	1538 (16%)	92 (12%)	<0.01	597 (16%)	24 (15%)	0.58
Having attended a sporting event with the child at age 6-7	2550 (27%)	103 (19%)	<0.001	1013 (27%)	18 (19%)	0.07
Gender male	4721 (49%)	726 (51%)	0.15	1752 (47%)	164 (50%)	0.37
Very preterm	91 (1%)	22 (2%)		38 (1%)	8 (2%)	
Moderate preterm	116 (1%)	11 (1%)	<0.05	44 (1%)	3 (1%)	0.11
Late preterm	517 (5%)	92 (7%)		200 (5%)	21 (6%)	
Full term	8838 (92%)	1287 (91%)		3434 (92%)	298 (90%)	
Severe motor problems (age 5)	25(0.3%)	1(0.1%)	0.5	6(0.2%)	0 (0%)	0.61
Weekly organised sport (age 5)	5339 (56%)	296 (38%)	<0.001	2206 (59%)	74 (45%)	<0.001
Weekly organised sport (age 7)	6776 (71%)	275 (50%)	<0.001	2736 (74%)	53 (57%)	<0.001

Sensitivity analysis of influencing factors for self-reported "½ moderate-vigorous PA" or measured minutes of "moderate-vigorous PA-AC5" age 14 years

	Model 7		Model 8	
	OR	(95%CI)	β	(95%CI)
Socio-economic (age 9 month)				
Ethnicity white	0.96	(0.78-1.17)	4	(-3-10)
High parental vocational qualification	1.05	(0.92-1.20)	1	(-3-4)
High parental education	**1.18**	**(1.03-1.34)**	-2	(-6-1)
income below 60% poverty index	1.02	(0.87-1.19)	2	(-3-6)
siblings in household	1.03	(0.97-1.10)	0	(-2-1)
lone parenthood status	1.08	(0.89-1.31)	6	(-1-12)
living in safe area	0.91	(0.81-1.03)	-1	(-4-2)
Parenting				
Pianta Scale Conflict (age 3)	1.00	(0.99-1.01)	0	(-0.3-0.3)
Pianta Scale Closeness (age 3)	1.00	(0.97-1.03)	0	(-1-1)
Having attended a sporting event with the child at age 4-5	**1.24**	**(1.05-1.46)**	1	(-3-5)
Having attended a sporting event with the child at age 6-7	**1.40**	**(1.22-1.61)**	**5**	**(1-9)**
Individual				
Gender male	**1.77**	**(1.58-1.99)**	**17**	**(13-20)**
Very preterm	0.92	(0.51-1.67)	-5	(-23-12)
Moderately preterm	**0.58**	**(0.36-0.93)**	2	(-13-18)
Late preterm	0.87	(0.68-1.11)	6	(-1-13)
Multiple	1.16	(0.78-1.72)	1	(-10-12)
Normal cognitive development (age 3)	0.93	(0.75-1.14)	2	(-4-8)
Normal speech development (age 3)	1.21	(0.99-1.46)	**-7**	**(-12-(-1))**
Asthma (age 5)	1.09	(0.93-1.28)	-2	(-6-3)
Severe motor problems (age 5)	**0.24**	**(0.08-0.67)**	-21	(-57-15)
Overweight (age 5)	0.91	(0.78-1.05)	**-5**	**(-9-(-0.5))**
Obese (age 5)	0.99	(0.77-1.29)	1	(-6-9)
Weekly organised sport (age 5)	**1.19**	**(1.05-1.34)**	**4**	**(0-7)**
Weekly organised sport (age 7)	**1.47**	**(1.29-1.68)**	**6**	**(2-10)**

½ moderate-vigorous PA: self-reported moderate to vigorous physical activity of ≥60 min. on at least 3-4 days per week. Moderate-vigorous PA-AC5: minutes of 5 min. windows with 80% bout activity (ENMO>100mg) measured by wrist accelerometer. For gestational age groups term born is reference group; for obesity/overweight normal weight is reference. SD: standard deviation. Model 7 includes all variables analysed in the logistic regression model 1 (N=6813, Cox&Snell r2=0.047) with "½ moderate-vigorous PA" as dependent variable. Model 8 (N=2732, r2=0.059) includes all variables analysed of the linear regression model 4 with "moderate-vigorous PA-AC5" as dependent variable.

Figure 1 (online)

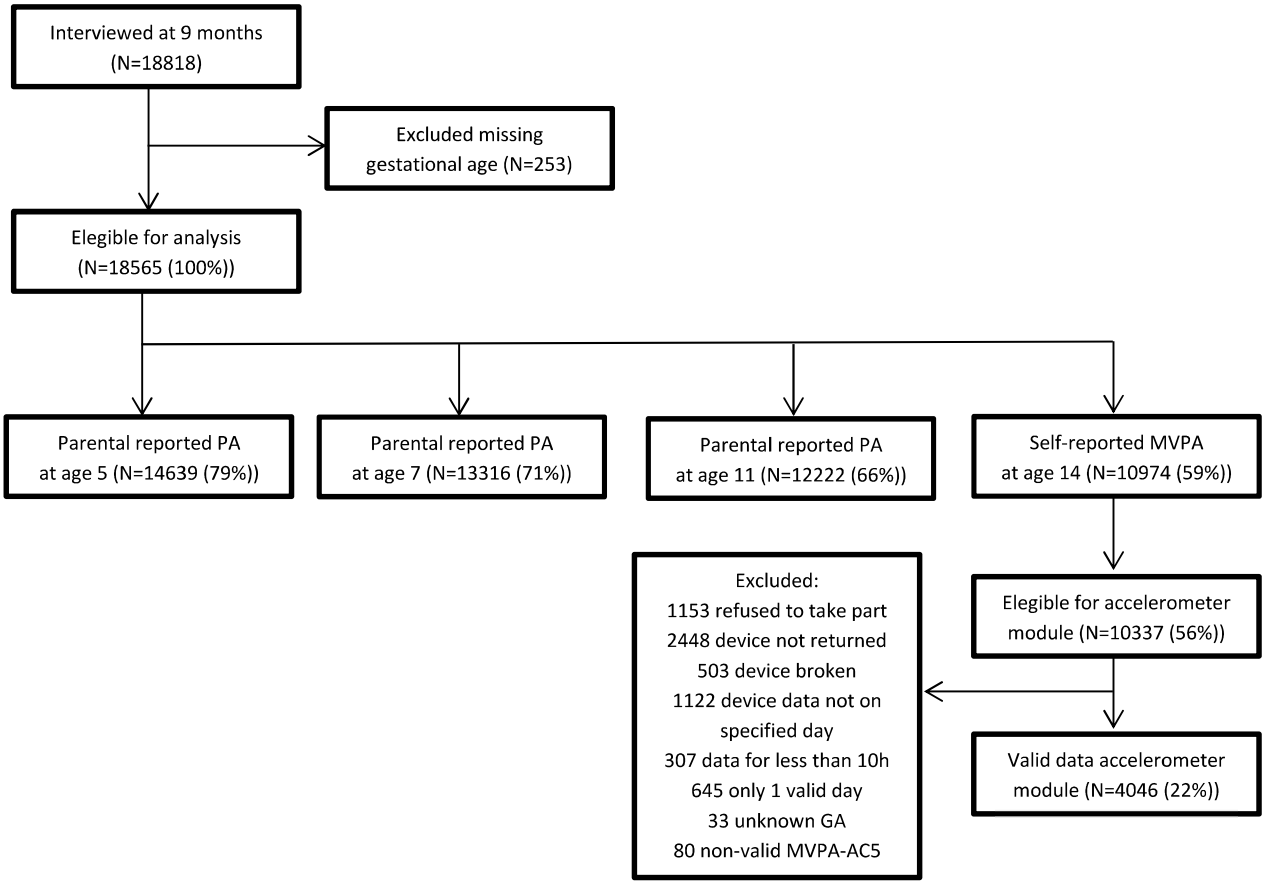
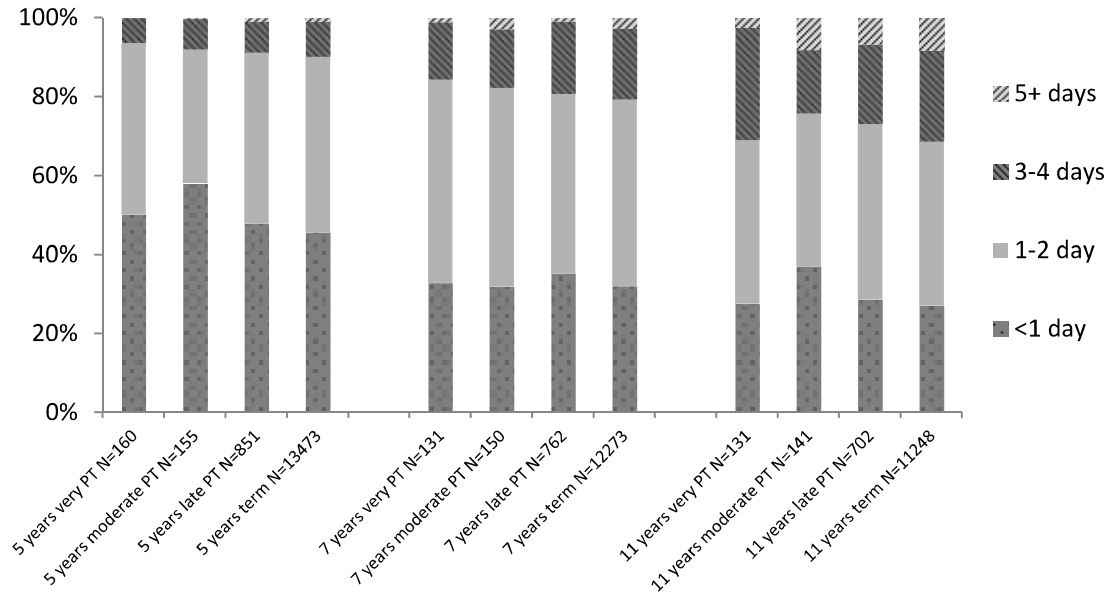


Figure 2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5 years late PT N=851
5 years term N=13473
7 years very PT N=131
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Figure 3 (online)

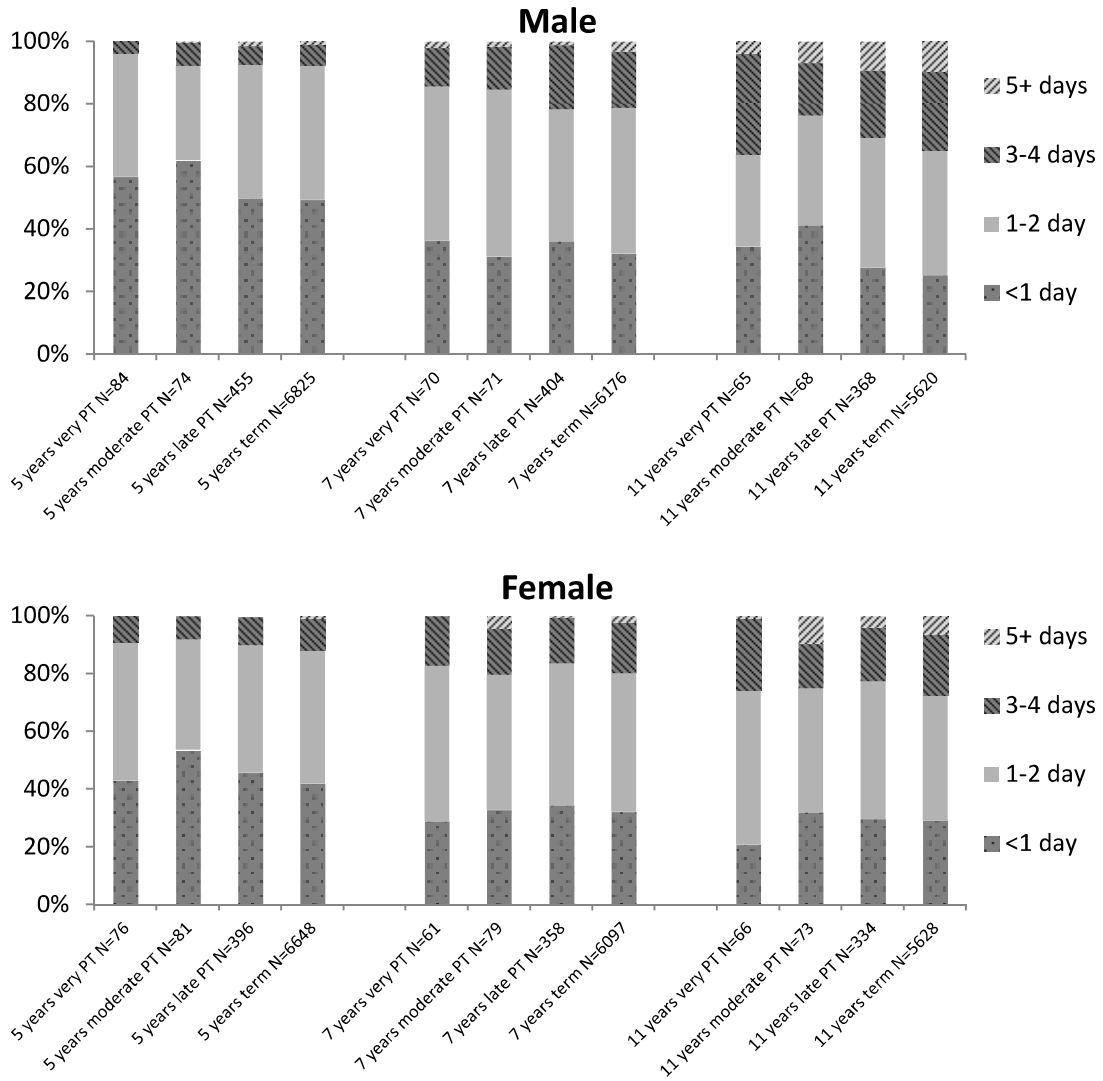
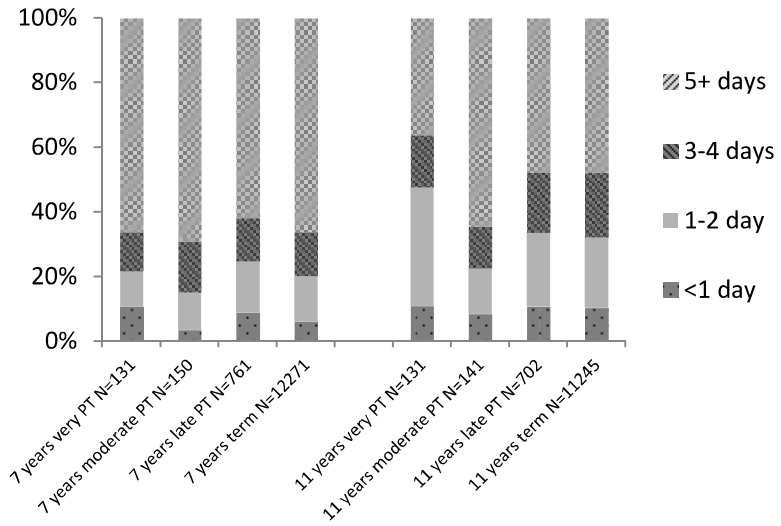


Figure 4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7 years very PT N=131
7 years moderate PT N=150
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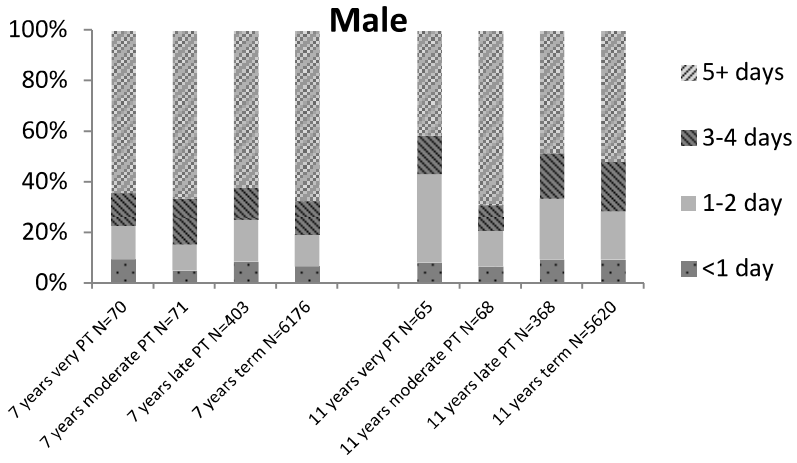
11 years late PT N=702
11 years term N=11245

Figure 5 (online)



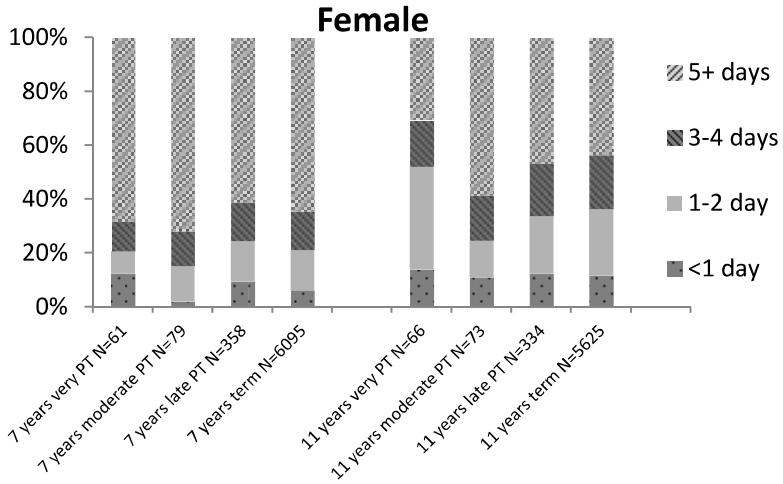
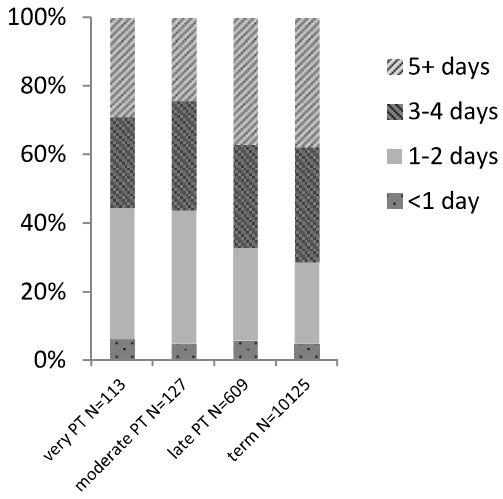


Figure 6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very PT N=113
moderate PT N=127
late PT N=609
term N=10125
5+ days
3-4 days
1-2 days
<1 day

Figure 7 (online)

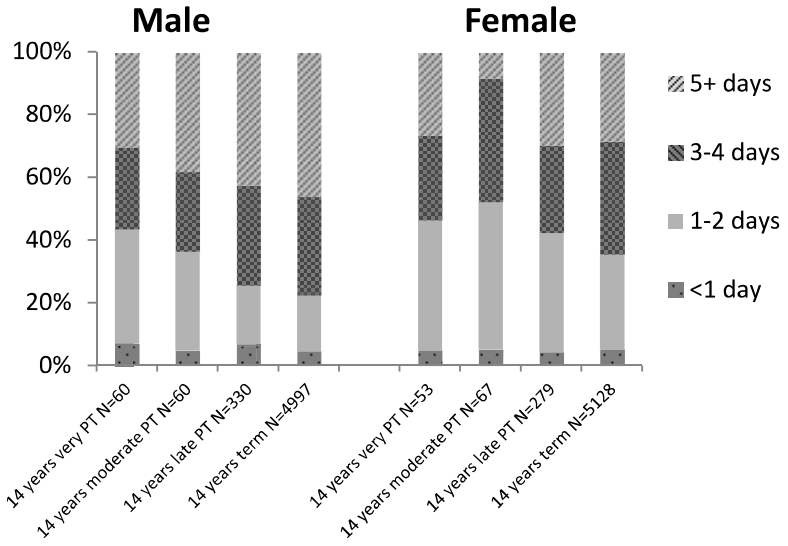


Figure 8 (online)

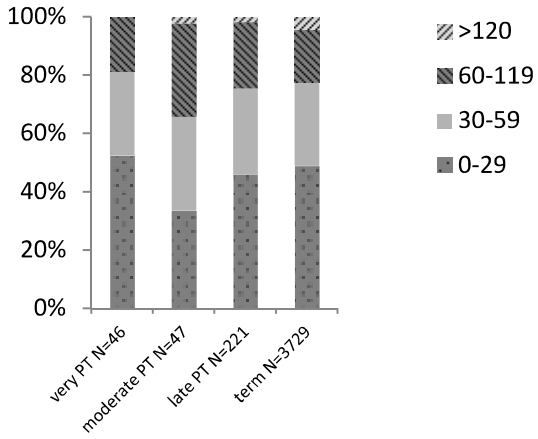
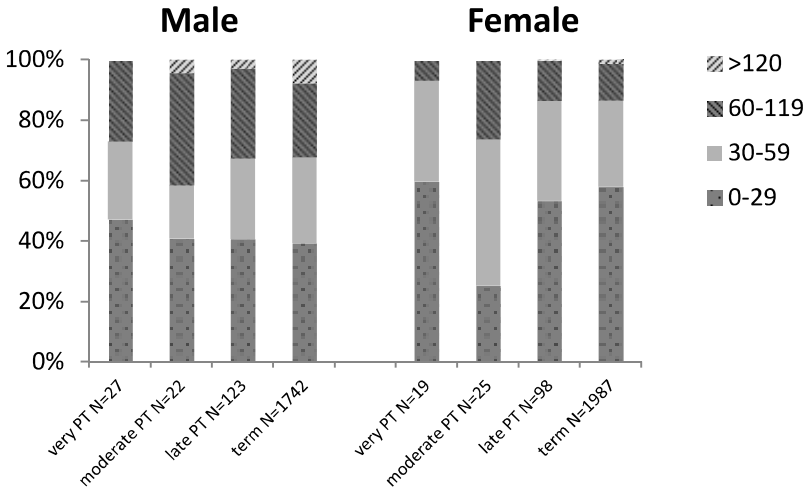


Figure 9


Male
Female
100%
80%
60%
40%
20%
0%
very PT N=27
moderate PT N=22
late PT N=123
term N=1742
very PT N=19
moderate PT N=25
late PT N=98
term N=1987
>120
60-119
30-59
0-29