

Do activity monitors increase physical activity in adults with overweight or obesity? A systematic review and meta-analysis

Herman J. de Vries^{1, 2}, Thea J.M. Kooiman³, Miriam W. van Ittersum⁴, Marco van Brussel¹, Martijn de Groot^{3, 5}.

1 Clinical Health Sciences, Utrecht University / University Medical Center Utrecht, the Netherlands;

2 Paramedics PT center, Assen, the Netherlands;

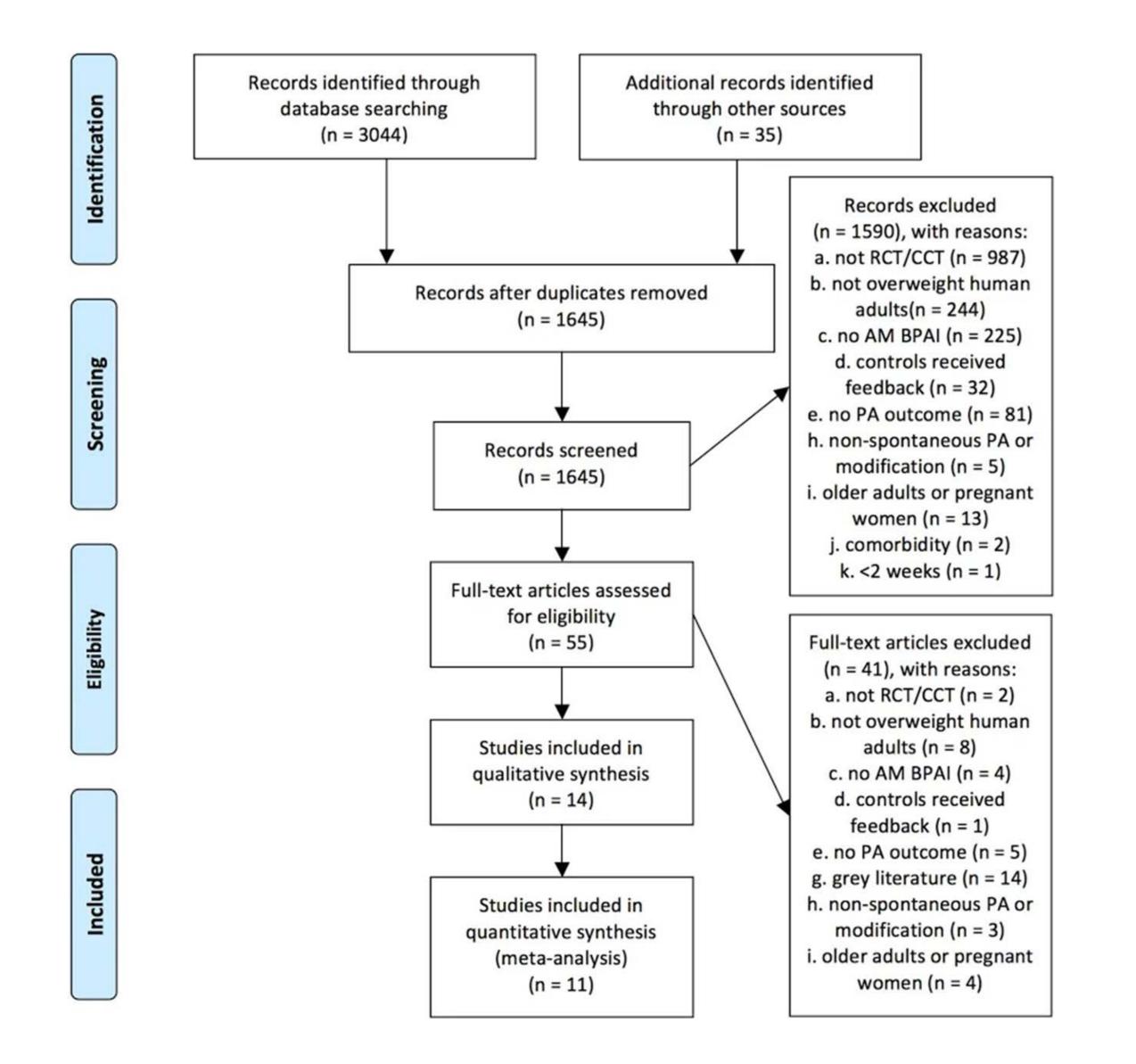
3 Research Group Healthy Ageing, Allied Health Care and Nursing, Hanze University of Applied Sciences, Groningen, the Netherlands;

4 School of Health Care Studies, Physiotherapy Department, Hanze University of Applied Sciences, Groningen, the Netherlands;

5 Quantified Self Institute, Hanze University of Applied Sciences, Groningen, the Netherlands.

Background

Activity monitors might be useful tools in interventions for people with obesity. The objective of this study was to systematically assess contemporary knowledge regarding behavioral physical activity interventions including an activity monitor (BPAI+) in adults with



overweight or obesity.

Methods

PubMed/MEDLINE, Embase, CINAHL, PsycINFO, CENTRAL and PEDro were searched for eligible full text articles up to July 1st 2015. Methodological quality was assessed independently using the Cochrane Collaboration's tool for risk of bias.



Figure 1: Flowchart of selected studies.

Results

Fourteen studies (1157 participants) were included for systematic review and eleven for meta-analysis. A positive trend in BPAI+ effects on several measures of physical activity was ascertained compared to both waitlist or usual care (WL/UC) and behavioral physical activity interventions without an activity monitor (BPAI-). No convincing evidence of the effects of activity monitor use on weight loss was found when comparing BPAI+ to BPAI-.

A. Steps per day

		BPAI+		1	WL/UC		:	Std. Mean Difference	Std. Mean	Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Rando	m, 95% Cl
Baker 2008	3,175	2,850	39	157	1,952	40	19.2%	1.23 [0.74, 1.71]		
Bond 2014	2,027	1,887	42	203	1,374	38	19.7%	1.09 [0.61, 1.56]		
Morgan 2013(a)	1,838	3,089	54	233	2,478	52	23.7%	0.57 [0.18, 0.96]		
Morgan 2013(b)	2,015	3,087	53	233	2,478	52	23.5%	0.63 [0.24, 1.02]		
Tudor-Locke 2004	3,370	3,780	24	-657	2,574	23	14.0%	1.22 [0.59, 1.85]		
Total (95% CI)			212			205	100.0%	0.90 [0.61, 1.19]		•
Heterogeneity: Tau ² = Test for overall effect					= 0.10);	l ² = 49	9%		-2 -1 (Favours [WL/UC]	Favours [BPAI+]
(a) Offline resources		· ·	• • •							

(b) Online resources intervention group (i2)

B. Total moderate to vigorous physical activity (MVPA)

		BPAI+		١	WL/UC		:	Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Bond 2014	21	26.9	42	-0.1	16.3	38	27.4%	0.93 [0.47, 1.39]	
Morgan 2011	0.4	0.6	65	0.1	0.7	45	31.3%	0.46 [0.08, 0.85]	-
Patrick 2011	5.44	18.51	244	1.04	18.56	217	41.3%	0.24 [0.05, 0.42]	
Total (95% CI)			351				100.0%	0.50 [0.11, 0.88]	· · · · · · · · · · · · · · · · · · ·
Heterogeneity: Tau ² = Test for overall effect:				= 2 (P	= 0.02)	; ² = 7	4%	-	-2 -1 0 1 2 Favours [WL/UC] Favours [BPAI+]

Figure 2: Meta-analysis for BPAI+ vs. WL/UC.

A. Total moderate to vigorous physical activity (MVPA) Std. Mean Difference BPAI+ **BPAI-**Std. Mean Difference SD Total Mean SD Total Weight IV, Random, 95% Cl Study or Subaroup IV, Random, 95% CI Mean 13 0.67 [-0.12, 1.47] -66.8 442.8 Pal 2009 323.2 656.2 13 30.4% Pal 2011 288.3 466.9 13 209.4 392.7 15 34.6% 0.18 [-0.57, 0.92] 15 44.8 124.6 14 35.0% 0.48 [-0.26, 1.22] Unick 2012 133 217 0.43 [-0.00, 0.87] Total (95% CI) 42 100.0% 41 Heterogeneity. Tau² = 0.00; Chi² = 0.82, df = 2 (P = 0.66); l² = 0% Test for overall effect: Z = 1.95 (P = 0.05) Favours [BPAI-] Favours [BPAI+]

B. Walking MET minutes/week

BPAI+					BPAI-			Mean Difference	Mean Difference		
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI		
Pal 2009	344.8	364.2	13	-23.2	250.6	13	52.8%	368.00 [127.68, 608.32]			
Pal 2011	402.3	349.4	13	216.4	335	15	47.2%	185.90 [-68.69, 440.49]			
Total (95% CI)			26			28	100.0%	282.00 [103.82, 460.18]			
Heterogeneity. Tau ² = Test for overall effect		-	-	df = 1(P = 0.30	1); ² =	4%		-500 -250 0 250 500 Favours [BPAI-] Favours [BPAI+]		

C. Physical activity kilocalories per week

		BPAI+			BPAI-			Std. Mean Difference	Std. Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% Cl
Pellegrini 2012	713.9	1,278.8	17	473.9	800.7	17	31.8%	0.22 [-0.45, 0.89]	_
Polzien 2007 (a)	1,286.7	3,150.7	19	281.6	1,205.4	19	34.9%	0.41 [-0.23, 1.06]	- +-
Polzien 2007 (b)	1,112.3	1,042.3	19	281.6	1,205.4	19	33.3%	0.72 [0.06, 1.38]	
Total (95% CI)			55			55	100.0%	0.45 [0.07, 0.83]	•
Heterogeneity: Tau ² = Test for overall effect:	-	-		(P = 0.5	$(7); 1^2 = 0;$	%			-2 -1 0 1 2 Favours [BPAI-] Favours [BPAI+]

(a) Intermittent Technology-Based Behavioral Weight Control Program (i1)(b) Continuous Technology-Based Behavioral Weight Control Program (i2)

Figure 3: Meta-analysis for BPAI+ vs. BPAI-.



Behavioral physical activity interventions with an activity monitor increase physical activity in adults with overweight or obesity. Also, adding an activity monitor to behavioral physical activity interventions appears to increase the effect on physical activity, although current evidence has not yet provided conclusive evidence for its effectiveness.







Contact:

Herman de Vries: hermandevries@gmail.com Thea Kooiman: t.j.m.kooiman@pl.hanze.nl