

ELECTRONIC SUPPLEMENTARY MATERIAL

A systematic literature review with meta-analyses of within- and between-day differences in objectively measured physical activity in school-aged children

SPORTS MEDICINE

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Electronic Supplementary Material Table S1. Search strategy conducted in January 2013 of MEDLINE via PubMed, Scopus, Science Citation Index (SCI) via Web of Knowledge, and SPORTDiscus via EBSCOhost limited to papers published post-1990

Theme	Keywords	Mesh terms (PubMed only)
Young people	Children, child, childhood, adolescence, adolescent, teen, teens, teenaged, teenager, teenagers, "young people", youth, youths, boy, boys, girl, girls, "school aged",	"Child", "Adolescent"
Physical activity	"physical activity", "physical activities", exercise, "energy expenditure", sport, sports, "active travel", ("leisure time", AND, activity),	"Motor Activity", "Sports", "Exercise", "Physical Exertion"
Objective measures	Accelerometer, accelerometry, accelerometers, "counts per minute", CPM, triaxial, Actigraph, Yamax, Actiheart, Omron, sensewear, caltrac, walk4life, ideea, actireg, lifecorder, tritrac, genea, stepwatch, actical, actiwatch, rt3, activpal, actimarker, dynaport, CSA, MTI, pedometer, "heart rate", pedometry, pedometers, uniaxial, actigraphy,	"Monitoring, Ambulatory", "Actigraphy"
Time-segments	Hour, hours, hourly, day, days, daily, week, weeks, weekly, morning, afternoon, evening, weekday, weekdays, weekend, school, "break time", "play time", recess, lunchtime	

Themes were combined using AND, keywords were combined using OR. There were no language limitations enforced.

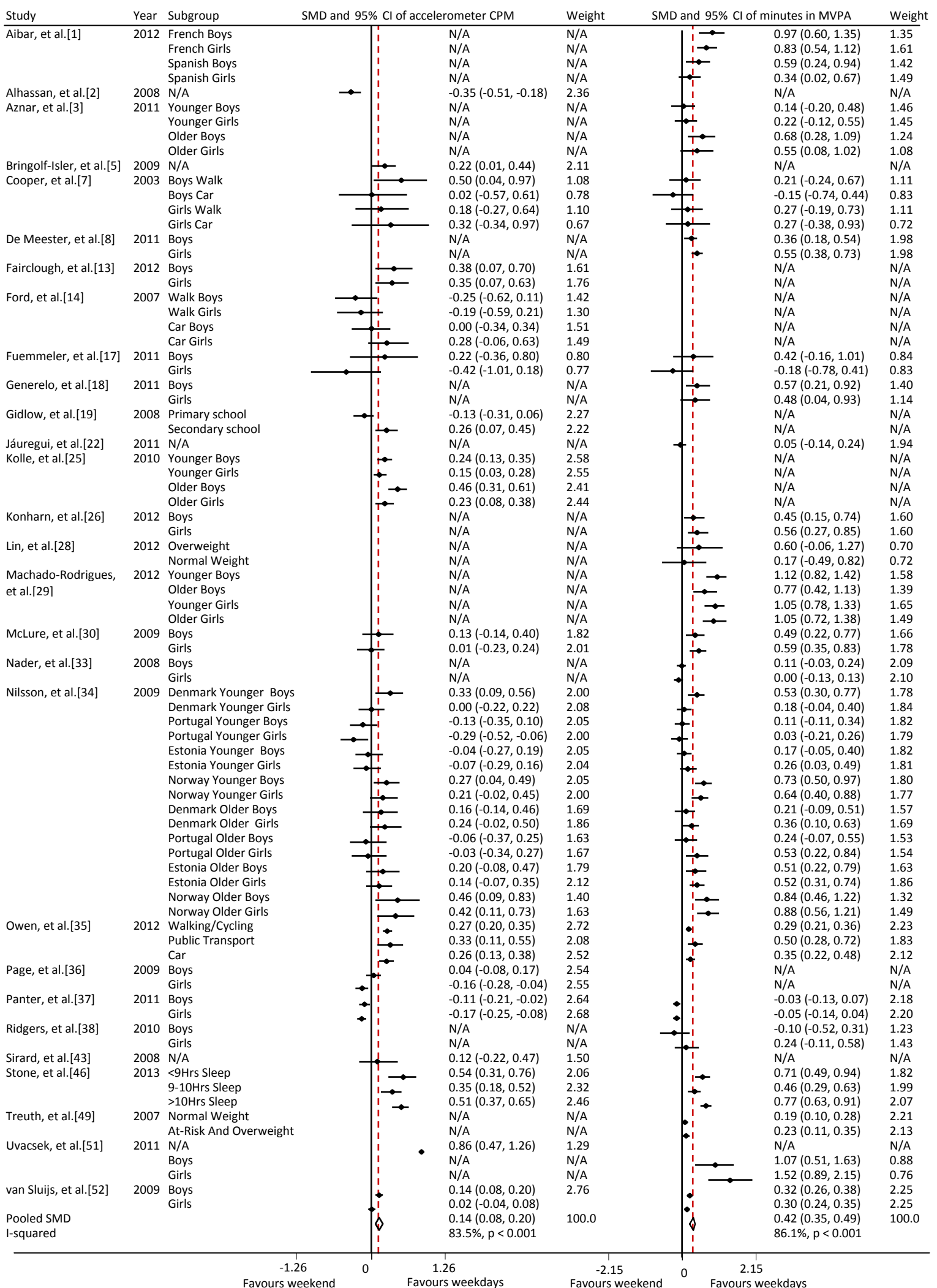
Electronic Supplementary Material Table S2. Study by study descriptive characteristics

Study	Year	Study name	Country	Sample size	Age (years)	Ethnicity	SES	Meta-analysed	Accelerometer	Epoch length (seconds)	MVPA cut-point (cpm ^a)	Minimum registered activity for inclusion (minutes)	
												Week days	Weekends
Aibar, et al.[1]	2013	EPAPA	France and Spain	301	14 to 15		Low to medium	Yes	Actigraph, GT3X	15	2296	600	480
Alhassan, et al.[2]	2008	GEMS	USA	293	8 to 10	Majority other than white - African American	Low	Yes	Actigraph, model not stated	60	3000	585	330
Aznar, et al.[3]	2011		Spain	221	9 and 15			Yes	Actigraph, GT1M	15	2000	600	600
Basterfield, et al.[4]	2011	Gateshead Millennium Study	Britain	291	6 to 8			No	Actigraph, GT1M	NR	3200	360	360
Bringolf-Isler, et al.[5]	2009	SCARPOL	Switzerland	169	6 to 14		Medium to high	Yes	CSA/MTI, 7164	60	1950	480	480
Carver, et al.[6]	2008	CLAN	Australia	534	8 to 9 and 13 to 15		Medium to high	Yes	CSA/MTI, 7164	60	Age specific	167	167
Cooper, et al.[7]	2003		Britain	114	9 to 10		Low	Yes	CSA/MTI, 7164	60	Age specific	720	600
De Meester, et al.[8]	2011		Belgium	513	13 to 15		High	Yes	Actigraph, GT1M	60	3200	600	480
Deforche, et al.[9]	2009		Belgium	97	6 to 10			No	CSA/MTI, 7164	60	2000	600	600
Edwardson, et al.[10]	2013		Britain	136	12 to 16	Majority white	Medium to high	Yes	Actigraph, GT1M	5	Age specific	252 ^b	540
Esliger, et al.[11]	2010		Canada	413	8 to 13			No	CSA/MTI, 7164	60	Age specific	600	600
Fairclough, et al.[12]	2007		Britain	58	7 to 11			Yes	Actigraph, GT1M	5	1956	600	NA
Fairclough, et al.[13]	2012		Britain	175	10 to 11		Medium to high	Yes	Actigraph, GT1M	5	2000	629	605
Ford, et al.[14]	2007		Britain	239	5 to 11			Yes	CSA/MTI, 7164	60	NA	720	600
Frömel, et al.[15]	2012		Poland	497	16 to 18			No	Actigraph, GT1M	60	1951	600	600
Frömel, et al.[16]	2008		Poland	244	7 to 8			No	Caltrac	NR	NA	NR	NR
Fuemmeler et al.,[17]	2011		USA	45	9 to 11	Majority white	Medium to high	Yes	CSA/MTI, 7164	60	Age specific	600	600
Generelo, et al.[18]	2011		Spain	104	11 to 15			Yes	Actigraph, GT1M	60	Age specific	600	480
Gidlow, et al.[19]	2008	CHAMPS	Britain	446	5 to 16	Majority white	Low	Yes	Actigraph, GT1M	60	Age specific	600	480
Godard, et al.[20]	2012	INTA	Chile	109	4 to 10			No	Actiwatch AW64	NR	900	450	450
Jago, et al.[21]	2010	Bristol 3Ps	Britain	952	10 to 11		Other - IMD score 20.73 ± 16.52	Yes	Actigraph, GT1M	NR	2912	500	500
Jáuregui, et al.[22]	2011		Mexico	217	6 to 7		Low - medium	Both	RT3	60	970	600	600
Jürisson, et al.[23]	1996			24	10 to 13			No	Caltrac	NR	NR	NR	NR
Kemp, et al.[24]	2011		South Africa	24	9 to 12	Majority white		No	Actical	NR	2.7 ^c	NR	NR
Kolle, et al.[25]	2010		Norway	1824	9 and 15			Yes	CSA/MTI, 7164	10	2000	480	480
Konharn, et al.[26]	2012		Thailand	186	13 to 18			Yes	Actigraph, GT1M	30	Age specific	600	600
Kriemler, et al.[27]	2010		Switzerland	352	6 to 12		Other - 9% with no formal parental education	Yes	CSA/MTI, 7164	60	2000	720	NA
Lin, et al.,[28]	2012		Taiwan	36	8 to 10			Yes	Actigraph, GT1M	NR	Age specific	NR	NR
Machado-Rodrigues, et al.[29]	2012	MALS	Portuguese	362	13 to 16		Medium to high	Yes	Actigraph, GT1M	60	Age specific	600	600
McLure, et al.[30]	2009		Britain	246	9 to 10		Low to medium	Yes	Actigraph, GT-256	60	1100	180	180
McManus, et al.[31]	2011		Hong Kong	84	7 to 9			No	RT3	1	1860	NR	NR
Miller, et al.[32]	2013	SRTS initiative	USA	193	6 to 12			Yes	Actical	60	NA	NR	NA
Nader, et al.[33]	2008	NICHD SECC	USA	839	9	Majority white	Other - 24% low family income	Yes	CSA, model not stated	60	Age specific	NR	NR
Nilsson, et al.[34]	2009	EYHS	Denmark, Portugal, Estonia, Norway	1954	9 and 15			Yes	CSA/MTI, 7164	60	2000	600	600

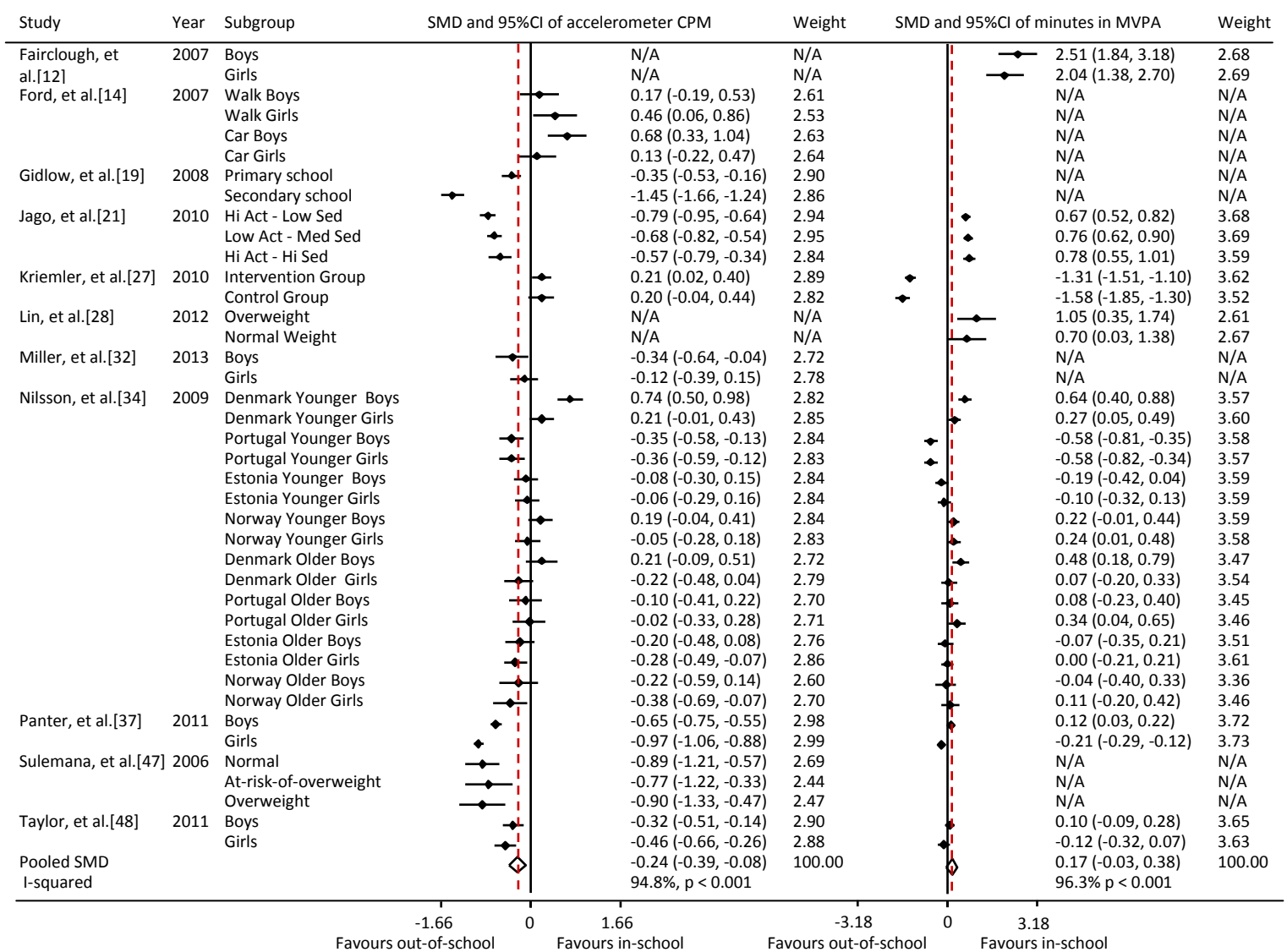
Electronic Supplementary Material Table S2. Study by study descriptive characteristics continued

Study	Year	Study name	Country	Sample size	Age (years)	Ethnicity	SES	Meta-analysed	Accelerometer	Epoch length (seconds)	MVPA cut-point (cpm ^a)	Minimum registered activity for inclusion (minutes)	
												Week days	Weekends
Owen, et al.[35]	2012	CHASE	Britain	2035	9 to 10	Mixed		Yes	Actigraph, GT1M	5	2000	600	600
Page, et al.[36]	2009	PEACH	Britain	1300	10 to 11		Other - IMD score 27.29 ± 17.84	Yes	Actigraph, GT1M	10	NA	480	480
Panter, et al.[37]	2011	SPEEDY	Britain	1824	9 to 10		Low to medium	Yes	Actigraph, GT1M	5	2000	500	500
Ridgers, et al.[38]	2010	A-CLASS Project	Britain	110	9 to 10			Yes	Actigraph, GT1M	5	Individually calibrated	540	540
Rowlands, et al.[39]	2008		Britain	84	9 to 11			No	Actigraph, GT1M	2	1950	600	480
Rush, et al.[40]	2012		New Zealand	47	8 to 11		Low	No	Actical	15	1500	NR	NA
Sherar, et al.[41]	2009		Canada	77	9 to 14		Medium to high	No	Actical	15	2300	600	600
Silva, et al.[42]	2011		Portuguese	24	10 to 13			No	CSA/MTI, 7164	60	Age specific	480	NA
Sirard, et al.[43]	2008	Team COOL	USA	65	14 to 17	Majority other than white - African American	Low	Yes	Actigraph, GT1M	30	Age specific	600	600
Soric, et al.[44]	2010		Croatia	91	10.5 to 11.5			No	SenseWear Armband	60	3 ^c	1260	1260
Stone, et al.[45]	2013	BEAT	Canada	856	10 to 12			Yes	Actigraph, GT1M	NR	4242	600	600
Stone, et al.[46]	2009		Britain	47	8 to 10			No	Actigraph, GT1M	2	3581	600	600
Sulemana, et al.[47]	2006		USA	172	14 to 17	Mixed		Yes	Actigraphy	60	NA	NR	NA
Taylor, et al.[48]	2011	PLAY	New Zealand	427	5 to 13	Majority white	Medium to high	Yes	Actigraph, GT3X	60	1500	480	NA
Treuth, et al.[49]	2007	TAAG	USA	1577	11 to 12	Mixed		Yes	CSA/MTI, 7165	30	1500	360 ^d	360 ^d
Trost, et al.[50]	2000	Amherst Health and Activity study	USA	381	6 to 12	Majority white		No	CSA/MTI, 7164	60	Age specific	NR	NR
Uvacsek, et al.[51]	2011		Hungary	53	9 to 13		High	Yes	CSA/MTI, 7164	5	2000	671	575
van Sluijs, et al.[52]	2009	ALSPAC	Britain	4688	11	Majority white		Yes	CSA/MTI, 7164	60	3600	600	600
Veitch, et al.[53]	2010	CLASS	Australia	173	8 to 9		Other - varying	Yes	CSA/MTI, 7164	60	Unclear	167	167
Wilkin, et al.[54]	2006		Britain	431	4 to 10			No	CSA/MTI, model not stated	60	1000	NR	NR

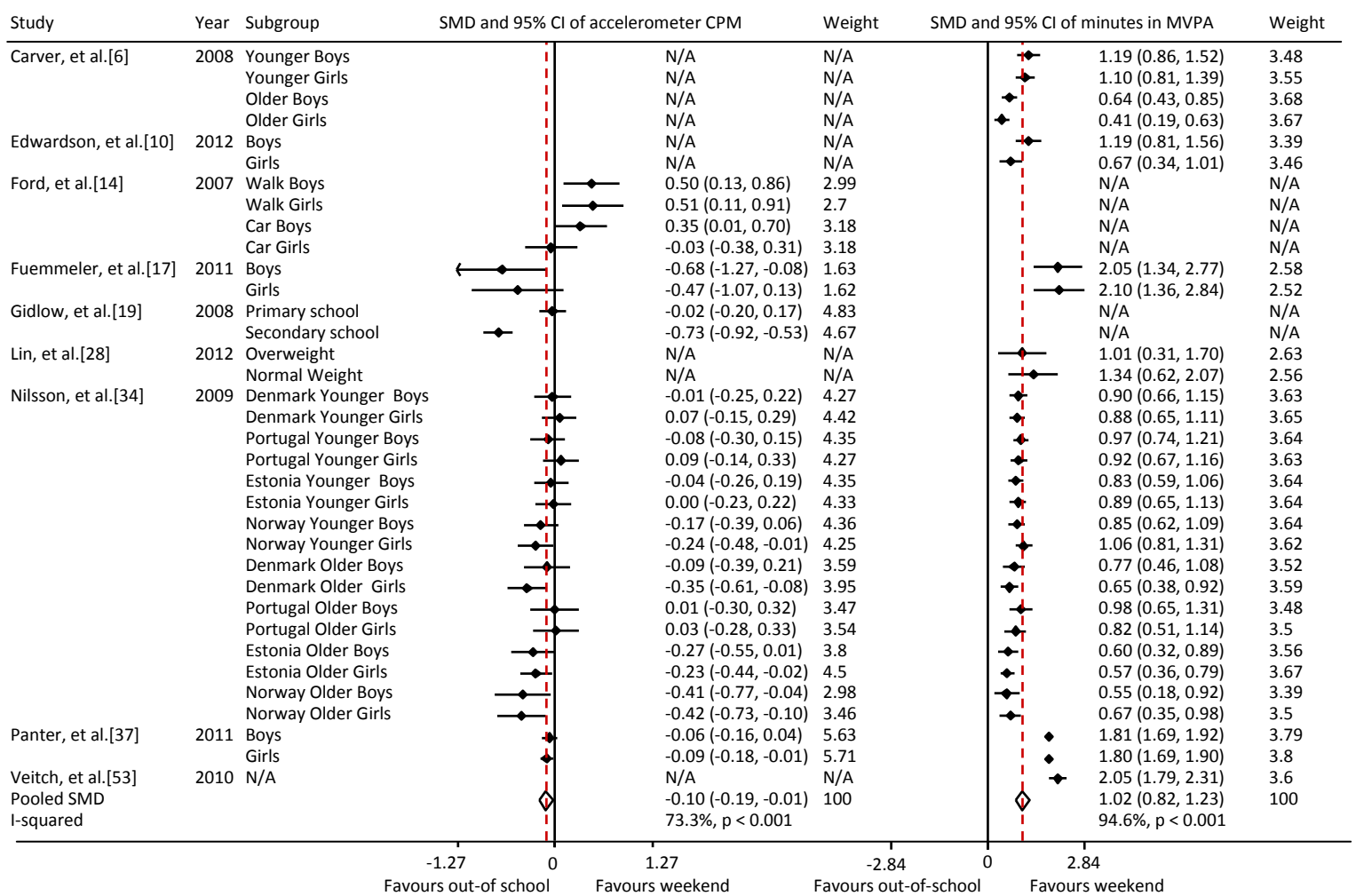
^a If cut-point was reported per epoch length the per minute equivalent was calculated. NR, not reported; NA, not applicable eg. study only measured physical activity on weekdays; SES, socioeconomic status; MVPA, moderate-to-vigorous intensity physical activity; CSA, computer science applications; MTI, manufacturing technologies Inc, ^b valid after-school period; ^c reported as Metabolic equivalents as this was the measure reported by the monitor, ^d at least one day of seven with 360 minutes of data was required



Electronic Supplementary Material Figure S1. Forest plots showing standardised mean differences (SMD) and 95% confidence intervals (CI) between week day and weekend day physical activity measured by accelerometer in average counts per minute (CPM) and minutes in moderate-to-vigorous intensity physical activity (MVPA). SMD is reported in units of standard deviation; 0.2, 0.5 and 0.8 respectively represent small, moderate and large effects. I^2 is a measure of heterogeneity between studies.



Electronic Supplementary Material Figure S2. Forest plots showing standardised mean differences (SMD) and 95% confidence intervals (CI) between in-school and out-of-school physical activity measured by accelerometer in average counts per minute (CPM) and minutes in moderate-to-vigorous intensity physical activity (MVPA). SMD is reported in units of standard deviation; 0.2, 0.5 and 0.8 respectively represent small, moderate and large effects. I^2 is a measure of heterogeneity between studies.



Electronic Supplementary Material Figure S3. Forest plots showing standardised mean differences (SMD) and 95% confidence intervals (CI) between out-of-school and weekend physical activity measured by accelerometer in average counts per minute (CPM) and minutes in moderate-to-vigorous intensity physical activity (MVPA). SMD is reported in units of standard deviation; 0.2, 0.5 and 0.8 respectively represent small, moderate and large effects. I^2 is a measure of heterogeneity between studies.

Electronic Supplementary Material Table S3a. Summary of results of meta-regression analyses in univariate models

	Weekday vs weekend day					In-school vs out-of-school					Weekend vs out-of-school					
	B Coef.	95% CI		P - value	Adjusted R-squared (%)	B Coef.	95% CI		P - value	Adjusted R-squared (%)	B Coef.	95% CI		P - value	Adjusted R-squared (%)	
TPA	Age	0.03	-0.001	0.05	0.061	7.46	-0.05	-0.11	-0.003	0.04	8.83	-0.05	-0.08	-0.02	0.003	46.81
	Gender	Ref					Ref					Ref				
	Both	Ref														
	Boy	-0.17	-0.33	-0.009	0.039	25.24	0.46	0.04	0.89	0.033	9.31	0.31	-0.09	0.70	0.124	7.57
	Girl	-0.28	-0.44	-0.12	0.001		0.20	-0.21	0.61	0.329		0.28	-0.12	0.67	0.161	
	Global region	Ref					Ref					Ref				
	Europe	Ref														
North America	0.06	-0.15	0.27	0.558	-0.58	-0.42	-0.89	0.05	0.077	3.16	-0.49	-1.06	0.08	0.089	6.19	
Other	omitted					-0.22	-0.90	0.45	0.506		omitted					
MVPA	Age	0.06	0.03	0.09	<0.001	30.1	-0.02	-0.13	0.09	0.738	-4.26	-0.09	-0.15	-0.04	0.002	33.05
	Gender	Ref					Ref					Ref				
	Both	Ref														
	Boy	-0.02	-0.28	0.24	0.871	-4.75	0.48	-0.37	1.33	0.258	-3.46	-1.04	-1.91	-0.17	0.021	20.10
	Girl	-0.02	-0.28	0.24	0.876		0.29	-0.58	1.16	0.496		-1.12	-1.99	-0.25	0.014	
	Global region	Ref					Ref					Ref				
	Europe	Ref														
North America	-0.14	-0.36	0.09	0.235	-1.52	0.23	-0.67	1.12	0.609	-3.13	1.15	0.34	1.95	0.007	14.35	
Other	-0.11	-0.43	0.22	0.523		omitted					0.16	-0.23	0.55	0.408		

TPA, total physical activity; MVPA, moderate-to-vigorous intensity physical activity; B Coef, Beta Coefficient; 95% CI, 95% Confidence interval; Ref, reference category. Bold p - values indicate a significant association of the potential effect modifier (age, gender, and global region of study setting) with the standardised mean difference in physical activity between time-segments. Significantly factors were combined in a multivariate model where appropriate (**Electronic Supplementary Material Table S3b**). Adjusted R-squared indicates the proportion of between-study variance explained by the covariates. Negative adjusted R-squared indicates that the covariates explain less of the heterogeneity than would be expected by chance. In several models global region 'Other' was omitted due to co-linearity.

Electronic Supplementary Material Table S3b. Summary of results of meta-regression analyses in multivariate models

		B Coef.	95% CI		P - value	Adjusted R-squared (%)	P-value for joint test of all covariates
In-school vs out-of-school TPA	Age	-0.06	-0.11	-0.01	0.023	20.33	0.0175
	Gender						
	Both						
	Boy	0.51	0.11	0.91	0.015		
	Girl	0.29	-0.10	0.68	0.142		
Weekend vs out-of-school MVPA	Age	-0.07	-0.12	-0.02	0.005	53.05	0.0006
	Gender						
	Both	Ref					
	Boy	-0.97	-1.70	-0.23	0.012		
	Girl	-1.04	-1.78	-0.29	0.008		
	Global region						
	Europe	Ref					
North America	1.01	0.30	1.72	0.007			
Other	-0.13	-0.46	0.21	0.437			

TPA, total physical activity; MVPA, moderate-to-vigorous intensity physical activity; B Coef, Beta Coefficient; 95% CI, 95% Confidence interval; Ref, reference category. Adjusted R-squared indicates the proportion of between-study variance explained by the covariates.

Electronic Supplementary Material Table S4. Summary of sensitivity analyses assuming differing degrees of correlation between time-segments

Outcome	Time-segment comparison	Correlation r=0.0			Correlation r=0.2			Correlation r=0.5			Correlation r=0.8		
		Pooled SMD	95% CI of pooled SMD		Pooled SMD	95% CI of pooled SMD		Pooled SMD	95% CI of pooled SMD		Pooled SMD	95% CI of pooled SMD	
			Lower	Upper		Lower	Upper		Lower	Upper		Lower	Upper
TPA	Weekdays	0.14	0.08	0.20	0.14	0.08	0.20	0.14	0.08	0.20	0.14	0.09	0.20
	Weekend		Ref			Ref			Ref			Ref	
MVPA	Weekdays	0.42	0.35	0.49	0.41	0.35	0.48	0.42	0.36	0.48	0.43	0.37	0.49
	Weekend		Ref			Ref			Ref			Ref	
TPA	In-school	-0.24	-0.40	-0.08	-0.24	-0.39	-0.08	-0.23	-0.39	-0.08	-0.23	-0.38	-0.08
	Out-of-school		Ref			Ref			Ref			Ref	
MVPA	In-school	0.17	-0.03	0.38	0.14	-0.04	0.33	0.17	-0.02	0.35	0.19	0.02	0.37
	Out-of-school		Ref			Ref			Ref			Ref	
TPA	Weekend	-0.10	-0.19	-0.01	-0.10	-0.19	-0.02	-0.10	-0.18	-0.02	-0.10	-0.18	-0.02
	Out-of-school		Ref			Ref			Ref			Ref	
MVPA	Weekend	1.02	0.82	1.23	1.01	0.82	1.20	1.02	0.83	1.21	1.03	0.84	1.22
	Out-of-school		Ref			Ref			Ref			Ref	

TPA, Total physical activity; MVPA, moderate-to-vigorous intensity physical activity; SMD, Standardised mean difference; 95% CI, 95% Confidence interval; Ref, Reference time-segment. SMD is reported in units of standard deviation.

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