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Obesity prevention at School-Settings
What do we know ?

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November 2021
18th INTERNATIONAL TEACHING week

Introduction

Decreasing levels of Physical Activity

Decreasing levels of Physical Fitness

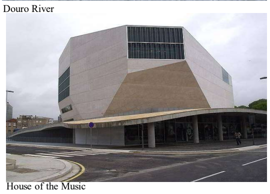
Increasing prevalence of Overweigh and Obesity

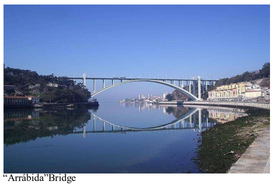
Ruiz, J *Am J Clin Nutr*. 2006;84(2):299-303; Stratton, G *Int J Obes (Lond)*. 2007;31(7):1172-8.

PORTO


Douro River

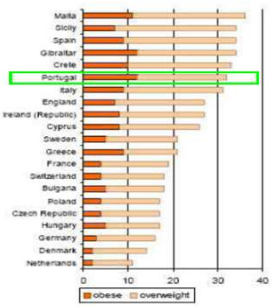

Historical Center


House of the Music


"Arrábida"Bridge

Obesity and Physical Activity – What do we Know ?

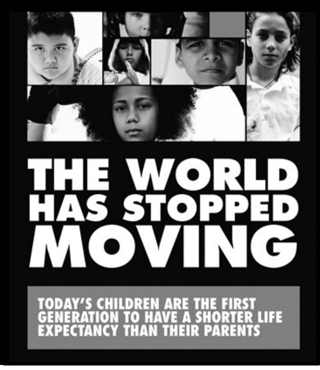
Pediatric Epidemiology



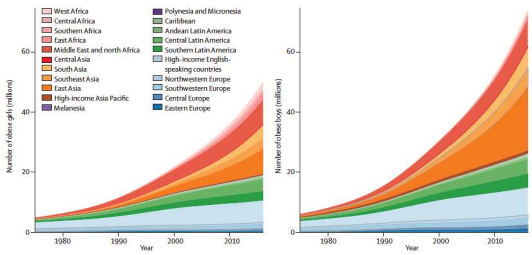
43% of adolescents are overweight and obesity are a result of energy imbalance over a long period of time.

PROBLEM

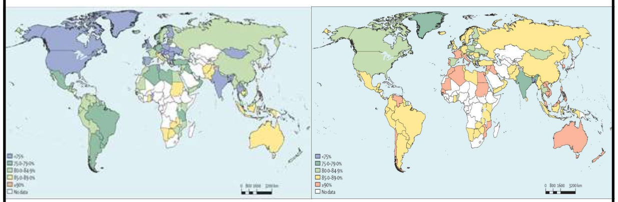
Sedentariness vs Physical Activity?



Obesity in children and adolescents



Lancet 2017; 390: 2627–4



We used data from 298 school-based surveys from 146 countries, territories, and areas including 1·6 million students aged 11–17 years.

Globally, in 2016, 81·0% (95% uncertainty interval 77·8–87·7) of students aged 11–17 years were insufficiently physically active (77·6% [76·1–80·4] of boys and 84·7% [83·0–88·2] of girls).

The Lancet Child & Adolescent Health DOI: (10.1016/S2352-4642(19)30323-2)

Anthropometric indicators in early life and low-grade inflammation, insulin resistance and lipid profile in adolescence

Table 4 Linear Regression Coefficients, Significance Values and Coefficients of Determination, Examining the Associations Between Birth Weight and BMI at Several Time Points of Age, and Inflammatory Score, HOMA-IR and TC/HDL Ratio of adolescent boys, Adjusted for Age, Pubertal Stage, BMI, BF%, Socioeconomic Status and KIDMED Index.

		Dependent Variables		
		Inflammatory Score	HOMA-IR	TC/HDL
Birth weight	B (p value)	1.37 (0.08)	-3.73 (0.89)	-6.87 (0.47)
	r^2	0.00	0.01	0.00
BMI at 6 months	B (p value)	-0.19 (0.36)	0.02 (0.82)	0.02 (0.45)
	r^2	0.06	0.03	0.01
BMI at 12 months	B (p value)	-0.01 (0.96)	0.09 (0.44)	0.02 (0.58)
	r^2	0.12	0.02	0.02
BMI at 18 months	B (p value)	-0.02 (0.95)	0.19 (0.05)	-0.01 (0.78)
	r^2	0.06	0.01	0.00
BMI at 2 years	B (p value)	**0.04 (0.01)**	**0.16 (0.02)**	0.03 (0.31)
	r^2	**0.03**	**0.07**	0.02
BMI at 3 years	B (p value)	**0.15 (<0.05)**	**0.20 (0.03)**	0.03 (0.38)
	r^2	**0.05**	**0.04**	0.14
BMI at 4 years	B (p value)	**0.33 (<0.01)**	**0.27 (<0.01)**	0.05 (0.10)
	r^2	**0.11**	**0.07**	0.03
BMI at 5 years	B (p value)	**0.29 (<0.01)**	**0.23 (<0.01)**	**0.04 (<0.01)**
	r^2	**0.11**	**0.06**	**0.03**
BMI at 6 years	B (p value)	**0.36 (0.02)**	**0.32 (<0.01)**	**0.05 (<0.01)**
	r^2	**0.10**	**0.25**	**0.03**
Current BMI	B (p value)	**0.44 (<0.01)**	**0.23 (<0.01)**	**0.04 (<0.01)**
	r^2	**0.17**	**0.24**	**0.07**

Abbreviations: BMI, body mass index; B, linear regression coefficient; p, significance value; r^2, coefficient of determination; HOMA-IR, homeostatic model assessment of insulin resistance index; TC/HDL, total cholesterol to high-density lipoprotein cholesterol ratio. Significant values are represented in bold.

Study Sample: Retrospective school-based study with 415 Portuguese adolescents (220 girls), mean age of 14.08 ± 1.6 years old.

Main Conclusions:

-Overweight at 2 years was associated with inflammation and HOMA-IR in adolescence.

-Overweight at 5 years was associated with worse lipid profiles in adolescence.

-A persistently high BMI during infancy and childhood is associated with an unfavourable state of biomarkers in adolescence.

Oliveira-Santos et al.Nutrition, Metabolism & Cardiovascular Diseases (2019) 29, 783e792

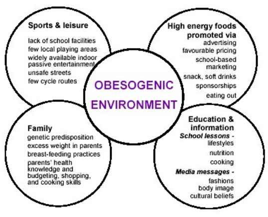
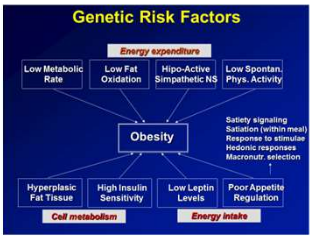


Figure 5 – Factors contributing to the Obesogenic Environment



That may be due to a combination of several factors.
Individual behaviors', environmental factors, and genetics all contribute to the complexity of the obesity epidemic.

THE LANCET
Volume 388, Issue 10051, 24–30 September 2016, Pages 1302-1310

Articles

Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women

Prof Ulf Ekelund PhD, Jostein Steene-Johannessen PhD, Prof Wendy J Brown PhD, Morten Wang

In comparison with other risk factors for poor health, the increased mortality risk (58%) in those who sat for more than 8 h/day and were also least active, is similar to that of smoking and obesity.

Conclusion

About 60–75 min MVPA per day seem to eliminate the increased risk of death associated with high sitting time.

However, this high activity level attenuates, but does not eliminate the increased risk associated with high TV-viewing time

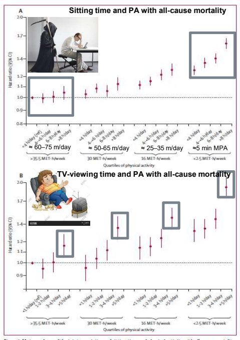


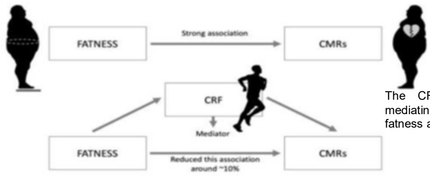
Figure 2: Meta-analyses of the joint associations of sitting time and physical activity with all-cause mortality (A) and of TV-viewing time and physical activity with all-cause mortality (B)
(A) Sitting time analysis, N=1005791. (B) TV-viewing time analysis, N=465450. The reference categories are the groups with the highest levels of physical activity (>35·5 MET-h per week) in combination with <4 h/day of sitting (A) or <1h/day of TV-viewing (B). The median MET-h per week for the upper boundary for the first (lowest) quartile was 2·5 MET-h per week (equivalent to about 5 min of moderate intensity activity per day). Corresponding values for the second and third quartiles were 16 MET-h per week (about 25–35 min of moderate intensity activity per day) and 30 MET-h per week (about 50–65 min of moderate intensity activity per day), and the lower boundary for the fourth (top) quartile was 35·5 MET-h per week (about 60–75 min of moderate intensity activity per day).

Why is this so Important ?

Mediation role of cardiorespiratory fitness on the association between fatness and cardiometabolic risk

Important indicators of fatness (BMI, WHtR, and FMI) show a significant and positive association with a powerful indicator of cardiometabolic risk in adolescents.

CRF shows a significant and inverse relationship with the cardiometabolic risk of adolescents.



The CRF is capable of partially mediating **(~ 10%)** the association of fatness and cardiometabolic risk.

Reducing fatness indicators and **increasing CRF** are necessary to improve adolescent cardiometabolic health.

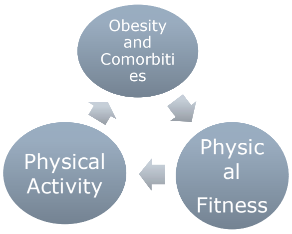
Cristi-Montero et al (2019). JSHS. DOI: 10.1016/j.jshs.2019.08.003

In the first regression step (direct effect, path a), BMI was positively related to speed-agility (lower values in this variable indicate better performance), and negatively related to CRF and MF (p < 0.001). The total effects (path c) showed that BMI was negatively associated to general intelligence in all mediation models. In the last regression model (direct effect, path b), speed-agility was negatively related to the dependent variable (p < 0.001) and positively related to CRF and MF (p < 0.05), but when BMI and the fitness components were included in the model (direct effect, path c'), the regression coefficients became positive for CRF and speed-agility and increased for MF. In the last confirmatory step, the IE (a*b) and the Sobel test were significant in all models (p < 0.05), confirming that fitness components act as mediators in these models.

Policies in several settings, including schools leading towards physical activity enhancement

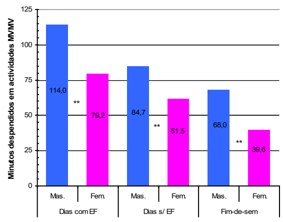
Physical Education: Programs and environments that facilitates the motor literacy and physical activity engagement leading towards a better education and promoting healthy lifestyles.

This complex network of interrelationships demand further research



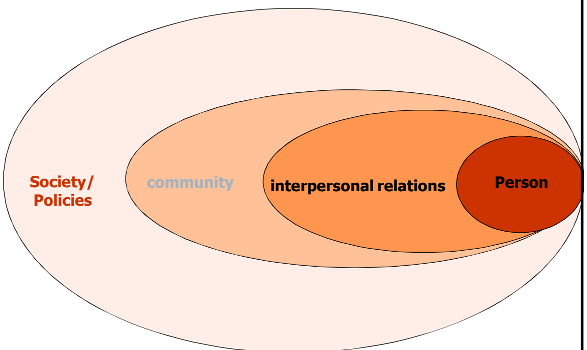
Descriptive longitudinal and intervention studies covering OBESE children and adolescents will be of great help

Daily Average of MVPA- Boys vs. Girls days PE; days without PE; weeknds

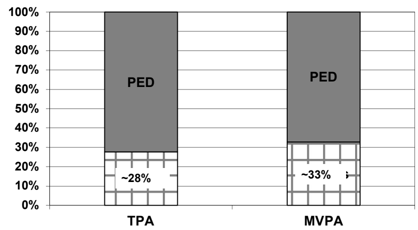


** p <0.05

Different Levels of Actions To Understand the Obesity Related Factors



Contribution of Physical Education Class for the Total Physical Activity (TPA)and for Moderate-to-Vigorous Physical Activity (MVPA)



Vale et al. Journal of Paediatrics and Child Health. 2011. 47: 48–53.

Motor Coordination vs. Sedentary Behaviour

Table 2 Association between gross motor-coordination age 10 and physical activity/sedentary behaviour age 16 (n = 3073)

Motor co-ordination category	After school screen time (>3 h/day)		Physical activity participation (>1/week)	
	Model 1	Model 2	Model 1	Model 2
	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)
Low (n = 637)	1.0 (Ref)	1.0	1.0 (Ref)	1.0
Medium (n = 792)	0.76 (0.60, 0.96) z	0.80 (0.63, 1.02)	0.98 (0.77, 1.25)	0.98 (0.78, 1.25)
High (n = 1644)	0.74 (0.60, 0.92)	0.79 (0.64, 0.98)	1.20 (0.97, 1.48)	1.16 (0.93, 1.44)

Table 3 Association between gross motor-coordination age 10 and physical activity/sedentary behaviour age 42 (n = 4879)

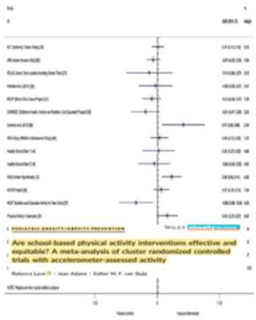
Motor co-ordination category	TV viewing (>3 h/day)		Physical activity participation (>1/week)	
	Model 1	Model 2	Model 1	Model 2
	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)	OR (95 % CI)
Low (n = 1125)	1.0 (Ref)	1.0	1.0 (Ref)	1.0
Medium (n = 1255)	0.87 (0.72, 1.04)	0.90 (0.75, 1.09)	1.11 (0.94, 1.30)	1.08 (0.92, 1.27)
High (n = 2499)	0.80 (0.68, 0.94)	0.85 (0.72, 0.99)	1.22 (1.06, 1.41)	1.18 (1.02, 1.36)

Model 1 adjusted for sex
Model 2 adjusted for sex, child BMI age 10, child TV viewing age 10 (hardly ever/often), child sports participation age 10 (hardly ever/often), father occupational class, father BMI, parents smoking habit

The level of gross motor coordination during childhood was associated with PA participation and SB in adulthood. Intervention efforts to increase PA participation and reduce SB over the life course may be best targeted towards children with low gross motor coordination.

Smith et al., IJBNPA; 12: 75. 2015

Mean difference of change in physical activity between intervention and control groups of school-based physical activity interventions



There was no evidence of differential effectiveness by gender or SEP. This review provides the strongest evidence to date that current school-based efforts **do not positively impact young people's physical activity across the full day, with no difference in effect across gender and SEP.** Further assessment and maximization of implementation fidelity is required before it can be concluded that these interventions have no contribution to make.

Table 3. Association between performance in SRT+J2F and obesity status in preschoolers

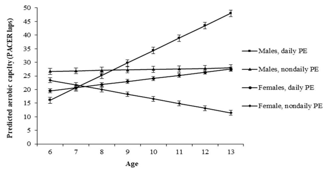
BMI	SRT+J2F OR (95% CI)	R^2_N	P-value
Normal weight	1		1
Overweight	0.3 (0,6-2.1)	0.27	0.277
Obese	**6.4 (1.3-36.6)**		***0.035***

Abbreviations: BMI, Body Mass Index; SRT, Shuttle Run Test; J2F, Jumping a distance of 7m on 2 feet; All analyses were adjusted for age, gender and TPA, total physical activity. Bold figures indicate significant P values.

- OW and OB already showed statistical significant association in pre-schoolers

Silva –Santos et al, 2019. JMD

Daily Physical Education Linked to Higher Youth Aerobic Fitness Levels: A 4-Year Longitudinal Study



Results: **Across the sample, aerobic fitness increased with age. Throughout the study, males demonstrated growth in aerobic fitness compared with a slight decline for females (P < .001). Youth participation in daily PE was linked to increases in aerobic fitness compared with youth who did not receive daily PE (P < .001).**

Conclusions: **Findings suggest that exposure to daily PE may contribute to increased aerobic fitness in youth.**

Preventive Medicine

Review

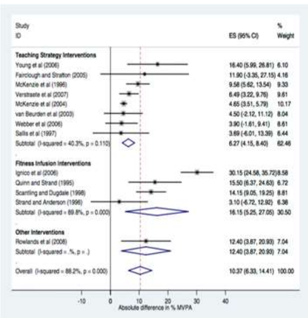
A systematic review and meta-analysis of interventions designed to increase moderate-to-vigorous physical activity in school physical education lessons

Students in intervention conditions spent 24% more lesson time in MVPA compared with students in usual practice conditions

Students in the teaching strategies intervention conditions (organization and management) were more active than controls (**(+6,27%)**

Students in fitness infusion intervention condition (combining sports , eg basketball, with vigorous fitness activities , eg jumping) spent more time in MVPA compared with controls) **(+ 16,15%, greater heterogeneity)**

This review indicates that interventions can increase the proportion of time students spend in MVPA during PE lessons.



Cochrane Library

Interventions for treating obesity in children - Luttikhuis1et al. Evid-Based Child Health 4: 1571–1729 (2009)

Selection criteria

RCTs of lifestyle (i.e. dietary (n=6), PA (n=12) and/or behavioural therapy (n=36), drug (n=10 ;metformin, orlistat and sibutramine) and surgical interventions for treating obesity in children.
Age <18 yr with or without the support of family members.
64 RCTs; n=5230
INTERV- 6 months follow up (three months for actual drug therapy).
No eligible: eating disorders or DT2 or surgical treatment (excluded).
The studies included varied greatly in intervention design, outcome measurements and methodological quality.

Interventions for preventing obesity in children. Water et. Al Cochrane Database of Systematic Reviews 2011, Issue 12

Selection criteria

Data from childhood obesity prevention studies that used a controlled study design with or without randomisation
INTERV 12 weeks or more. If studies were randomized at a cluster level, 6 clusters were required.
Studies that only enrolled children who were obese a baseline were considered to be focused toward treatment rather than prevention and were therefore excluded
Meta-analysis included **37 studies; n=27,946 children aged 1-18 yr-old**

Interventions for treating obesity in children -Luttikhuis1et al. Evid-Based Child Health 4: 1571–1729 (2009)

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Comparison 1. Lifestyle interventions in children younger than 12 years

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Change in BMI-SDS at six months follow up	4	301	Mean Difference (IV, Fixed, 95% CI)	-0.06 [-0.12, -0.01]
2 Change in BMI-SDS at twelve months follow up	3	264	Mean Difference (IV, Fixed, 95% CI)	-0.04 [-0.12, 0.04]

Comparison 2. Lifestyle interventions in children 12 years and older

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Change in BMI-SDS at six months follow up	3	291	Mean Difference (IV, Fixed, 95% CI)	-0.14 [-0.17, -0.12]
2 Change in BMI at six months follow up	4	362	Mean Difference (IV, Fixed, 95% CI)	-3.04 [-3.14, -2.94]
3 Change in BMI-SDS at twelve months follow up	2	231	Mean Difference (IV, Fixed, 95% CI)	-0.14 [-0.18, -0.10]
4 Change in BMI at twelve months follow up	2	231	Mean Difference (IV, Fixed, 95% CI)	-3.27 [-3.38, -3.17]

Conclusion

This review shows that combined behavioural lifestyle interventions compared to standard care or self-help can produce a significant and clinically meaningful reduction in overweight in children and adolescents.

Research article

Open Access

A randomized controlled trial on a multicomponent intervention for overweight school-aged children - Copenhagen, Denmark

Nina Majlund Harder-Lauridsen, Nina Marie Birk, Mathias Ried-Larsen, Anders Juul, Lars Bo Andersen, Bente Klarlund Pedersen and Rikke Krogh-Madsen

Conclusions: The multicomponent intervention had significant favorable effects on BMI, weight, WHtR, mean and minimum steps/day, and fat mass. In addition, similar beneficial metabolic effects were found in the children as shown in adults, e.g. increase

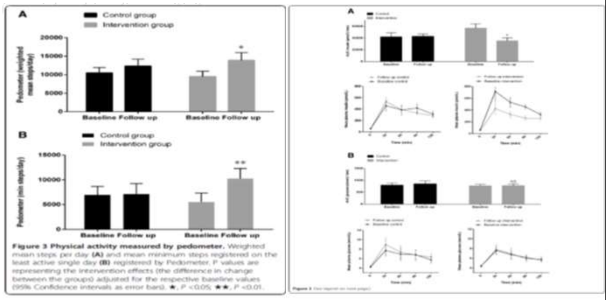


Figure 3 Physical activity measured by pedometer. Weighted mean steps per day (A) and mean minimum steps registered on the least active single day (B) registered by Pedometer. P values are representing the intervention effects (the difference in change between the groups) adjusted for the respective baseline values (95% Confidence intervals as error bars). ★, P <0.05, ★★, P <0.01.

Cochrane Library

[Intervention Review]

Interventions for preventing obesity in children

Elizabeth Waters[1], Andrea de Silva-Sanigorski[1], Belinda J Hall[2], Tamara Brown[3], Karen J Campbell[4], Yang Gao[5], Rebecca Armstrong[1], Lauren Prosser[1], Carolyn D Summerbell[6]

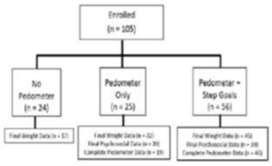
Cochrane Database of Systematic Reviews 2011, Issue 12.

Childhood obesity interventions versus control by age groups 0-5, 6-12 and 13-18 years

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Standardised mean change in Body Mass Index (BMI/zBMI) from baseline to postintervention	37	27946	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.21, -0.09]
1.1 0-5 years	7	1815	Std. Mean Difference (IV, Random, 95% CI)	-0.26 [-0.53, 0.00]
1.2 6-12 years	24	18983	Std. Mean Difference (IV, Random, 95% CI)	-0.15 [-0.23, -0.08]
1.3 13-18 years	6	7148	Std. Mean Difference (IV, Random, 95% CI)	-0.09 [-0.20, 0.03]

The meta-analysis included 37 studies of 27,946 children and demonstrated that programs were effective at reducing adiposity although not all individual interventions were effective, and there was a high level of observed heterogeneity I2=82%).

We found strong evidence to support beneficial effects of child obesity prevention programs on BMI, particularly for programs targeted to children aged six to 12 years However, given the unexplained heterogeneity and the likelihood of small study bias, these findings must be interpreted cautiously.



Methods: Overweight and obese children ages 8–17 years (n = 105) participated in a 10-week family-based weight management intervention, including physical activity, nutrition, and behavioral modification. A quasi-experimental design was used to group eight cohorts into three conditions: no pedometer (n = 24), pedometer only (n = 25), and pedometer with step goals (i.e., 500 steps/day weekly increase above baseline; n = 56).

Table 3. Absolute Change in Weight-Related Parameters after 10 Weeks

	No pedometer (n = 17)	Pedometer only (n = 22)		Pedometer + step goals (n = 45)	
	Mean ± SD	Mean ± SD	p	Mean ± SD	p
Body weight (kg)	1.12 ± 1.90	0.23 ± 1.87	0.522	−0.49 ± 2.06	0.045
BMI (kg/m²)	0.43 ± 0.82	−0.24 ± 0.78	0.087	−0.37 ± 0.92	0.017
BMI (z-score)	0.01 ± 0.04	−0.03 ± 0.04	0.098	−0.03 ± 0.05	0.012

p-Values are compared with the No-Pedometer group in analysis of covariance models controlling for baseline age and baseline variable (weight, BMI, or BMI z-score).
SD, standard deviation.

The pedometer with goals condition significantly increased steps per day (+1185 – 425 steps/day) compared with the pedometer-only condition(-162 – 620 steps/day; p < 0.05). Both pedometer groups similarly increased in subjective health and quality of life.

Staiano et al (2017) Child. Obesity

Effectiveness of interventions at changing obesity-related behaviours and BMI/BMI z-score.

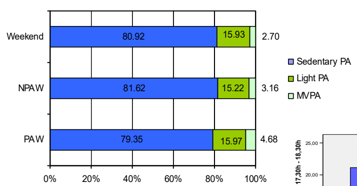
Outcome 1: MVPA (mins/day)	Studies (n=)	INT (n=)	C (n=)	I^2	MD (95% CI)
Device-measured	16	4523	3921	41%	1.53 (0.49, 2.57)
Self-reported	2	372	361	0%	12.37 (8.51, 16.22)
MVPA min/day (≤6 months)	4	280	285	0%	4.84 (0.81, 8.88)
MVPA min/day (>6 months)	14	4546	3997	74%	1.89 (0.09, 3.40)
Theory-based	9	3481	3102	74%	2.19 (0.04, 4.34)
No theory	9	1414	1266	49%	2.15 (−0.53, 4.82)
Outcome 2: SB (mins/day)	**Studies (n=)**	**INT (n=)**	**C (n=)**	**I^2**	**MD (95% CI)**
Device-measured	11	3966	3456	55%	−0.91 (−2.30, 0.48)
Self-reported	1	40	52	N/A	1.40 (−25.95, 28.75)
ST min/day (≤6 months)	2	186	192	0%	1.29 (−5.67, 8.24)
ST min/day (>6 months)	10	3820	3316	59%	−1.00 (−2.42, 0.42)
Theory-based	6	3091	2691	20%	−0.46 (−1.93, 1.02)
No theory	5	915	817	65%	−4.51 (−8.68, −0.34)
Outcome 3: BMI z-score	**Studies (n=)**	**INT (n=)**	**C (n=)**	**I^2**	**MD (95% CI)**
Only targeting one outcome	6	1659	1719	99%	−0.21 (−0.28, −0.14)
Targeting > 1 outcome	14	7009	65,552	53%	−0.01 (−0.05, 0.02)
≤6 months	4	624	591	0%	−0.01 (−0.12, −0.10)
>6 months	16	8044	7680	96%	−0.05 (−0.09, −0.02)
Theory-based	9	4504	4580	66%	−0.03 (−0.07, 0.01)
No theory	11	4164	3691	97%	−0.08 (−0.13, −0.03)
Outcome 4: BMI (kg/m²)	**Studies (n=)**	**INT (n=)**	**C (n=)**	**I^2**	**MD (95% CI)**
Only targeting one outcome	7	2339	2273	14%	−0.02 (−0.21, −0.18)
Targeting > 1 outcome	14	4977	4512	89%	−0.48 (−0.58, −0.38)
≤6 months	6	656	632	83%	−0.85 (−0.99, −0.72)
>6 months	15	6660	6153	60%	−0.04 (−0.15, 0.08)
Theory-based	7	2659	2683	67%	−0.19 (−0.36, −0.02)
No theory	14	4657	4102	89%	−0.46 (−0.56, −0.36)

Abbreviations: INT = intervention, C = control, MVPA = moderate-to-vigorous physical activity, SB = sedentary behaviour, ST = sedentary time, MD = mean difference, BMI = body mass index.

N=38- The findings demonstrate that interventions in children when compared to controls resulted in a small positive treatment effect in the control group (2.14; 95% CI = 0.77, 3.50). There was no significant effect on sedentary behaviour, energy intake and fruit and vegetable intake. Significant reductions were found between groups in BMI kg/m2 (-0.39; 95% CI = -0.47, -0.30) and BMI z-score (-0.05; 95% CI = -0.08, -0.02) in favour of the intervention.

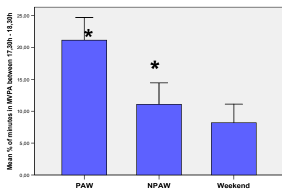
The meta-analyses of the included interventions to prevent childhood obesity showed significant overall effects on BMI, but inconclusive results were found regarding MVPA, SB and nutrition behaviour compared with the control condition.

OBESE CHILDREN INTERVENTION PROGRAM



Relative contribution of time spend in sedentary, light activity and moderate to vigorous activity according to Programmed activity days, Non-programmed activity days and Weekend

Relative contribute of class to time (5:30- 6:30 p.m.) spent in moderate to vigorous activities



* Significantly different from NPAW and weekend (p<0.05)

Aires et al. Am. J. Hum Biol. 19(6): 871-877, 2007

Results from 8-months intervention

Table 2. Estimated body composition, metabolic measurements and physical activity with adjustments for covariates.

	IDC			WIDC		
	TP0	TP1	% Δ	TP0	TP1	% Δ
Body Mass Index (kg/m²)	26.2 (0.9)	26.0 (0.9)	−0.2 (1.2)	24.6 (0.9)	24.6 (0.9)	−0.6 (1.2)
Waist Circumference (cm)	87.95 (2.7)	91.12 (2.3)	4.6 (2.5)	80.9 (2.7)	81.0 (2.3)[b]	0.6 (2.5)
% Body Fat (DXA)	44.5 (1.0)	42.8 (1.0)	−3.5 (2.3)	39.8 (1.0)[a]	40.1 (1.0)	1.3 (2.3)
% Trunk Fat (DXA)	43.7 (1.3)	40.8 (1.3)[c]	−6.4 (3.1)	37.7 (1.3)[a]	37.5 (1.5)	0.2 (3.1)
% Body Fat (Tanita)	35.4 (1.9)	35.7 (1.5)	5.1 (4.4)	33.4 (1.9)	−6.7 (4.4)	−3.7 (1.7)
Systolic Blood Pressure (mmHg)	117.3 (2.4)	104.6 (2.1)[c]	−10.3 (2.2)	116.4 (2.4)	113.2 (2.1)[b]	−1.9 (2.2)[d]
Diastolic Blood Pressure (mmHg)	59.2 (1.6)	58.1 (1.3)	−0.3 (3.0)	61.4 (1.6)	63.7 (1.3)[b]	4.6 (3.0)
Glucose (mg/dl)	78.8 (1.6)	78.1 (2.2)	−2.8 (3.2)	88.3 (1.6)[a]	80.8 (2.2)[c]	−8.4 (3.2)
Insulin (μU/mL)	12.1 (1.4)	11.4 (1.2)	19.1 (10.9)	13.1 (1.4)	12.2 (1.2)	−5.5 (10.9)
TG (mg/dl)	94.3 (8.9)	83.3 (9.7)	−6.8 (8.2)	84.2 (8.9)	81.8 (9.7)	−1.3 (8.2)
TC (mg/dl)	188.0 (4.1)	162.9 (5.7)[c]	−13.7 (2.6)	171.8 (4.1)[a]	169.1 (5.7)	−1.3 (2.6)[d]
HDLc (mg/dl)	53.9 (2.3)	54.6 (2.5)	2.9 (6.1)	52.6 (2.3)	51.3 (2.5)	0.4 (6.1)
LDLc (mg/dl)	94.7 (4.1)	87.6 (4.9)[c]	−7.0 (3.6)	95.0 (4.1)	99.0 (4.9)	4.9 (3.6)[d]
VLDLc (mg/dl)	18.6 (1.8)	18.8 (3.3)	4.7 (14.5)	16.9 (1.8)	16.9 (3.3)	0.7 (14.5)
Sedentary Time (min/day)	569.05 (15.3)	501.4 (16.3)[c]	−11.3 (3.4)	618.1 (15.3)[a]	587.0 (16.3)[b]	−4.0 (3.4)
Light PA (min/day)	380.0 (12.5)	394.9 ((12.8)	5.3 (4.5)	326.3 (12.5)[a]	366.2 (12.8)[c]	13.1 (4.5)
MVPA (min/day)	48.5 (3.8)	65.0 (4.7)[c]	40.0 (14.4)	37.7 (3.8)	47.1 (4.7)[b,c]	41.6 (14.4)
Steps/day (number)	9071.0 (351.4)	10 798.5 (436.7)[c]	20.3 (5.5)	8807.9 (351.4)	9443.8 (436.7)	8.8 (5.5)
Kcal/day (spent in PA)	445.9 (23.3)	524.4 (26.7)[c]	20.2 (6.6)	334.3 (23.3)[a]	427.5 (26.7)[b,c]	36.4 (6.6)

ACORDA Project significantly increased habitual PA over time in both groups. However, the group IDC showed better results for body fat and metabolic variables with favourable changes observed for %TF (DEXA), SBP, TC and LDLc. Despite the success in increasing habitual PA, it did not yield a significant decrease in total BF (only in %TF). The differences in PA over time for both groups (IDC and WIDC) were promising showing a decrease in sedentary time and an increase in light and moderate intensities

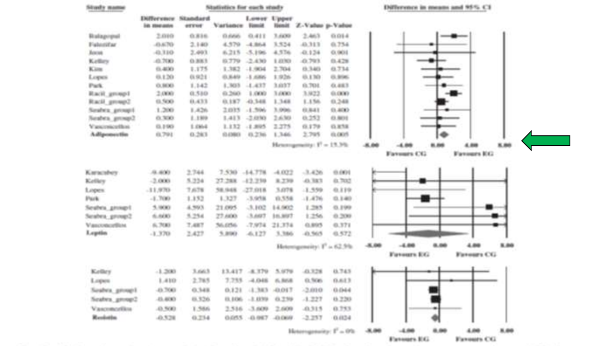


Figure 2. Absolute changes in adiponectin, leptin, and resistin levels in individual studies of exercise group vs control group. HIIT indicates High-intensity Interval Training. MIIT indicates Moderate-Intensity Interval Training.

Exercise training substantially **increases adiponectin** in childhood obesity.
Exercise programs of longer duration as well as changes in BF seemed to favor a **reduction in leptin levels.**
The heterogeneity in the exercise programs (length of intervention, frequency, type of exercise and so on) and the limited number of youths could influence the final results

Pediatric Weight loss and Cardiometabolic Outcomes

The Association of Weight Loss with Cardiometabolic Outcomes in Obese Children: Systematic Review and Meta-regression

Table 1. BMI or weight change per 1- unit change in metabolic outcomes

	Change in BMI (kg/m2)	P-value	Baseline BMI (kg/m2) Median, IQR	Change in weight (kg)	P-value	Baseline weight (kg) Median, IQR
1 Unit change in A1C (mg/dl)	−4.38	0.10	36.9 (34.3, 38.83)	NA	NA	NA
1 Unit change in FBG (mg/dl)	0.30	0.32	34 (30, 38.1)	−0.21	0.63	86 (56.85, 94.44)
1 Unit change in OGTT (mg/dl)	−0.19	0.79	31 (25.93, 36.7)	−0.02	0.96	77.46 (55.5, 93.95)
1 Unit change in SBP (mmHg)	**-0.16**	**0.04**	**30 (26.1, 35.47)**	**-0.61**	**0.05**	**70.1 (53.5, 89.1)**
1 Unit change in DBP (mmHg)	−0.15	0.18	30 (26.1, 35.83)	−0.42	0.22	70.4 (56.25, 88.05)
1 Unit change in ALT (IU/liter)	−0.19	0.31	33.53 (28.15, 34)	NA	NA	NA
1 Unit change in AST (IU/liter)	−0.42	0.17	34 (33,35)	−0.65	0.4	88 (65.5, 91.85)
1 Unit change in GGT (IU/liter)	−0.22	0.51	33.53 (28.15, 34)	NA	NA	NA
1 Unit change in HDL (mg/dl)	0.91	0.14	34 (25.75, 36.43)	**0.74**	**0.02**	**62.5 (52.05, 89.5)**
1 Unit change in LDL (mg/dl)	−0.04	0.75	33.9 (26.7, 36.5)	−0.18	0.20	84.74 (59, 91.2)
1 Unit change in TG (mg/dl)	−0.10	0.07	33.2 (26.1, 36.2)	**-0.10**	**0.03**	**70.1 (56.4, 87.5)**
Unit change in TC (mg/dl)	−0.10	0.60	33.37 (25.93, 36.73)	−0.10	0.33	85.37 (61.63, 91.58)

Conclusions:
Weight reduction in children is associated with **significant changes** in several cardiometabolic outcomes, particularly HDL, SBP and triglycerides. The magnitude of improvement may help in setting expectations and inform shared decision making and counseling.

The quality of evidence (ie, certainty in estimates) was low due to the observational nature of the tested associations and **high heterogeneity.**

Rajjo et al., J Clin Endocrinol Metab 2017 doi: 10.1210/jc.2016-2575

Results

Table 3 - Association among total number of sedentary time accumulated in bouts of 5, 10, 15, 20 or 30 minutes and body mass index groups

	BMI Groups					
	Normal Weight			Overweight & obesity		
Bout length	beta	95%CI	R^2	beta	95%CI	R^2
5 minutes	0.34	1.59; 3.47*	0.57	0.42	1.85; 4.80*	0.53
10 minutes	0.21	1.41; 6.20*	0.53	0.37	3.42; 10.52*	0.53
15 minutes	0.10	-1.10; 7.48	0.50	0.26	2.05; 16.93*	0.47
20 minutes	0.09	-2.12; 10.07	0.49	0.16	-3.05; 20.79	0.43
30 minutes	0.07	-4.44; 13.80	0.49	0.63	-14.29; 23.38	0.41

Multiple linear regression models. BMI, body mass index; All associations are adjusted for age, gender, moderate to vigorous physical activity intensity time and parental education. *p<0.05.

PEDIATRIC REVIEW

Exercise, adipokines and pediatric obesity: a meta-analysis of randomized controlled trials

A García-Hermoso[1], RJM Ceballos-Ceballos[1], CE Poblete-Aro[1], AC Hackney[2], J Mota[3] and R Ramírez-Vélez[4]

International Journal of Obesity

OBJECTIVE: The objective of this meta-analysis was to determine the effectiveness of exercise interventions on adipokines in pediatric obesity.
METHODS: The analysis was restricted to studies that examined the effect of exercise interventions on adipokines (adiponectin, leptin, resistin and visfatin) in pediatric obesity (6–18 years old). **Fourteen randomized controlled trials (347 youths)** were included. Weighted mean difference (WMD) and 95% confidence intervals were calculated.
RESULTS: Exercise was associated with a significant increase in adiponectin (WMD = 0.882 μgml − 1, 95% CI, 0.271–1.493) but did not alter leptin and resistin level. Likewise, exercise intensity and change in body fat; as well as total exercise program duration, duration of the sessions, and change in body fat all significantly influenced the effect of exercise on adiponectin and leptin, respectively.
CONCLUSIONS: Exercise seems to increase adiponectin levels in childhood obesity. Our results also suggested that exercise on its own, without the concomitant presence of changes in body composition levels, does not affect leptin levels.

REVIEW Open Access

A systematic review and meta-analysis of the overall effects of school-based obesity prevention interventions and effect differences by intervention components

Table 2 Subgroup analyses by characteristics of single-component interventions

Outcomes	BMI			BMI Z-score		
	N	Mean difference, 95% CI	P for subgroup analyses	N	Mean difference, 95% CI	P for subgroup analyses
Characteristics of the PA component						
1) PA's frequency and duration						
≥ 3/week and ≥ 10 min/time	5	−0.10 (−0.22, 0.01)	0.16	-	-	-
< 3/week or < 10 min/time	2	−0.31 (−0.57, −0.05)		-	-	
2) Curricular PA						
Yes	3	−0.30 (−0.51, −0.10)	0.02	-	-	-
No	4	−0.04 (−0.17, 0.09)		-	-	
3) PA emphasizing enjoyment						
Yes	5	−0.19 (−0.33, −0.05)	0.03	-	-	-
No	2	−0.004 (−0.10, 0.09)		-	-	
Topics of HE covering both energy intake and output						
Yes	3	−0.06 (−0.26, 0.13)	-	5	−0.07 (−0.16, −0.03)	-
No	1	−0.40 (−1.01, 0.21)		1	−0.12 (−0.28, 0.04)	

CI confidence interval, SP school policy, PA physical activity, HE health education, DI dietary improvement. "-" due to insufficient observations

Effectiveness of a childhood obesity prevention programme delivered through schools, targeting 6 and 7 year olds: cluster randomised controlled trial (WAVES study)

thebmj | BMJ 2018;360:k211 | doi: 10.1136/bmj.j3984

Table 4 | Adjusted differences for body mass index (BMI) z score between control and intervention groups at first, second, and third follow-up

Follow-up	No of participants (No in intervention arm)	Mean (SD) BMI z scores: Intervention arm*	Mean (SD) BMI z scores: Control arm†	Mean difference (95% CI), P value: Intervention v control (baseline adjusted)‡	Mean difference (95% CI), P value: Intervention v control (further adjusted)§
15 months	n=1197¶ (n=556) baseline adjusted, n=837¶ (n=393) further adjusted	0.34 (1.34)	0.23 (1.27)	−0.075 (−0.183 to 0.033), 0.18	−0.077 (−0.191 to 0.037), 0.19
30 months	n=1094¶ (n=505)baseline adjusted, n=772¶ (n=359) further adjusted	0.42 (1.34)	0.31 (1.32)	−0.027 (−0.137 to 0.083), 0.63	−0.042 (−0.163 to 0.080), 0.50
39 months	n=467** (n=232)baseline adjusted, n=345** (n=173) further adjusted	0.49 (1.37)	0.63 (1.22)	−0.204 (−0.396 to −0.013), 0.04; (99% CI −0.456 to 0.048)	−0.177 (−0.386 to 0.033), 0.03; (99% CI −0.386 to 0.033)

*Baseline, all participants 0.23 (1.24); baseline, group 1 school participants only 0.29 (1.24).
†Baseline, all participants 0.15 (1.20); baseline group 1 school participants only 0.28 (1.12).
‡Adjusted for baseline outcome.
§Adjusted for baseline outcome, baseline pupil level covariates (sex, ethnicity, deprivation (index of multiple deprivation score for home postcode), 24 hour total energy intake, physical activity energy expenditure) and baseline school level covariates (size (number of pupils on roll), % school population South Asian, % school population black African Caribbean, % free school meal eligibility).
¶Includes group 1 and group 2 school participants.
**Includes group 1 school participants only

WHAT THIS STUDY ADDS

The WAVES study evaluated a theoretically informed, skills based intervention targeting children's diet and physical activity behaviours through schools and families

It did not result in any meaningful effect on adiposity, dietary intake, or physical activity after 15 or 30 months

Although such interventions can fulfil the responsibility of schools for wider education, without upstream support they are unlikely to halt the childhood obesity epidemic

PEDIATRIC OBESITY
ORIGINAL ARTICLE

Recommended levels of physical activity to avoid adiposity in Spanish children

M. Laguna[1], J. R. Ruiz[2,3], M. T. Lara[4] and S. Aznar[1]

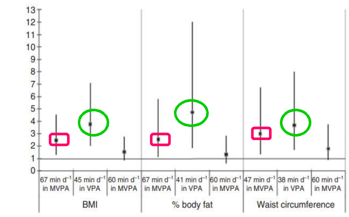


Figure 1 Odds ratio and 95% confidence interval for having overweight + obesity (BMI categories), overfat + obesity (%BF categories) and overfat + obesity (waist circumference categories) in boys not meeting the physical activity recommendations, compared to those meeting the recommendations for boys. BMI, body mass index; MVPA, moderate-to-vigorous physical activity; VPA, vigorous physical activity.

Boys who did not meet 67 min in MVPA had an increased risk of being overweight + obese and overfat + obese (odds ratio [OR] = **2.48**, 95% confidence interval [CI] = 1.36, 4.53, and OR = **2.56**, 95% CI = 1.12, 5.82).

Conclusions

The findings support current PA recommendations (60 min d^{-1} of MVPA) to avoid excess of body fat in Spanish children. However, VPA appears to be an important component for the prevention of obesity, and our findings suggest that PA recommendations should specify the dose of VPA required for optimal health. Therefore, public health PA recommendations should incorporate specifically a greater dose of VPA into the total amount of MVPA in 8- to 10-year-old boys.

Journal of Sports Sciences

Effect of a pilot multi-component intervention on motor performance and metabolic risks in overweight/obese youth

Dominique Silva Silveira, Luis Filipe Gomes Barbosa Ferreira Lemos, Rafael Miranda Tassitano, Maria Teresa Cattuzzo, Anderson Henry Pereira Feitoza, Luisa Maria Seara Moreira Carneiro Aires, Jorge Augusto Pinto Silva Mota & Clarice Maria de Lucena Martins

Table 3. Scores at baseline and after the 12-week intervention period.

	Control (n = 18)		Intervention (n = 17)				
Variable	T0	T1	T0	T1	P (group)	P (time)	P (interaction)
ScoreL	0,397(0,126)	0,318(0,177)	0,312(0,110)	0,231(0,116)	0.423	0.738	0.301
ScoreG	0,041(0,180)	0,094(0,154)	0,044(0,196)	−0,311(0,183)[a,b]	0.035	0.911	<0.001
ScoreH	0,037(0,273)	0,094(0,224)	0,040(0,135)	−0,419(0,115)[a,b]	0.123	0.736	<0.001
ScoreMP	0,067(0,169)	0,087(0,156)	0,010(0,096)	0,254(0,087)[a,b]	0.175	0.033	<0.001

ScoreL: score for lipid profile; ScoreG: Score for glycolytic profile; ScoreH: Score for hepatic profile; ScoreMP: score for motor performance profile;
[a]Significant between groups difference P < 0.05
[b]Significant intergroup difference P < 0.05

Table 4. Partial correlation and linear regressions showing estimating results with %Δglicidicscore e %Δhepaticscore as dependent variables and %ΔMP as independent variable.

Independent Variable	Dependent Variables	r	β (95%CI)	P value
%ΔMP	%Δglycolytic	−.460*	−.424 (-.343; -.022)	.027*
	%Δhepatic	−.430*	−.382 (-.001; -.009)	.019*

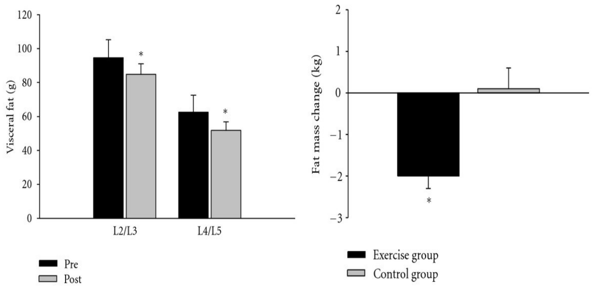
%ΔMP = relative variance for motor performance score; %Δglycolytic = relative variance for glycolytic score; %Δhepatic = relative variance for hepatic score; adjusted for MVPA, SB, total intake and maturational stage; p < 0.05.

Methods: A 3-month multi-component intervention was performed, consisting of physical exercise sessions (twice/week;1h), nutritional education sessions (once/month), and parental support (twice/week). The sample included 35 volunteers (7–13 yr-old): INT, n = 17 and CONT, n = 18.

Conclusion: The intervention produced a moderate-to-high effect on the MP and some MRM. Changes in MP were inversely associated with changes in glycolytic and hepatic markers.

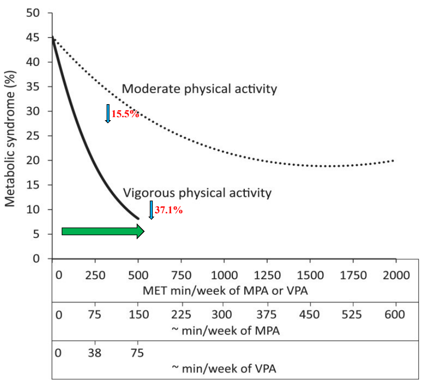
High-intensity intermittent exercise and body composition in overweight young males

Effect of a 12-week of HIIE intervention on TB, AB, TRK, VFM, and FFM of young overweight males (n=49; E=25)- **Conclusion:** Twelve weeks of HIIE resulted in significant reductions in total abdominal, trunk, and visceral fat and significant increases in fat free mass and aerobic power.



Heydari et al. J Obesity; 2012: 480487

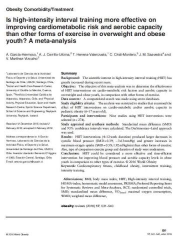
Vigorous intensity physical activity and metabolic syndrome



Methods: Participants consisted of 1841 adults from the 2003–06 NHNES,. MPA and VPA over 7 days using Actigraph accel. MetS was determined using an established clinical definition.
Results: VPA had a greater influence on the MetS than an equivalent energy expenditure dose of MPA
For example, ~75min/week of VPA were associated with **2.4-fold greater** difference in the prevalence of the MetS than ~150 min/week of MPA.

These cross-sectional findings suggest that VPA per se has an important role in cardiometabolic disease prevention.

Janssen et al. Int J. Epidem: 41: 1132–1140, 2012


obesity reviews

Obesity Comorbidity/Treatment

Is high-intensity interval training more effective on improving cardiometabolic risk and aerobic capacity than other forms of exercise in overweight and obese youth? A meta-analysis

A. García-Hermoso,[1] A. J. Cerrillo-Urbina,[2] T. Herrera-Valenzuela,[1] C. Cristi-Montero,[3] J. M. Saavedra[4] and V. Martínez-Vizcaíno[2]

Summary
Background: The scientific interest in high-intensity interval training (HIIT) has greatly increased during recent years.
Objective: The objective of this meta-analysis was to determine the effectiveness of HIIT interventions on cardio-metabolic risk factors and aerobic capacity in overweight and obese youth, in comparison with other forms of exercise.
Data sources: A computerized search was made using seven databases.
Study eligibility criteria: The analysis was restricted to studies that examined the effect of HIIT interventions on cardio-metabolic and/or aerobic capacity in pediatric obesity (6–17 years old).
Participants and interventions: Nine studies using HIIT interventions were selected (n = 274).
Study appraisal and synthesis methods: Standarized mean difference (SMD) and 95% confidence intervals were calculated. The DerSimonian-Laird approach was used.
Results: HIIT interventions (4–12 week duration) produced larger decreases in systolic blood pressure (SMD = 0.39; −3.63 mmHg) and greater increases in maximum oxygen uptake (SMD = 0.59; 1.92 mL/kg/min) than other forms of exercise. Also, type of comparison exercise group and duration of study were moderators.
Conclusions: HIIT could be considered a more effective and time-efficient intervention for improving blood pressure and aerobic capacity levels in obese youth in comparison to other types of exercise. © 2016 World Obesity
Keywords: Cardiorespiratory fitness, childhood obesity, intermittent training, intensity training.

Role of the **intensity** of exercise?

HIIT (64–90% VO2max or 77–95% HRmax) VS. continuous or interval training at moderate or low intensity

Table 2 Effects of HIIT programmes compared to other exercise modalities on body composition, cardiometabolic risk factors and aerobic capacity

	Study (n)	Subjects (n)	SMD (95% CI)*	p	I^2 (%)
Body composition					
Weight, kg	8	274	0.06 (−0.19, 0.30)	0.650	0
Body mass index, kg/m^2	8	274	−0.02 (−0.26, 0.23)	0.881	0
Waist circumference, cm	6	154	0.07 (−0.29, 0.43)	0.701	24
Fat mass, %	6	138	0.16 (−0.16, 0.48)	0.323	0
Fat mass, kg	3	86	−0.03 (−0.43, 0.48)	0.875	0
Lipids and lipoprotein					
Total cholesterol, mmol/L	4	141	0.09 (−0.24, 0.43)	0.585	0
HDL, mmol/L	4	168	0.26 (−0.48, 1.00)	0.491	81
LDL, mmol/L	4	141	−0.06 (−0.52, 0.39)	0.794	41
Triglycerides, mmol/L	5	168	0.19 (−0.11, 0.49)	0.221	2
Insulin resistance					
Fasting glucose, mmol/L	4	139	0.43 (−0.15, 1.02)	0.154	68
Fasting insulin, µU/mL	5	158	0.23 (−0.07, 0.52)	0.131	0
HOMA-index	4	131	0.39 (−0.13, 0.91)	0.144	48
Blood pressure					
Systolic blood pressure, mmHg	5	165	**0.39 (0.09, 0.69)**	**0.010**	1
Diastolic blood pressure, mmHg	5	165	0.31 (−0.06, 0.68)	0.103	30
Aerobic capacity					
VO_{2max}, mL/kg/min	6	137	**0.59 (0.17, 1.01)**	**0.006**	35

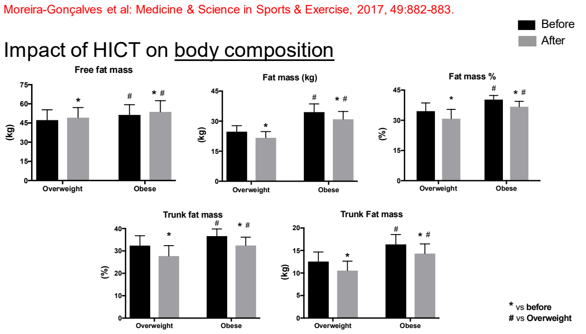
VO_{2max}, maximal oxygen consumption; SMD, standarized mean difference. Bold indicates statistical significance ($p < 0.05$)
*Positive effect sizes indicate values that favour HIIT group.

Intensity of exercise is an important variable to maximize the benefits of EX on CM risk factors

Obesity Reviews (2016) 17, 531–540

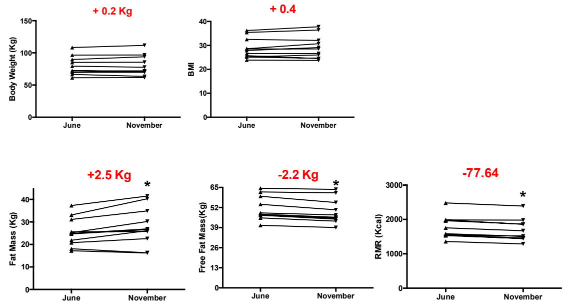
Moreira-Gonçalves et al: Medicine & Science in Sports & Exercise, 2017, 49:882-883.

Impact of HICT on <u>body composition</u>



RESULTS

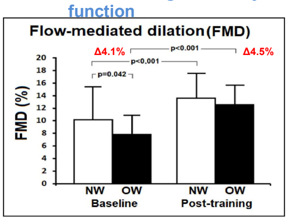
Impact of detraining (5 months)
N=11



*P<0.05 vs. June

unpublished data

Effects of high-intensity interval training on endothelial function



Endothelial function assessed by flow-mediated dilation (FMD). NW: normal-weight group; OW: overweight-obese group. Generalized estimating equation (GEE) method followed by Bonferroni's post-hoc was used (p<0.05).

Thirty-eight participants aged 14–17 years who were physically inactive (IPAq) were divided in two groups: normal weight (NW, n=13) and overweight-obese (OW, n=25).

HIIT improved physical fitness in normal-weight and overweight-obese adolescents.

A lower endothelial function was found in the overweight-obese vs normal-weight.

HIIT increased FMD in both groups from baseline.

Ramos da Silva et al (2019) Physiology Beh

CONCLUSION

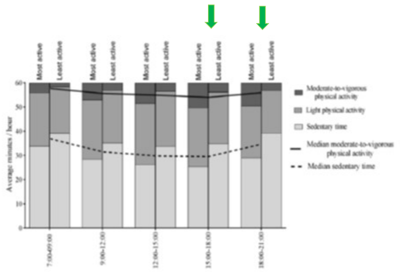
Our results support the notion that a short-term high-intensity circuit-training program is an effective strategy to modulate several physiological health markers in overweigh adolescents

American Heart Association.

- 30 MVPA/daily at school.
- Effective PE programs with qualified teachers.
- Enhance outside School PA.
- Active transportation improvement
- At least 30' recess time daily (playing).

PATE RR, et al. Circulation 2006; 114: 1214-1224.

Physical Activity Patterns



Wiersma et al. BMC Public Health (2019) 19:1647

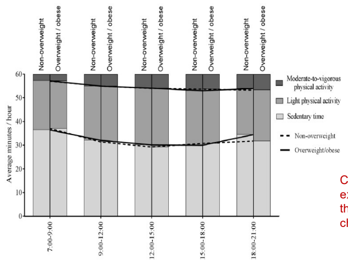
Table 3 – Logistic regression model for the recommended amount of PA given the participation on EC-sports by gender.

Explanatory variables		Odds Ratio	95% C. I.	p-value
Age	Girls	.53	.39 - .73	<.001
	Boys	.77	.53 – 1,14	.197
BMI	Girls			
	Boys	.88	.74 – 1.05	.16
EC-sports				
No sports[1]	Girls	[1]	[1]	.001
	Boys	[1]	[1]	.010
School sports	Girls	8.98	2.72 – 29.65	<.001
	Boys	.79	.14 – 4.47	.796
Club Sports	Girls	5.40	.88 – 32.92	.068
	Boys	5.26	1.32 – 20.89	.018
Both Sports	Girls	5.38	.77 – 37.70	.090
	Boys	15.71	1.69 – 145.73	.015

[1]. Reference category

Silva et al (2011). Eur Physical Educ. Rev.

Physical Activity Patterns



Children affected by overweight exhibited less ST and more LPA in the evening (18:00–21:00) than children without overweight

Wiersma et al. BMC Public Health (2019) 19:1647

OUTDOOR PLAYING TIME AND PARENTAL SES

Table 3– Linear Regressions for Girls and Boys at weekdays and weekends according to parental education status (dummy variables)

Girls	β	t	P
HPE vs. MPE (WK)	0.39	0.38	0,71
HPE vs. LPE (WK)	0,18	2.20	**0.03**
HPE vs. MPE (WEND)	0.08	0.27	0.42
HPE vs. LPE (WEND)	0.17	2.03	**0.04**
Boys	**β**	**t**	**P**
HPE vs. MPE (WK)	0.04	0.39	0,70
HPE vs. LPE (WK)	0,13	1.88	0.06
HPE vs. MPE (WEND)	0.13	1.34	0.18
HPE vs. LPE (WEND)	0.19	2.60	0.01
Data adjusted for age* BMI* TPA			

HPE – High Parental Education; MPE – Midlle Parental Education; LPE – High Parental Education

Mota et al-2017

Sports Med (2013) 43:287–299
DOI 10.1007/s40279-013-0024-2

SYSTEMATIC REVIEW

The Effect of School Recess Interventions on Physical Activity

A Systematic Review

Anne-Maree Parrish · Anthony D. Okely · Rebecca M. Stanley · Nicola D. Ridgers

4 out 8 studies showed positive effect in PA **(inconclusive evidence)**

Broekhuizen et al. International Journal of Behavioral Nutrition and Physical Activity 2014, 11:59
http://www.ijbnpa.org/content/11/1/59

INTERNATIONAL JOURNAL OF BEHAVIORAL NUTRITION AND PHYSICAL ACTIVITY

REVIEW Open Access

The value of (pre)school playgrounds for children's physical activity level: a systematic review

Karen Broekhuizen[1,2], Anne-Marie Scholten[1,3] and Sanne I de Vries[1,4*]

- Play tools availability **(moderate evidence)**
- Drawings/playground marks, spaces to play **(inconclusive evidence)**

Chillón et al. International Journal of Behavioral Nutrition and Physical Activity 2011, 8:10
http://www.ijbnpa.org/content/8/1/10

INTERNATIONAL JOURNAL OF BEHAVIORAL NUTRITION AND PHYSICAL ACTIVITY

REVIEW Open Access

A systematic review of interventions for promoting active transportation to school

Palma Chillón[1,3*], Kelly R Evenson[2,3], Amber Vaughn[3], Dianne S Ward[3,4]

Activie commuting to school, bult –up routes, available equipment and financial support (eg: teacher to speak out in the community).

6/14 most of the interventions reported a small effect size on active transportation (change de 3% a 64%)

More research with higher quality study designs and measures should be conducted to further evaluate interventions and to determine the most successful strategies for increasing active transportation to school.

Journal of Physical Activity and Health, 2014, 11, 1640-1643
http://dx.doi.org/10.1123/jpah.2013-0035
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Physical Activity & Health
Official Journal of ISPAH
www.JPAH-Journal.com
ORIGINAL RESEARCH

Independent Mobility and its Relationship With Moderate-to-Vigorous Physical Activity in Middle-School Portuguese Boys and Girls

Elisa A. Marques, Andreia Isabel Pizarro, Jorge Mota, and Maria Paula Santos

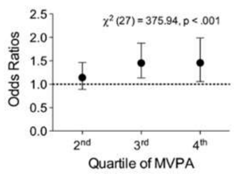


Figure 1 — Odds ratios (OR) and 95% confidence intervals for belonging to quartiles of MVPA in a multinomial logistic regression adjusted for adjusted for age, gender, BMI, meeting PA recommendations, and participation in structured exercise. R^2 = .17 (Cox & Snell), 0.19 (Nagelkerke).

Independent mobility associated to higher opportunity for cognitive , social and phsyical development.

Higher levels of IM associated to MVPA

Take home message

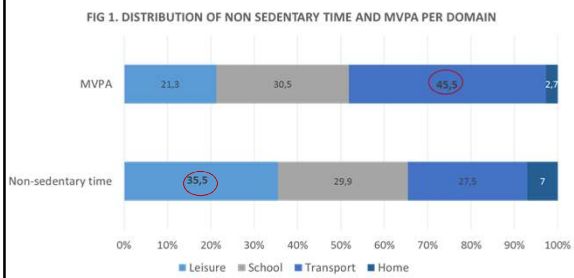
Promising policies and strategies:

- **combined lifestyle interventions (exercise + diet)- At least >12 weeks**
- **-BMI and BF as well as FFM which may induce positive metabolic adaptation (adipokines, lipid profile , BP).**
- **-depending on outcome goals/measures aerobic exercise + resistance may induce more important adaptations.**
- **- Program length and frequency showed different roles according to the outcome**
- **-Intensity it is also an important variable to be analyzed. Inclusion of MVPA activities and multicomponent exercise in a organized context**
- **- The improvements in co-morbidity that occur in the absence of weight loss / change in BMI should be highlighted and taken into consideration especially in treatment scenarios where weight reduction may not be huge but the effect on the individual significant in terms of health and functioning**

Possible Bias- Interpretation:

- **High level of observed heterogeneity and individual variability**
- **-Follow up studies-The long-term impact on OB/OW youngsters still less clear.**
- **High quality research that considers psychosocial determinants for behaviour change, and cost-effective programs for primary and community care is required.**

The best primary strategy for improving the long-term health of children and adolescents through exercise may be creating a lifestyle pattern of regular physical activity that will carry over to adult life.



Pizarro et al., IJBNPA(submitted)

Key Concepts

- Activity for all
- Modified for success
- Challenging
- Appropriate
- ENJOYABLE FOR ALL

59

Sedentary Behavior Prevalence: Summary of Key Findings

- School-aged children are sedentary for ≈8 of their daily waking hours on average; most are engaging in excessive screen time.
- Screen time increases substantially with age, most notably during preadolescence.
- Traditional television viewing has declined in the past 10 years, whereas use of other screen-based devices for viewing television and other recreational content is on the rise, leading to overall net increases in screen time.
- Adolescents are the most sedentary of pediatric populations and are engaging in the most total recreational screen-based media.

The best primary strategy for improving the long-term health of children and adolescents through exercise may be creating a lifestyle pattern of regular physical activity that will carry over to adult life

THANK YOU