Effectiveness of Family-based Intervention Programs on Objectively Measured Physical Activity in Children under 13: a Systematic Review of Randomized Controlled Trials

Qian Wang[1], Lawrence T. Lam[1], Heng Lin[1], Wenxian Yang[2], Fuxian Ying[1], Yongwei Li[1]

[1]Faculty of Medicine, Macau University of Science and Technology, Taipa, Macau 999078, China
[2]Jiangsu Research Institute of Sports Science, Nanjing, China

Introducticon

1. Insufficient physical activity is a global public health concern and is associated with adverse physical and mental health outcomes in children, highlighting the need for effective health promotion strategies.
2. Guided by social cognitive theory, parental involvement is closely linked to children's physical activity, suggesting that family-based interventions may be effective. However, evidence regarding their effectiveness remains inconsistent.
3. Moreover, reliance on subjective measures may introduce bias, whereas objective assessments such as ActiGraph accelerometers are more appropriate for evaluating physical activity in young children.

Question

Do family-based intervention programs improve objectively measured physical activity levels in children under 13 years old?

Objectives

To investigate the effectiveness of family-based RCT physical activity intervention programs which were measured by objective devices in children under 13 by a quantitative approach.

Methods

Information sources and search strategy: A PICO-guided systematic search of four databases (Web of Science, Embase, Medline, and PubMed) identified 6,233 studies published between January 2013 and February 2024, which were managed using EndNote X9.

Eligibility criteria: Randomized controlled trials were included if they involved children under 13 years of age and parent–child dyads participating together in family-based physical activity interventions, included a comparison group, and reported objectively measured physical activity outcomes (moderate-to-vigorous physical activity, sedentary behavior, or daily steps). No restrictions were applied to intervention setting, duration, FITTVP components, or sample size.

Studies were excluded if they were non-English publications, reviews, protocols, or patents; lacked objective physical activity data; involved children with physical or exercise disorders; used duplicate samples; or did not clearly define a family-based intervention.

Data Extraction and Management: Data screening and extraction were independently performed by reviewers, with consensus resolution; key study characteristics, interventions, and outcomes were extracted, and missing or duplicate data were addressed accordingly.

Quality assessment: Risk of bias was independently assessed using the Cochrane RoB 2.0 tool, with consensus resolution and visualization in RevMan 5.4.

Statistical analysis: A random-effects meta-analysis was performed in RevMan 5.4 using SMDs or WMDs with 95% CIs ($P < 0.05$). Heterogeneity, subgroup, publication bias, and sensitivity analyses were conducted using I^2 statistics, Egger's test, and leave-one-out methods.

Results

Figure 1 Article selection flow chart for the meta-analysis.

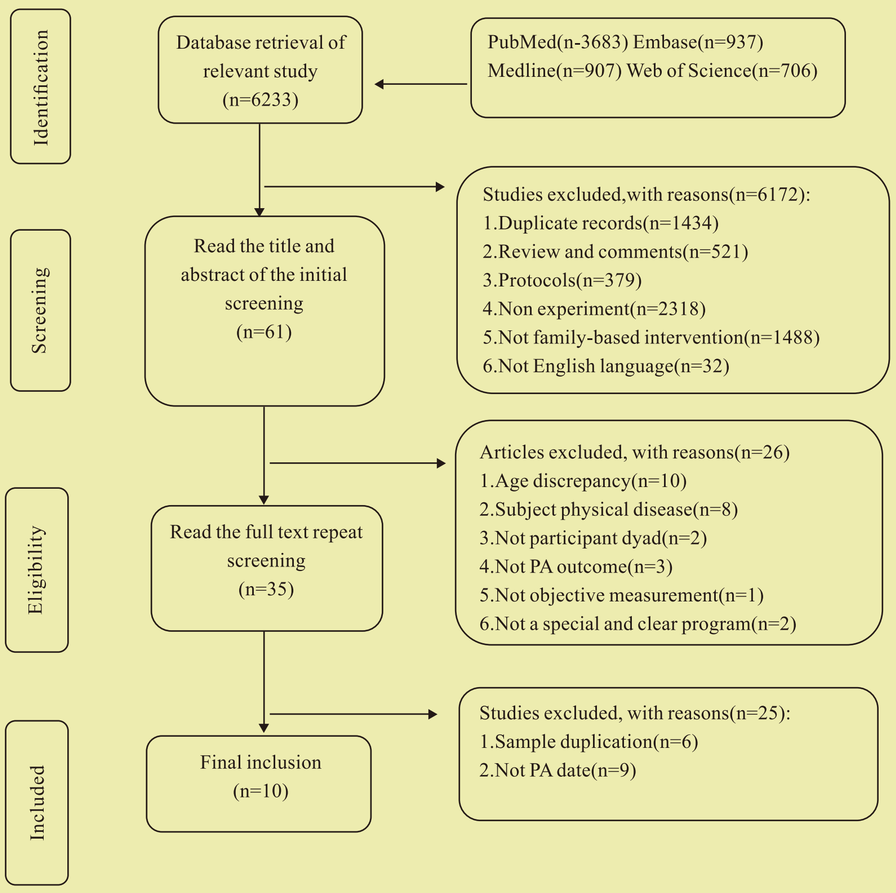

Figure 2 Subgroup of the forest plot of family-based intervention on MVPA in children aged under 13

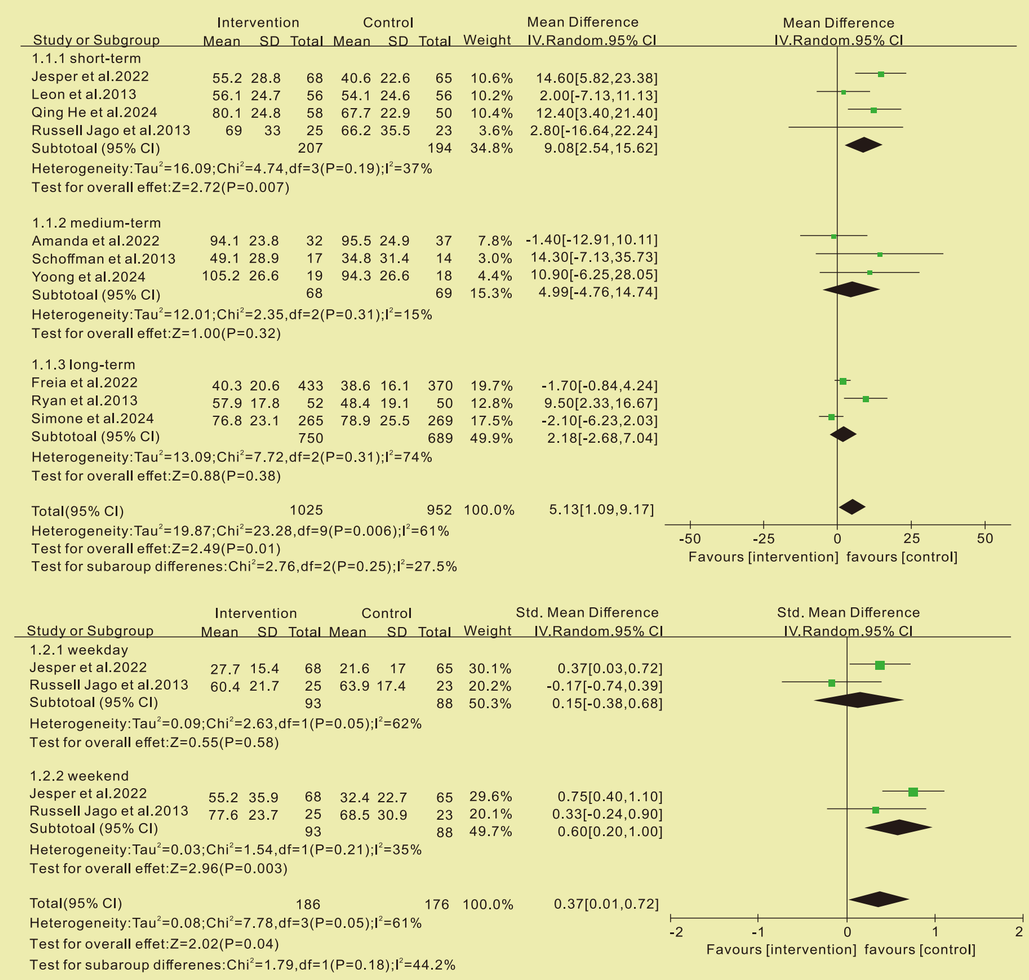

Figure 3 Forest plot of family-based intervention on MVPA in parents

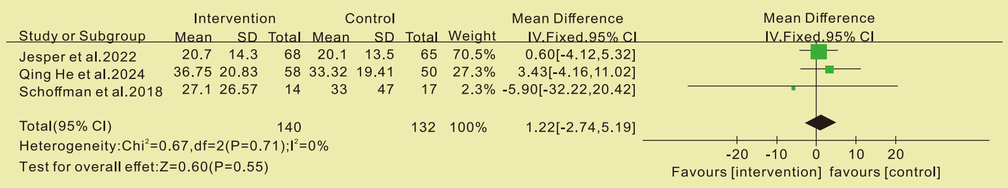

Figure 4 Forest plot of family-based intervention on SB in children aged under 13

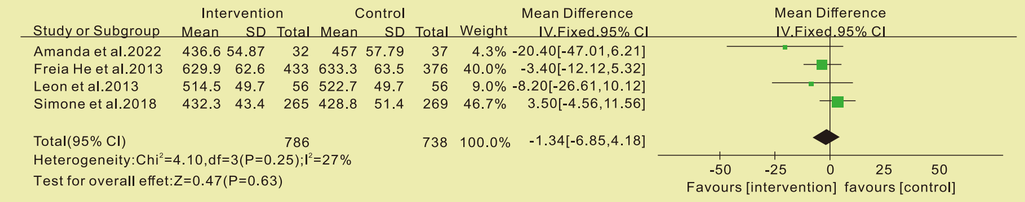

Table 1 Characteristics results of a meta-analysis on the family-based physical activity intervention

	pulication	country	monitoring device	participants	age (mean±SD)	theory	program	duration	outcome	study
1	Freia et al.(2013)	German	Atciheart device	826	5.0±0.2	social learning	participatory intervention	12 months	MVPA, SB	two-armed luster RCT
2	Jago et al.(2013)	UK	GT1M Actigraph accelerometer	75	7.3±3.5	self-determination theory	teamplay intervention	8 weeks	MVPA	two-armed RCT
3	Leon et al.(2013)	Australia	Actical accelerometer	56	11.3±0.8	NA	the replacement of electronic games at home intervention	8 weeks	MVPA, SB	crossover RCT
4	Yoong et al.(2018)	Australia	Actigraph GT3X+	76	4.4±0.5	the theory of planned behavior	sleep intervention	3 months	MVPA, PA	two-armed pilot RCT
5	Schoffinan et al.(2018)	USA	GT1M Actigraph accelerometer	33	11±0.6	social cognitive theory, the theory of planned behavior, family systems theory	motivated interactive technology with family intervention	12 weeks	MVPA, Steps	two-armed pilot RCT
6	Simone et al.(2018)	USA	Actigraph GT3X+	534	3.4±0.7	social cognitive theory	Now Everybody Together for Amazing and Healthful Kids(NET-Works) intervention	3 years	MVPA, SB	two-armed RCT
7	Ryan et al.(2019)	Canada	Actigraph GT3X+	102	8.9±2.1	planning and self-regulation theory	parental planning skills intervention	26 weeks	MVPA	two-armed RCT
8	Jesper et al.(2022)	Danish	non-commercial Device Tracker apps	89	9.1±2.6	the behavioral model Social Cognitive Theory	screen media reduction intervention	2 weeks	MVPA,leisure nonsedentary	two-armed cluster randomized clinical trial
9	Amanda et al.(2022)	USA	Actigraph GT3X+	72	4.0±0.8	social cognitive theory	mHealth intervention	12 weeks	MVPA, SB, FMS	two-armed RCT
10	He et al.(2024)	China	Actigraph GT3X+	108	4.5±0.6	social cognitive theory	family-based parent-led intervention	8 weeks	MVPA, FMS	

Conclusions

1. This review found that family-based physical activity interventions positively increase children's MVPA.
2. The effects are most evident in the short term and during weekends. No significant effects were observed on children's sedentary behavior or parental MVPA. Greater emphasis should be placed on interventions targeting sedentary behavior reduction.
3. More high-quality, long-term RCTs are needed, particularly those involving larger and more diverse populations and using advanced objective measurement tools.

Email:3230004389@student.must.edu.mo ; tmlam@must.edu.mo
Advisor:Lawrence T. Lam