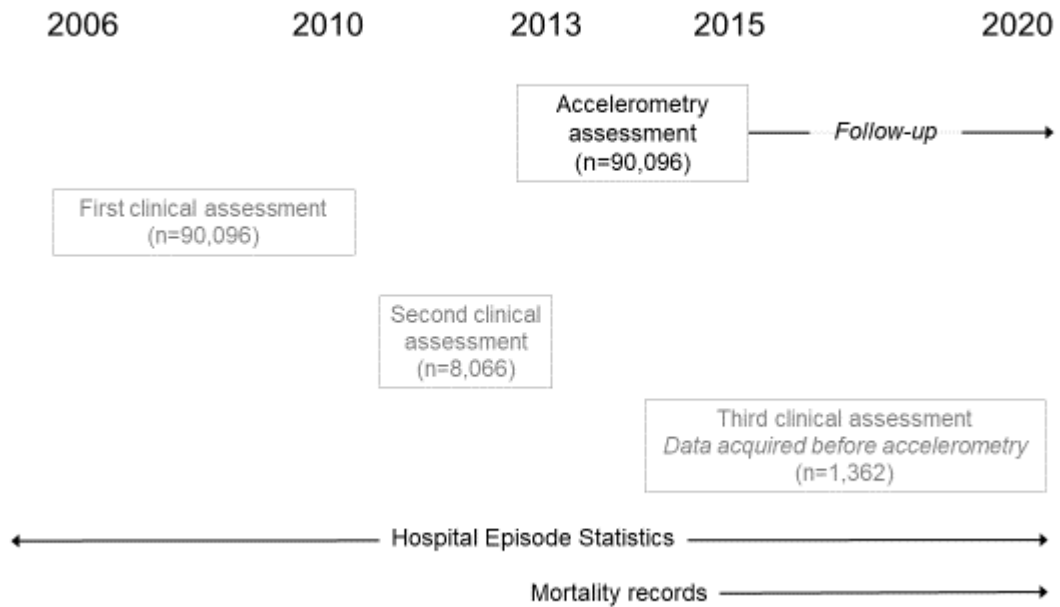


Supplementary Tables and Figures

Supplementary Figure 1

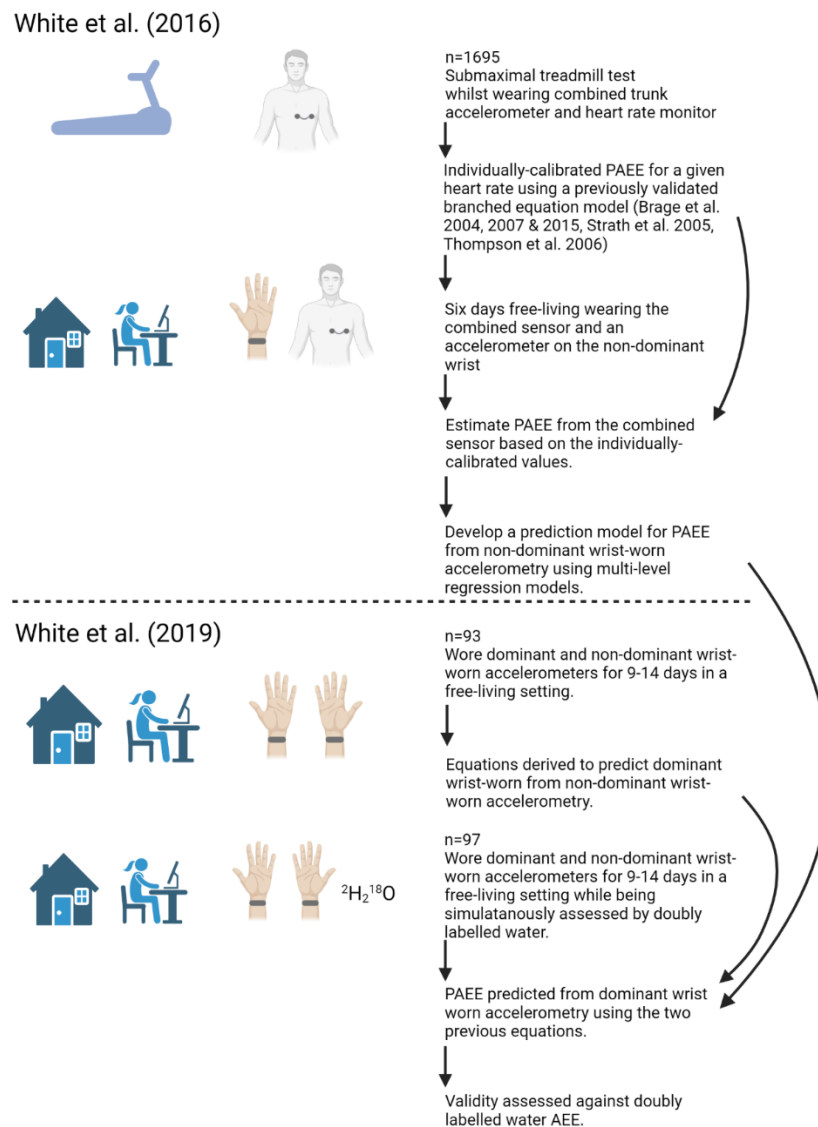
Timeline of measurements and sample sizes for those included in the present study.



Covariate data were obtained at the clinical assessment visits, with the data from the closest time point prior to accelerometry used (unless otherwise stated in the Methods). Hospital Episode Statistics data were used to inform prevalent disease status prior to accelerometry. Both Hospital Episode Statistics and Mortality records data were used to ascertain incident Type 2 diabetes during the follow-up period.

Supplementary Figure 2

Derivation and validation of PAEE from dominant wrist-worn accelerometry



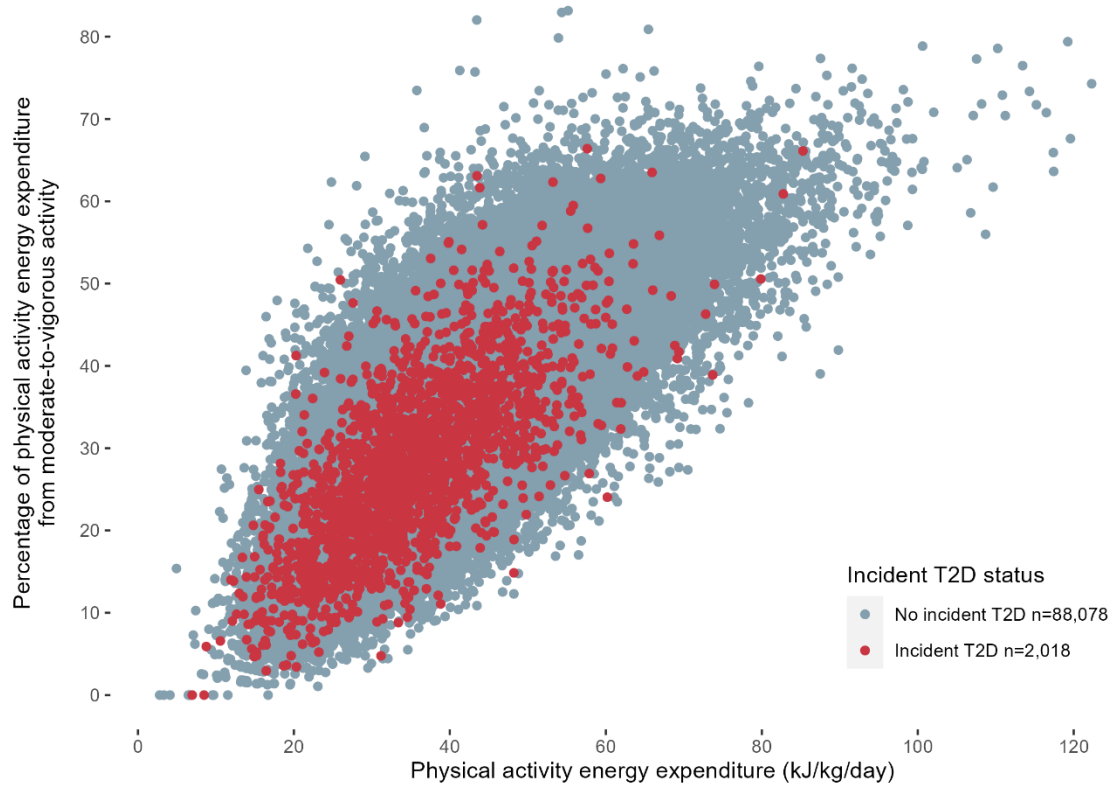
Created with biorender.com. PAEE: physical activity energy expenditure.

References:

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Supplementary Figure 3

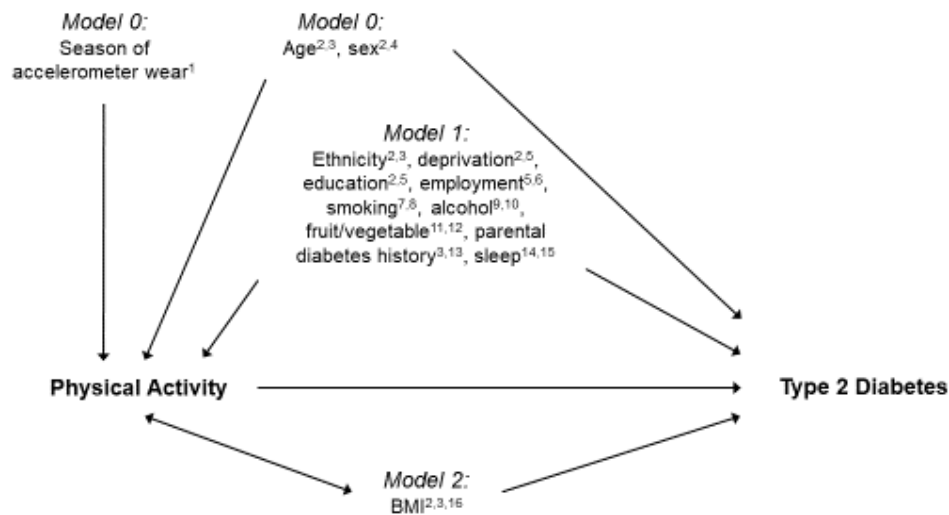
Scatter plot showing PAEE and the percentage of PAEE from MVPA by incident type 2 diabetes status; UK Biobank (n=90,096)



PAEE: Physical Activity Energy Expenditure, MVPA: moderate-to-vigorous physical activity. Pearson's correlation coefficient between PAEE and the percentage of PAEE from MVPA = 0.72

Supplementary Figure 4

A simplified diagram displaying the rationale for covariate adjustment



Models progressively adjusted for variables listed above i.e. Model 2 also adjusted for variables listed under Models 0 and 1.

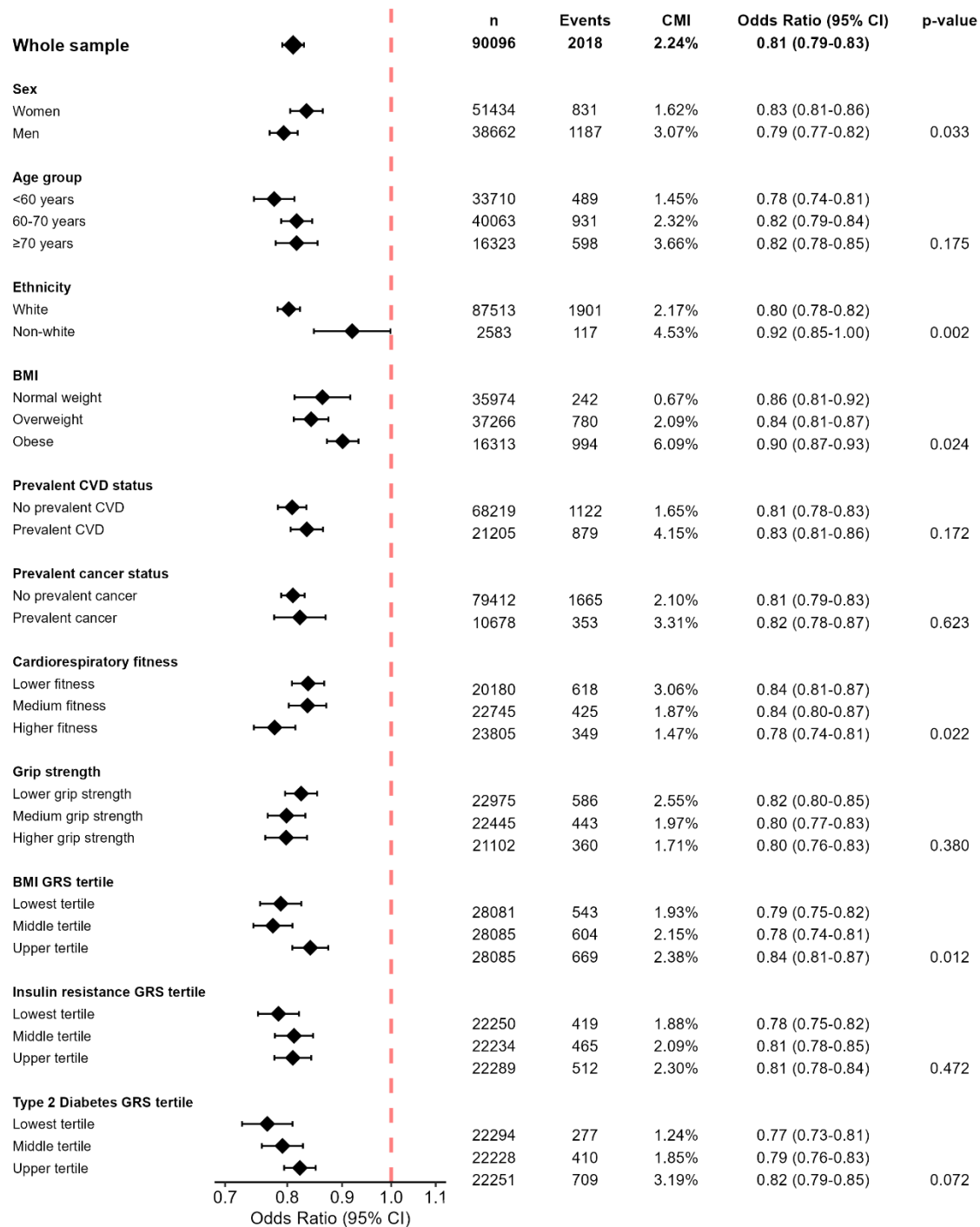
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Supplementary Figure 5

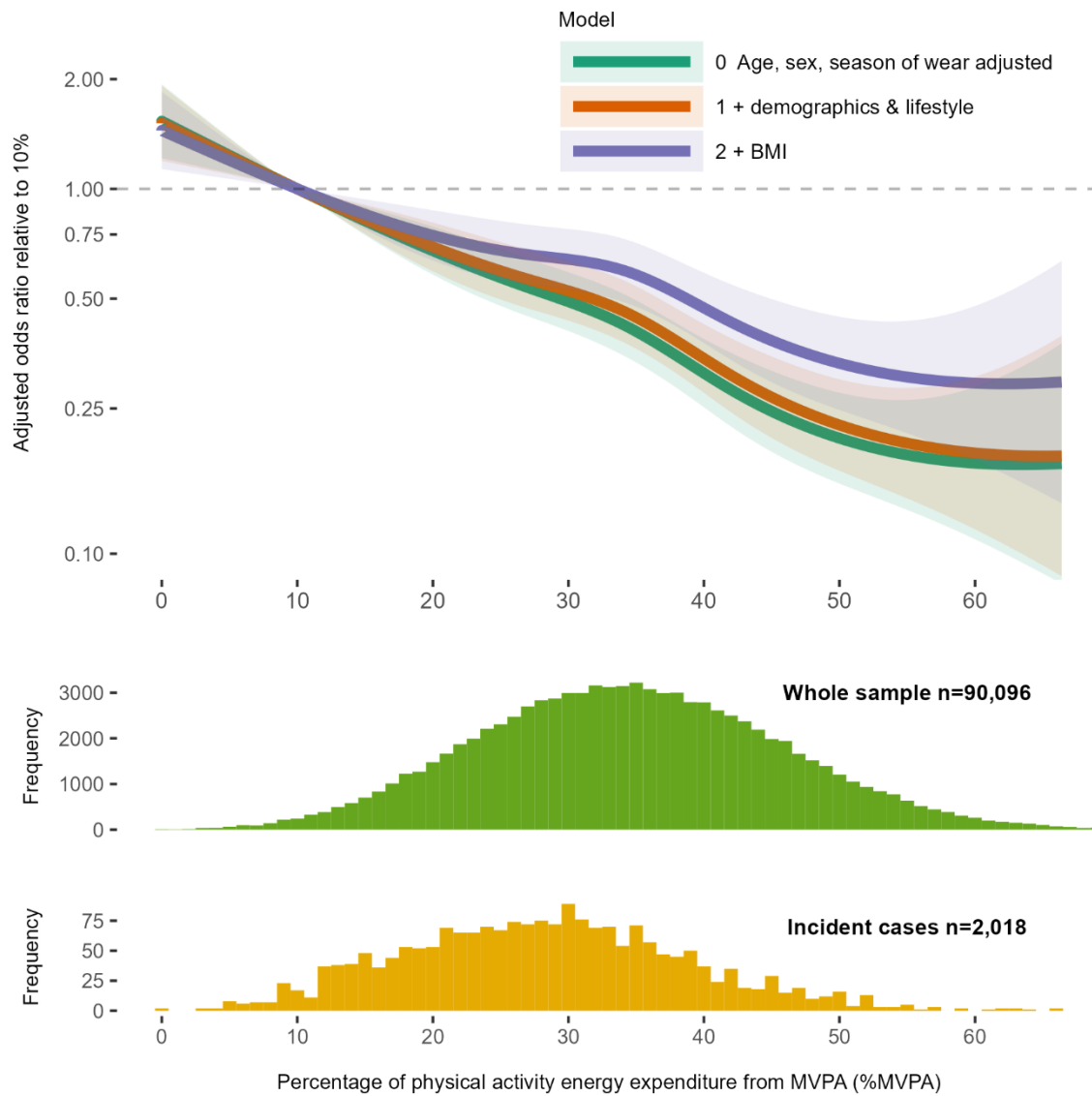
Odds ratios for incident type 2 diabetes per 5 kJ.kg⁻¹.d⁻¹ PAEE for the whole sample and in subgroups with adjustment for confounding factors but not BMI (Model 1); UK Biobank (n=90,096)



Model 1 displayed; adjusted for age, sex, season of accelerometry wear (using two orthogonal sine functions), ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake. Genetic risk score stratified analyses also adjusted for UK Biobank genotyping array and 10 genetic principal components but did not adjust for ethnicity as analyses were restricted to those of white European ancestry. PAEE: physical activity energy expenditure, CMI: Cumulative incidence, CVD: cardiovascular disease, BMI: body mass index, GRS: genetic risk score.

Supplementary Figure 6

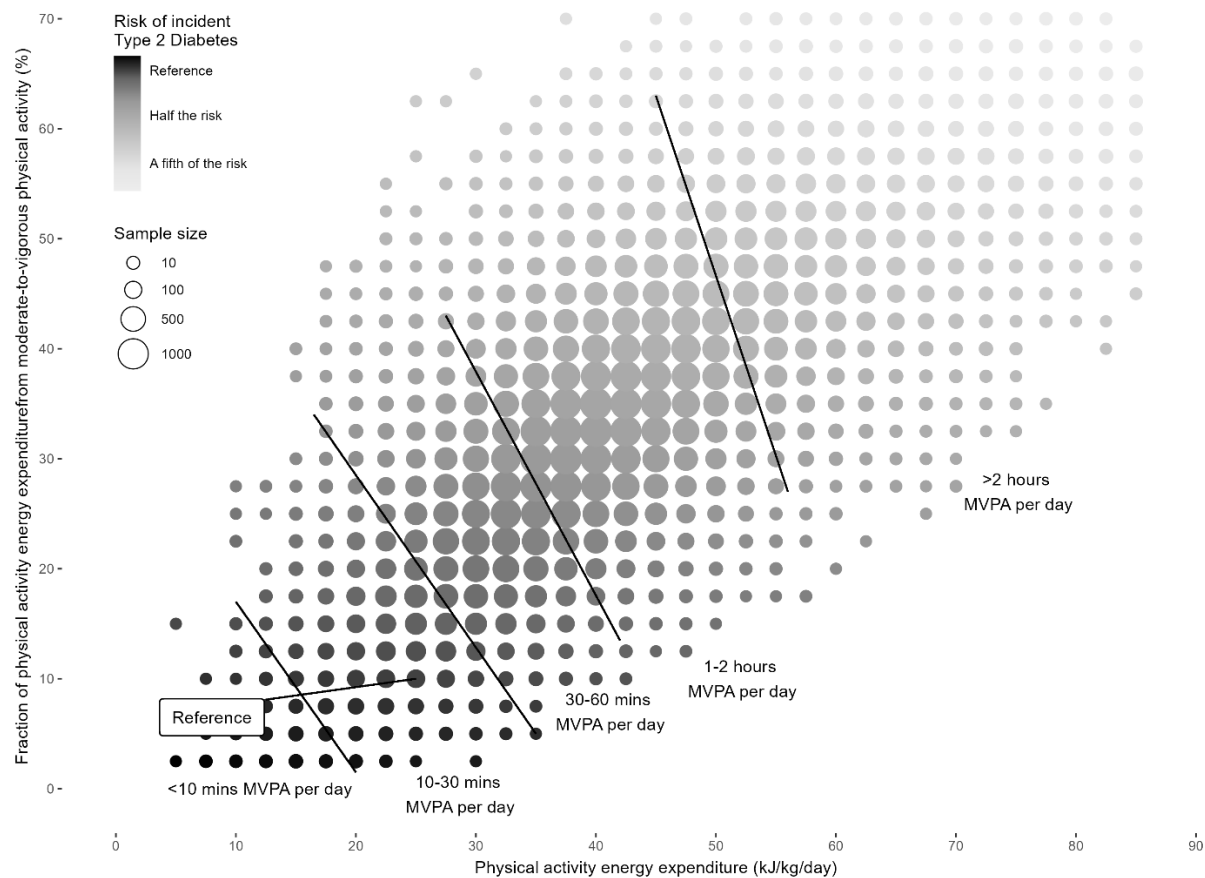
Cubic spline modelled association between the percentage of PAEE from MVPA and incident type 2 diabetes; UK Biobank (n=90,096)



Model 0 adjusted for age, sex, season of accelerometry wear (using two orthogonal sine functions), and PAEE; Model 1 additionally adjusted for ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake. Model 2 additionally adjusted for body mass index. Data presented for the observed range of %MVPA amongst incident cases. PAEE: physical activity energy expenditure, %MVPA: percentage of PAEE from Moderate-to-vigorous Physical Activity, BMI: body mass index.

Supplementary Figure 7

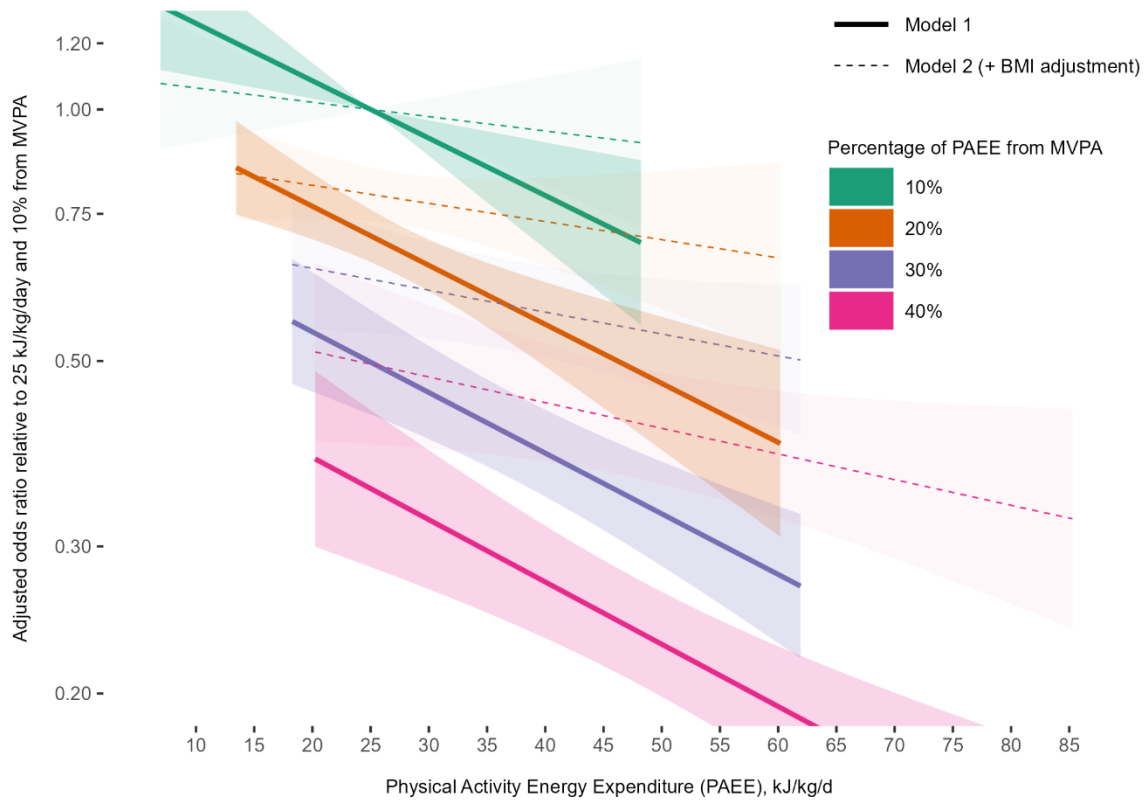
The relative risk of incident Type 2 diabetes for combinations of PAEE and %MVPA adjusted for BMI; UK Biobank (n=90,096).



PAEE: physical activity energy expenditure, %MVPA: percentage of PAEE from MVPA. BMI-adjusted odds ratio for type 2 diabetes represented by the colour gradient with 25 kJ/kg/day and 10% as reference values. Size of the points represents sample size and segments indicate the approximate average minutes of unouted MVPA for each combination. Lines divide groups of similar observed median values of MVPA time, as indicated by the text. Each data point represents categories of dimensions 2.5 kJ/kg/day * 2.5%. Data points are placed at the midpoint of these categories. Points are not shown if there were no observations for that combination. Data are shown within the observed range of PAEE and %MVPA amongst incident type 2 diabetes cases.

Supplementary Figure 8

The joint association of PAEE and %MVPA with the odds of incident type 2 diabetes (Model 1 emphasised); UK Biobank (n=90,096)

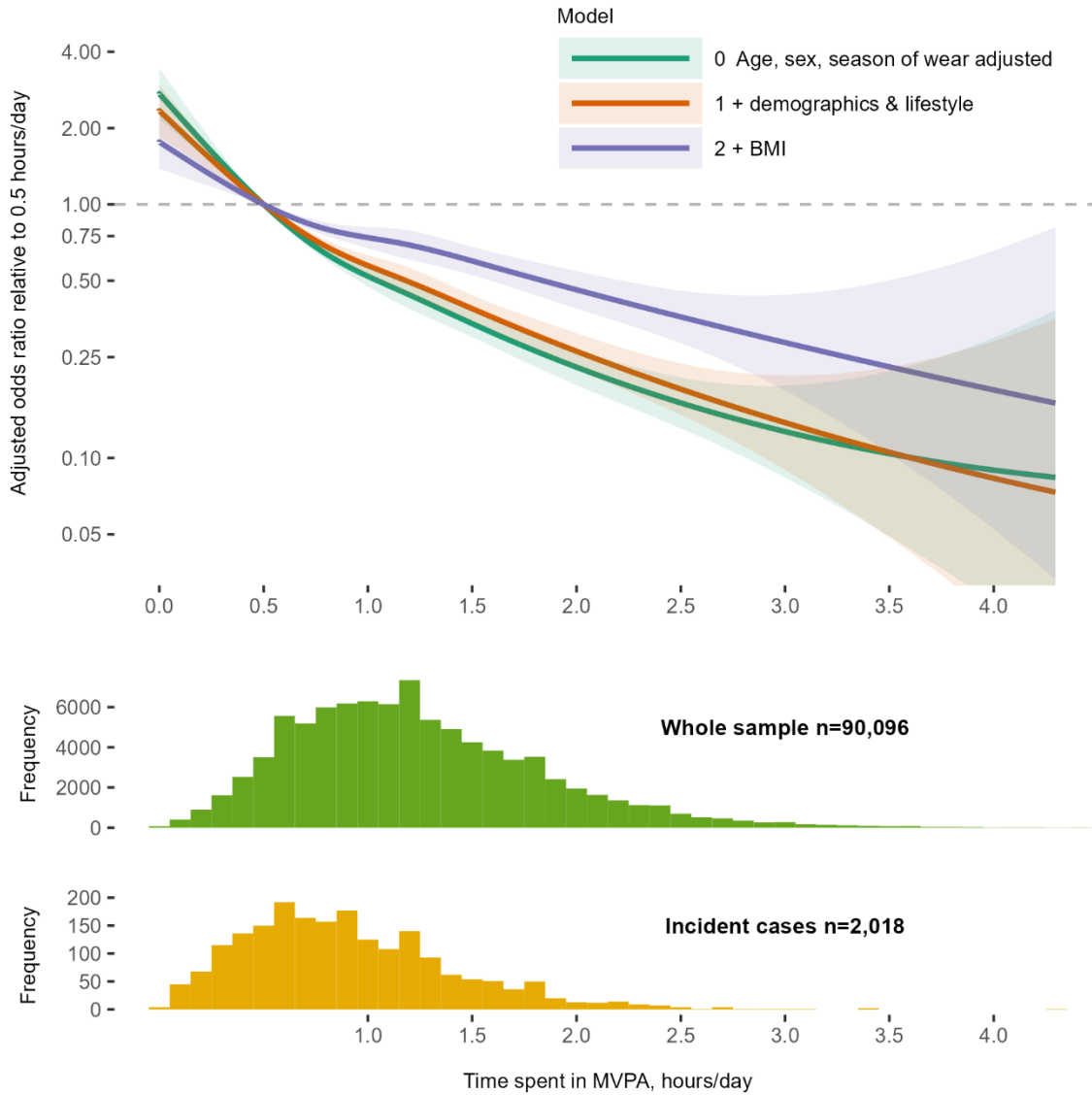


Model 1 adjusted for age, sex, season of accelerometry wear (using two orthogonal sine functions), ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, fruit and vegetable intake. Model 2 additionally adjusted for body mass index. Data presented for the observed range of PAEE amongst incident cases for a range around the %MVPA value ($\pm 5\%$, extending to respective end of distributions for 10% and 40%). PAEE: physical activity energy expenditure, %MVPA: percentage of PAEE from Moderate-to-vigorous Physical Activity.

Supplementary Figure 9

Cubic spline modelled association between time spent in MVPA and incident type 2 diabetes; UK

Biobank (n=90,096)



Model 0 adjusted for age, sex, and season of accelerometry wear (using two orthogonal sine functions); Model 1 additionally adjusted for ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake. Model 2 additionally adjusted for body mass index. Data presented for the observed range of MVPA amongst incident cases. MVPA: moderate-to-vigorous physical activity, BMI: body mass index.

Supplementary Table 1

Descriptive characteristics by incident Type 2 Diabetes status; UK Biobank (n=90,096)

	Incident Type 2 Diabetes status		Whole sample
	Non-cases	Cases	
Sample size (% of total analysis sample)	88078 (97.8%)	2018 (2.2%)	90096 (100.0%)
PAEE range (kJ/kg/d)	2.8-129.2	7.0-85.3	2.8-129.2
PAEE in kJ/kg/d, mean (SD)	41.7 (11.3)	35.5 (10.3)	41.5 (11.4)
Percentage of PAEE from MVPA, mean (SD)	34.7 (11.1)	28.2 (10.5)	34.6 (11.1)
Age in years, mean (SD)	62.2 (7.8)	65.2 (7.4)	62.3 (7.8)
Age group, (n, %)			
<60 years	33221 (37.7%)	489 (24.2%)	33710 (37.4%)
60-70 years	39132 (44.4%)	931 (46.1%)	40063 (44.5%)
>70 years	15725 (17.9%)	598 (29.6%)	16323 (18.1%)
Female sex, (n, %)	50603 (57.5%)	831 (41.2%)	51434 (57.1%)
Ethnicity, (n, %)			
White	85612 (97.2%)	1901 (94.2%)	87513 (97.1%)
Asian excl. Chinese	714 (0.8%)	46 (2.3%)	760 (0.8%)
Chinese	194 (0.2%)	3 (0.1%)	197 (0.2%)
Black	668 (0.8%)	38 (1.9%)	706 (0.8%)
Mixed	454 (0.5%)	12 (0.6%)	466 (0.5%)
Any other ethnic group	436 (0.5%)	18 (0.9%)	454 (0.5%)
Townsend Index of Deprivation, mean (SD)	-1.8 (2.8)	-1.1 (3.1)	-1.8 (2.8)
Highest education level achieved, (n, %)			
No qualification	6797 (7.7%)	328 (16.3%)	7125 (7.9%)
Any other qualification	42227 (47.9%)	1071 (53.1%)	43298 (48.1%)
Degree level or above	39054 (44.3%)	619 (30.7%)	39673 (44.0%)
Employment status, (n, %)			
Unemployed	34284 (38.9%)	1038 (51.4%)	35322 (39.2%)
In paid employment	53794 (61.1%)	980 (48.6%)	54774 (60.8%)
Smoking status, (n, %)			
Never	51009 (57.9%)	901 (44.6%)	51910 (57.6%)
Previous	31341 (35.6%)	910 (45.1%)	32251 (35.8%)
Current	5728 (6.5%)	207 (10.3%)	5935 (6.6%)
Alcohol drinking status, (n, %)			
Never	4735 (5.4%)	199 (9.9%)	4934 (5.5%)
< Twice a week	39852 (45.2%)	1008 (50.0%)	40860 (45.4%)
At least three times a week	43491 (49.4%)	811 (40.2%)	44302 (49.2%)
Sleep duration, (n, %)			
< 7 hours	19001 (21.6%)	567 (28.1%)	19568 (21.7%)
7-8 hours	63573.0 (72.2)	1263.0 (62.6)	64836.0 (72.0)
> 8 hours	5504 (6.2%)	188 (9.3%)	5692 (6.3%)
Fruit and veg intake score, mean (SD)	1.7 (1.1)	1.5 (1.1)	1.7 (1.1)
Parental history of diabetes, (n, %)			
No	73481.0 (83.4)	1479.0 (73.3)	74960.0 (83.2)
Yes	14597 (16.6%)	539 (26.7%)	15136 (16.8%)

BMI (kg/m ²), mean (SD)	26.4 (4.3)	30.7 (5.6)	26.5 (4.4)
Body Mass Index, (n, %)			
Underweight	541 (0.6%)	2 (0.1%)	543 (0.6%)
Normal weight	35732 (40.6%)	242 (12.0%)	35974 (39.9%)
Overweight	36486 (41.4%)	780 (38.7%)	37266 (41.4%)
Obese	15319 (17.4%)	994 (49.3%)	16313 (18.1%)
Prevalent CVD, (n, %)			
No	67097 (76.2%)	1122 (55.6%)	68219 (75.7%)
Yes	20326 (23.1%)	879 (43.6%)	21205 (23.5%)
Missing	655 (0.7%)	17 (0.8%)	672 (0.7%)
Prevalent cancer, (n, %)			
No	77747 (88.3%)	1665 (82.5%)	79412 (88.1%)
Yes	10325 (11.7%)	353 (17.5%)	10678 (11.9%)
Missing	6 (0.0%)	0 (0.0%)	6 (0.0%)
BMI genetic risk score tertile, (n, %)			
Lowest tertile	27538 (31.3%)	543 (26.9%)	28081 (31.2%)
Middle tertile	27481 (31.2%)	604 (29.9%)	28085 (31.2%)
Upper tertile	27416 (31.1%)	669 (33.2%)	28085 (31.2%)
Missing	5643 (6.4%)	202 (10.0%)	5845 (6.5%)
Insulin resistance risk score tertile, (n, %)			
Lowest tertile	27537 (31.3%)	546 (27.1%)	28083 (31.2%)
Middle tertile	27472 (31.2%)	612 (30.3%)	28084 (31.2%)
Upper tertile	27426 (31.1%)	658 (32.6%)	28084 (31.2%)
Missing	5643 (6.4%)	202 (10.0%)	5845 (6.5%)
Type 2 Diabetes genetic risk score tertile, (n, %)			
Lowest tertile	27728 (31.5%)	355 (17.6%)	28083 (31.2%)
Middle tertile	27543 (31.3%)	541 (26.8%)	28084 (31.2%)
Upper tertile	27164 (30.8%)	920 (45.6%)	28084 (31.2%)
Missing	5643 (6.4%)	202 (10.0%)	5845 (6.5%)
Fitness tertile, (n, %)			
Lower fitness	26446 (30.0%)	876 (43.4%)	27322 (30.3%)
Medium fitness	30032 (34.1%)	634 (31.4%)	30666 (34.0%)
Higher fitness	31548 (35.8%)	503 (24.9%)	32051 (35.6%)
Missing	52 (0.1%)	5 (0.2%)	57 (0.1%)
Grip strength tertile, (n, %)			
Lower grip strength	30717 (34.9%)	849 (42.1%)	31566 (35.0%)
Medium grip strength	29380 (33.4%)	632 (31.3%)	30012 (33.3%)
Higher grip strength	27649 (31.4%)	526 (26.1%)	28175 (31.3%)
Missing	332 (0.4%)	11 (0.5%)	343 (0.4%)

Supplementary Table 2

Odds ratios for incident type 2 diabetes for selected values of PAEE based on the cubic-spline models; UK Biobank (n=90,096)

	Model 0	Model 1	Model 2
PAEE (kJ.kg⁻¹.d⁻¹)	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
20	1.41 (1.31-1.53)	1.31 (1.21-1.41)	1.20 (1.11-1.30)
25	1.00	1.00	1.00
30	0.74 (0.70-0.77)	0.78 (0.75-0.82)	0.86 (0.82-0.90)
40	0.46 (0.40-0.52)	0.52 (0.46-0.59)	0.72 (0.63-0.82)
50	0.31 (0.27-0.35)	0.36 (0.32-0.41)	0.59 (0.52-0.68)
60	0.21 (0.17-0.25)	0.24 (0.20-0.29)	0.45 (0.37-0.55)

Model 0 adjusted for age, sex, and season of accelerometry wear (using two orthogonal sine functions); Model 1 additionally adjusted for ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake. Model 2 additionally adjusted for body mass index. PAEE: physical activity energy expenditure, CI: confidence interval.

Supplementary Table 3

Linear associations between PAEE (per 5 kJ.kg⁻¹.d⁻¹) and incident type 2 diabetes for the whole sample and in subgroups; UK Biobank (n=90,096)

	n / cases	Cumulative incidence	Model 0 OR (95% CI)	Model 1 OR (95% CI)	p value for interaction (Model 1)	Model 2 OR (95% CI)	p value for interaction (Model 2)
Whole sample	90096 / 2018	2.24%	0.78 (0.77-0.80)	0.81 (0.79-0.83)		0.89 (0.87-0.91)	
Sex							
Women	51434 / 831	1.62%	0.81 (0.78-0.83)	0.83 (0.81-0.86)		0.95 (0.91-0.98)	
Men	38662 / 1187	3.07%	0.77 (0.75-0.79)	0.79 (0.77-0.82)	0.033	0.86 (0.83-0.88)	0.000
Age group							
<60 years	33710 / 489	1.45%	0.76 (0.72-0.79)	0.78 (0.74-0.81)		0.85 (0.81-0.88)	
60-70 years	40063 / 931	2.32%	0.79 (0.76-0.82)	0.82 (0.79-0.84)		0.90 (0.87-0.93)	
≥70 years	16323 / 598	3.66%	0.79 (0.76-0.83)	0.82 (0.78-0.85)	0.175	0.90 (0.86-0.94)	0.062
Ethnicity							
White	87513 / 1901	2.17%	0.77 (0.76-0.79)	0.80 (0.78-0.82)		0.88 (0.86-0.91)	
Non-white	2583 / 117	4.53%	0.92 (0.84-1.00)	0.92 (0.85-1.00)	0.002	0.98 (0.91-1.07)	0.018
BMI							
Normal weight	35974 / 242	0.67%	0.84 (0.79-0.89)	0.86 (0.81-0.92)		0.87 (0.82-0.93)	
Overweight	37266 / 780	2.09%	0.83 (0.80-0.86)	0.84 (0.81-0.87)		0.85 (0.82-0.89)	
Obese	16313 / 994	6.09%	0.89 (0.86-0.92)	0.90 (0.87-0.93)	0.024	0.93 (0.90-0.96)	0.002
Prevalent CVD status							
No prevalent CVD	68219 / 1122	1.65%	0.79 (0.76-0.81)	0.81 (0.78-0.83)		0.89 (0.86-0.92)	
Prevalent CVD	21205 / 879	4.15%	0.81 (0.78-0.84)	0.83 (0.81-0.86)	0.172	0.91 (0.88-0.94)	0.353
Prevalent cancer status							
No prevalent cancer	79412 / 1665	2.10%	0.78 (0.76-0.80)	0.81 (0.79-0.83)		0.89 (0.87-0.91)	
Prevalent cancer	10678 / 353	3.31%	0.80 (0.75-0.84)	0.82 (0.78-0.87)	0.623	0.90 (0.85-0.95)	0.660

BMI genetic risk score tertile							
Lowest tertile	28081 / 543	1.93%	0.76 (0.73-0.80)	0.79 (0.75-0.82)		0.87 (0.83-0.91)	
Middle tertile	28085 / 604	2.15%	0.75 (0.72-0.78)	0.78 (0.74-0.81)		0.86 (0.82-0.89)	
Upper tertile	28085 / 669	2.38%	0.81 (0.78-0.85)	0.84 (0.81-0.87)	0.012	0.93 (0.90-0.97)	0.006
Insulin resistance genetic risk score tertile							
Lowest tertile	22250 / 419	1.88%	0.76 (0.73-0.79)	0.78 (0.75-0.82)		0.87 (0.83-0.91)	
Middle tertile	22234 / 465	2.09%	0.78 (0.75-0.81)	0.81 (0.78-0.85)		0.90 (0.86-0.94)	
Upper tertile	22289 / 512	2.30%	0.78 (0.75-0.81)	0.81 (0.78-0.84)	0.472	0.89 (0.85-0.92)	0.598
Type 2 Diabetes genetic risk score tertile							
Lowest tertile	22294 / 277	1.24%	0.73 (0.69-0.78)	0.77 (0.73-0.81)		0.85 (0.81-0.90)	
Middle tertile	22228 / 410	1.85%	0.76 (0.73-0.80)	0.79 (0.76-0.83)		0.88 (0.84-0.92)	
Upper tertile	22251 / 709	3.19%	0.80 (0.77-0.82)	0.82 (0.79-0.85)	0.072	0.90 (0.87-0.93)	0.191
Cardiorespiratory fitness							
Lower fitness	20180 / 618	3.06%	0.81 (0.78-0.84)	0.84 (0.81-0.87)		0.91 (0.88-0.94)	
Medium fitness	22745 / 425	1.87%	0.81 (0.78-0.85)	0.84 (0.80-0.87)		0.91 (0.87-0.95)	
Higher fitness	23805 / 349	1.47%	0.76 (0.72-0.79)	0.78 (0.74-0.81)	0.022	0.86 (0.82-0.90)	0.072
Grip strength							
Lower fitness	22975 / 586	2.55%	0.80 (0.77-0.83)	0.82 (0.80-0.85)		0.91 (0.88-0.94)	
Medium fitness	22445 / 443	1.97%	0.77 (0.74-0.80)	0.80 (0.77-0.83)		0.88 (0.85-0.92)	
Higher fitness	21102 / 360	1.71%	0.77 (0.74-0.81)	0.80 (0.76-0.83)	0.380	0.87 (0.83-0.91)	0.325

Model 0 adjusted for age, sex and season of accelerometry wear (using two orthogonal sine functions); Model 1 additionally adjusted for ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake. Model 2 additionally adjusted for body mass index. Genetic risk score stratified analyses also adjusted for UK Biobank genotyping array and 10 genetic principal components but did not adjust for ethnicity as analyses were restricted to those of white European ancestry. PAEE: physical activity energy expenditure, OR: odds ratio, CI: confidence interval, BMI: body mass index, CVD: cardiovascular disease.

Supplementary Table 4

Sensitivity analyses for the linear associations per 5 kJ.kg⁻¹.d⁻¹ of PAEE and incident Type 2 Diabetes; UK Biobank (n=93,036)

	n / cases	Model 1	Model 2
		Hazard Ratio (95% CI)	Hazard Ratio (95% CI)
Cox Regression	90096 / 2014	0.81 (0.80-0.83)	0.89 (0.87-0.91)
	n / cases	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Missing data imputed	93036 / 2131	0.81 (0.79-0.83)	0.89 (0.87-0.91)
Excluding early incident events (first 2 years)	89539 / 1461	0.82 (0.80-0.84)	0.90 (0.87-0.92)
Excluding underweight (BMI<18.5 kg/m ²)	89553 / 2016	0.81 (0.79-0.83)	0.89 (0.87-0.91)
Excluding those with HbA1c>48 mmol/mol	89710 / 1806	0.81 (0.79-0.83)	0.89 (0.87-0.91)

Model 1 adjusted for age, sex, season of accelerometry wear (using two orthogonal sine functions), ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, fruit and vegetable intake. Model 2 additionally adjusted for body mass index. *Hazard ratio. PAEE: physical activity energy expenditure, CI: confidence interval.

Supplementary Table 5

Associations between PAEE and %MVPA and incident Type 2 Diabetes for selected values of PAEE and %MVPA; UK Biobank (n=90,096)

PAEE (kJ.kg ⁻¹ .d ⁻¹)	%MVPA	Model 0	Model 1	Model 2	Additional adjustment for waist circumference
		Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
20	10	1.12 (1.07-1.18)	1.08 (1.03-1.14)	1.02 (0.97-1.07)	1.02 (0.97-1.07)
25	10	1.00	1.00	1.00	1.00
30	10	0.89 (0.85-0.93)	0.92 (0.88-0.97)	0.98 (0.93-1.03)	0.98 (0.93-1.03)
40	10	0.70 (0.61-0.81)	0.79 (0.68-0.91)	0.94 (0.81-1.09)	0.95 (0.82-1.10)
50	10	N/A	N/A	N/A	N/A
60	10	N/A	N/A	N/A	N/A
20	20	0.76 (0.69-0.83)	0.77 (0.70-0.84)	0.81 (0.74-0.89)	0.83 (0.76-0.92)
25	20	0.68 (0.63-0.73)	0.71 (0.66-0.76)	0.79 (0.74-0.85)	0.81 (0.76-0.88)
30	20	0.60 (0.56-0.65)	0.65 (0.61-0.70)	0.77 (0.72-0.83)	0.79 (0.74-0.85)
40	20	0.48 (0.43-0.54)	0.55 (0.49-0.62)	0.73 (0.65-0.83)	0.75 (0.67-0.85)
50	20	0.39 (0.32-0.46)	0.47 (0.39-0.56)	0.70 (0.58-0.84)	0.72 (0.59-0.87)
60	20	0.31 (0.24-0.40)	0.40 (0.31-0.52)	0.66 (0.51-0.86)	0.68 (0.52-0.89)
20	30	0.51 (0.43-0.60)	0.54 (0.46-0.64)	0.65 (0.55-0.76)	0.68 (0.58-0.81)
25	30	0.46 (0.40-0.53)	0.50 (0.43-0.58)	0.63 (0.54-0.73)	0.66 (0.57-0.77)
30	30	0.41 (0.36-0.47)	0.46 (0.40-0.52)	0.61 (0.53-0.69)	0.64 (0.56-0.73)
40	30	0.33 (0.30-0.37)	0.39 (0.34-0.44)	0.57 (0.50-0.65)	0.60 (0.53-0.68)
50	30	0.27 (0.23-0.31)	0.33 (0.28-0.38)	0.54 (0.46-0.63)	0.56 (0.48-0.66)
60	30	0.22 (0.18-0.26)	0.28 (0.23-0.34)	0.51 (0.42-0.62)	0.53 (0.43-0.64)
20	40	0.34 (0.27-0.43)	0.38 (0.30-0.49)	0.51 (0.40-0.66)	0.56 (0.44-0.72)
25	40	0.31 (0.25-0.38)	0.35 (0.28-0.44)	0.50 (0.40-0.62)	0.54 (0.43-0.67)
30	40	0.28 (0.23-0.34)	0.32 (0.27-0.39)	0.48 (0.39-0.58)	0.52 (0.43-0.63)
40	40	0.23 (0.20-0.27)	0.27 (0.23-0.32)	0.45 (0.38-0.52)	0.48 (0.41-0.56)
50	40	0.19 (0.16-0.22)	0.23 (0.20-0.26)	0.42 (0.36-0.48)	0.44 (0.38-0.52)
60	40	0.15 (0.13-0.18)	0.19 (0.16-0.23)	0.39 (0.33-0.46)	0.41 (0.34-0.49)

N/A indicates this combination of PAEE and %MVPA not observed in this sample amongst incident cases. Model 0 adjusted for age, sex and season of accelerometry wear (using two orthogonal sine functions); Model 1 additionally adjusted for ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake; Model 2 additionally adjusted for body mass index. Data presented for the observed range of PAEE amongst incident cases for a range around the %MVPA value ($\pm 5\%$, extending to respective end of distributions for 10% and 40%). PAEE: physical activity energy expenditure, %MVPA: percentage of PAEE from MVPA, CI: confidence interval.

Supplementary Table 6

Sensitivity analyses using different thresholds for MVPA to estimate the association between PAEE and %MVPA and incident Type 2 Diabetes; UK Biobank (n=90,096)

PAEE	%MVPA	100mg		150mg	
		Model 1 Odds Ratio (95% CI)	Model 2 Odds Ratio (95% CI)	Model 1 Odds Ratio (95% CI)	Model 2 Odds Ratio (95% CI)
20	10	1.05 (0.99-1.12)	1.00 (0.93-1.06)	1.11 (1.06-1.15)	1.04 (1.00-1.08)
25	10	1.00	1.00	1.00	1.00
30	10	0.95 (0.89-1.01)	1.00 (0.94-1.07)	0.90 (0.87-0.94)	0.96 (0.92-1.00)
40	10	N/A	N/A	0.74 (0.65-0.83)	0.89 (0.79-1.01)
50	10	N/A	N/A	0.60 (0.49-0.73)	0.83 (0.68-1.01)
60	10	N/A	N/A	N/A	N/A
20	20	0.78 (0.71-0.85)	0.81 (0.74-0.89)	0.76 (0.69-0.84)	0.82 (0.74-0.90)
25	20	0.73 (0.69-0.78)	0.80 (0.75-0.86)	0.69 (0.63-0.75)	0.78 (0.72-0.85)
30	20	0.69 (0.64-0.74)	0.80 (0.74-0.86)	0.62 (0.58-0.67)	0.75 (0.70-0.81)
40	20	N/A	N/A	0.51 (0.47-0.56)	0.69 (0.63-0.76)
50	20	N/A	N/A	0.42 (0.36-0.48)	0.64 (0.55-0.74)
60	20	N/A	N/A	0.34 (0.28-0.42)	0.59 (0.48-0.72)
20	30	0.58 (0.49-0.67)	0.66 (0.56-0.77)	0.52 (0.43-0.63)	0.64 (0.53-0.78)
25	30	0.54 (0.47-0.61)	0.65 (0.57-0.74)	0.48 (0.40-0.56)	0.61 (0.52-0.73)
30	30	0.50 (0.44-0.57)	0.64 (0.56-0.72)	0.43 (0.37-0.50)	0.59 (0.51-0.68)
40	30	0.44 (0.38-0.50)	0.62 (0.54-0.72)	0.36 (0.32-0.40)	0.54 (0.48-0.61)
50	30	0.38 (0.31-0.46)	0.60 (0.49-0.74)	0.29 (0.26-0.33)	0.49 (0.43-0.56)
60	30	N/A	N/A	0.24 (0.20-0.28)	0.45 (0.38-0.53)
20	40	0.43 (0.34-0.53)	0.53 (0.43-0.67)	N/A	N/A
25	40	0.39 (0.32-0.48)	0.52 (0.43-0.64)	0.33 (0.26-0.42)	0.48 (0.37-0.62)
30	40	0.36 (0.31-0.44)	0.51 (0.42-0.61)	0.30 (0.24-0.37)	0.46 (0.37-0.57)
40	40	0.31 (0.27-0.37)	0.49 (0.41-0.57)	0.25 (0.21-0.29)	0.42 (0.35-0.50)
50	40	0.27 (0.23-0.32)	0.47 (0.39-0.56)	0.20 (0.17-0.24)	0.38 (0.32-0.45)
60	40	0.23 (0.19-0.28)	0.45 (0.36-0.55)	0.17 (0.14-0.20)	0.35 (0.28-0.42)

Model 1 adjusted for age, sex, season of accelerometry wear (using two orthogonal sine functions), ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, fruit and vegetable intake. Model 2 additionally adjusted for body mass index. Data presented for the observed range of PAEE amongst incident cases for a range around the %MVPA value ($\pm 5\%$, extending to respective end of distributions for 10% and 40%). PAEE: physical activity energy expenditure, %MVPA: percentage of PAEE from MVPA, CI: confidence interval.

Supplementary Table 7

Odds ratios for incident type 2 diabetes for selected values of time spent in MVPA based on the cubic-spline models; UK Biobank (n=90,096)

MVPA (hours/d)	Model 0	Model 1	Model 2
	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
0.5	1.00	1.00	1.00
1	0.52 (0.47-0.57)	0.57 (0.52-0.63)	0.74 (0.67-0.81)
1.5	0.34 (0.30-0.38)	0.39 (0.34-0.44)	0.60 (0.53-0.68)
2	0.23 (0.19-0.27)	0.26 (0.22-0.31)	0.46 (0.39-0.55)

Model 0 adjusted for age, sex, and season of accelerometry wear (using two orthogonal sine functions); Model 1 additionally adjusted for ethnicity, Townsend Index of deprivation, highest educational level achieved, employment status, parental history of diabetes, smoking status, alcohol drinking status, sleep duration, and fruit and vegetable intake. Model 2 additionally adjusted for body mass index. MVPA: moderate-to-vigorous physical activity, CI: confidence interval