Effects of community-based interventions on physical activity levels: systematic review

Efeitos de intervenções comunitárias nos níveis de atividade física: revisão sistemática

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ABSTRACT

Aiming to evaluate the effects of community-based interventions on the physical activity (PA) levels in adults, in December, 2017 a systematic review was developed in five electronic databases (Pubmed, Physical Education Index, Scopus, Sportdiscus e Web of Science) and in reference lists, looking for community-based randomised controlled trials (RCT) with interventions aimed at PA increasing levels assessed by objective methods in samples of adults. Risk of bias was assessed using an adapted version of the EPHPP instrument. Of 3,223 articles initially identified, nine composed the descriptive synthesis. Most interventions focused on inactive people and women. In view of the heterogeneity between the PA indicators, a descriptive synthesis of the data was chosen, thus, considering number of steps per day, four of five interventions showed statistically positive results. In regard of moderate-to-vigorous PA levels, two of five interventions showed potential results. Most of interventions were based on educational activities as practices of counselling, home visits and telephone support. Articles with moderate risk of bias were the majority in four of the five domains assessed. In conclusion, most of the studies included showed the potential of community-based interventions to increase the number of steps per day. It is important that future studies discuss operational strategies of interventions, such as counselling and home visits.

Keywords: Physical activity; Adult; Public health; Randomized controlled trial; Review.

RESUMO

Com o objetivo de avaliar os efeitos de intervenções comunitárias nos níveis de atividade física (AF) em adultos, em dezembro de 2017 foi desenvolvida uma revisão sistemática, buscando ensaios controlados randomizados (ECR) comunitários com intervenções voltadas à promoção da AF avaliadas por métodos objetivos em amostras de adultos. Ao todo, nove ECR compuseram a síntese descritiva. A maioria dos ECR foi direcionada às pessoas inativas e mulheres. Considerando o número de passos por dia, quatro das cinco intervenções apresentaram resultados estatisticamente positivos. Em relação aos níveis de AF moderadas e vigorosas, duas de cinco intervenções apresentaram resultados potenciais. A maioria das intervenções foi baseada em atividades educacionais como práticas de aconselhamento, visitas domiciliares e chamadas telefônicas. Em conclusão, a maioria dos estudos incluídos mostrou o potencial das intervenções comunitárias ao aumento do número de passos por dia. É importante que futuros estudos debatam estratégias operacionais das intervenções, como o aconselhamento e visitas domiciliares.

Palavras-chave: Atividade física; Adulto; Saúde pública; Ensaio controlado randomizado; Revisão.

Introduction

Although physical activity (PA) contributes to the prevention and/or control of a large number of diseases[1–4] and is associated with a reduction in the risk of premature death[5], approximately 31% of the world adult population does not reach recommended levels of moderate and vigorous PA[6]. In view of its global dimension[6] it is also recognized that PA is multi-determined by socioeconomic and environmental variables[7], which raises the importance of studying the particularities of contexts where strategies to promote PA can be implemented.

Apart from the impossibility of better control over contextual variables, in comparison with clinical-based interventions, previous evidence suggests the potential of community-based strategies for health promotion and prevention of diseases[8–10]. Regarding PA promotion, a previous review[11] argues about the inconclusiveness of the effects of the community-based interventions, much due to the high methodological

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heterogeneity among the available evidence, which, therefore, justifies the elaboration of a synthesis based on more specifically inclusion criteria, in the sense that its evidence can contribute to the current debate, as well as providing insights for future research.

In this sense, we highlight both the evidence of randomized controlled trials (RCT), due to its better estimate for cause and effect, as well as the use of objective methods for PA assessment (e.g. accelerometers and pedometers), since, when compared with measures based on self-report, suggest more conservative results[12,13]. Thus, the objective of the present study was to evaluate the effects of community-based RCT on the PA levels assessed by objective methods in adults.

Methods

This review is part of the project "Translation of evidence for decision making in the Brazilian Health System: a review of interventions aiming physical activity promotion", registered in PROSPERO (CRD42015015993). To date, this project aims to raise evidence of community and educational interventions that can be reflected and translated into the Brazilian Health System.

The inclusion criteria of this review were delimited considering the PICOS strategy: Participants: adult populations, without health problems or specific diseases, with the exception of overweight and obesity-based samples. Interventions: with the primary objective of increasing PA levels, which had recruitment and implementation in community settings (e.g. neighbourhoods/districts, primary health care centres and community organizations), with duration of at least six months. Comparators: groups that did not receive any type of intervention or who, according to the authors, received a reduced content of intervention. Outcome: PA levels measured by objective methods. Study design: RCT.

Five electronic databases were used to retrieve the potential studies (Pubmed, Physical Education Index, Scopus, Sportdiscus e Web of Science), covering available literature until 27/12/2017. The systematic searches were developed in accordance to the strategy previously developed for Pubmed: (((((physical activity OR exercise OR physical fitness OR resistance training OR sports OR walk Or walking OR run OR running OR dance OR dancing))) AND ((population OR community OR communities OR community-based OR primary care OR primary health care OR

basic attention))) AND ((intervention OR treatment OR strategy OR strategies OR program))) AND ((physical activity promotion OR walking promotion OR running promotion OR physical activity level)) Filters: Clinical Trial; Clinical Trial, Phase I; Clinical Trial, Phase II; Clinical Trial, Phase III; Controlled Clinical Trial; Pragmatic Clinical Trial; Randomized Controlled Trial. In addition, manual searches were carried out in the reference lists. A full description of the systematic searches can be requested to the corresponding author.

The search and evaluation of the available evidence were conducted by two experienced researchers (ER and PG), independently, with permanent resolution of disagreements and establishment of consensus.

Data extraction was carried out in an electronic spreadsheet, divided into three domains: (i) descriptive characteristics (e.g. name/acronym of the intervention, location, description of population, age/age group); (ii) methods (e.g. recruitment and implementation site, size of baseline groups and sample losses, description and strategies used in the intervention and control groups, intervention implementation team, instruments and procedures used to assess PA) and (iii) outcomes (e.g. variables analysed, procedures used in of PA data analysis, magnitude and statistical significance of the findings).

Risk of bias was assessed by two independent researchers (PG and TR) with an adapted version[14] of the Effective Public Health Practice Project (EPHPP)[15], which covers the following domains of a RCT: selection bias, confounders, blinding of outcome assessor, validity and reproducibility of methods used for PA assessment and losses and withdrawals.

Results

The flowchart displays the numbers of this review (Figure 1). Briefly, after the identification and removal of 516 duplicates, 2,712 potential articles were evaluated by their titles and abstracts. Of the 182 remaining articles evaluated by their full texts, 173 were excluded, with the main following reasons: interventions (e.g. not community-based or not involving physical activity; n = 86) and populations (e.g. age range or specific health conditions; n = 37). Thus, nine articles composed the descriptive synthesis[16–24].

In terms of country, five of the included RCT were developed in the United States of America (55.6%). In synthesis, mean age ranged from 45 to 77 years (median = 53)[19,20] and, in relation to the samples,

women were the majority in all included studies, with four of them with samples only composed by women (44%)[18–20,24]. Communities were the most frequent setting in the implementation of interventions (n = 8; 89%)[16–19,21–24]. Regarding participants profile, most of the interventions were directed to physically inactive samples (n = 5)[16,17,20,21,24] (Table 1).
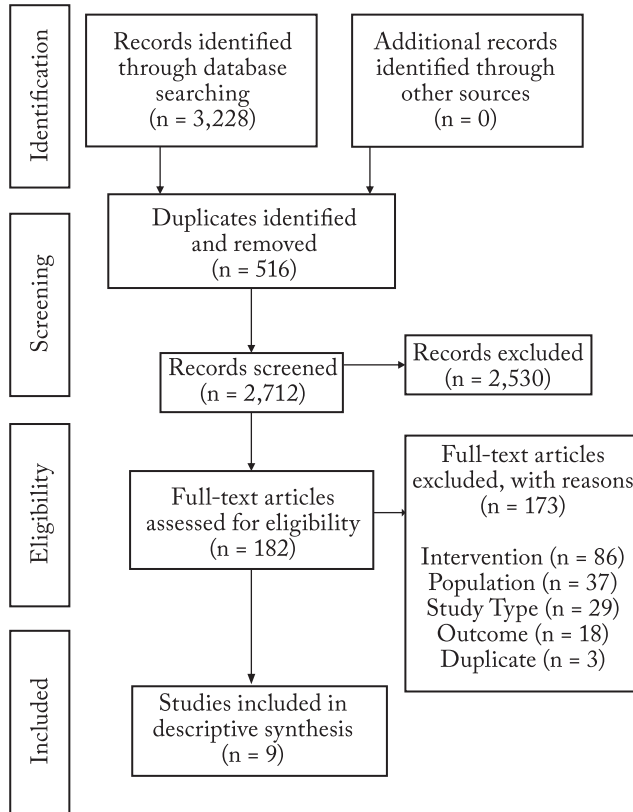

Figure 1 – Flowchart of systematic review

Included samples varied between 30 and 388 participants[16,22]. Regarding duration, the interventions ranged from six to 14 months, with five of them lasting for at least 12 months (56%)[16–18,23,24]. Interventions were implemented by health specialists (n = 4), Community Health Workers (CHW) (n = 3) and by research teams (n = 2). As for the organization of strategies, the most frequent were group meetings (n = 6)[18–21,23,24] and support by telephone calls (n = 6)[16,18–21,24]. In five studies, the practice of counselling was developed (n = 5)[17,18,20,21,23] (Table 2). One intervention was based exclusively on three-times a week walking sessions, over eight months[22]. For PA assessment, accelerometers were used in six studies[16,18–20,23,24] and pedometers in two[17,22]. One study used both accelerometers and pedometers [21] (Table 2).

Figure 2 shows that moderate risk of bias scores were attributed to all studies in the following domains: selection bias (due to samples representing specific populations) and lack of blinding procedure of the outcome assessor. Moderate scores were also attributed more frequently for confounders (n = 8; 88.9%) and losses and withdrawals (n = 5; 55.6%). All studies showed low risk of bias for validity and reproducibility of methods used for PA assessment (Figure 2).

In Table 3, the results of the RCT were grouped into two indicators of PA, aiming at a better presentation of the evidence: (i) number of steps per day, where four (of five) available studies showed significant differences between groups (80%)[17,19,21,22] and (ii) moderate and vigorous PA levels, where two of five studies presented positive after the intervention (40%)[16,21].

Table 1 – Descriptive characteristics of included studies (n = 9)

Reference	Country	Mean age (baseline)/ Percentage of females	Recruitment/ Implementation Settings	Special characteristics of samples
Castro et al.[16]	USA	59 (66%)	Community	≥50 years old physically inactive people
Fitzsimmons et al.[17]	SCO	49 (80%)	Community	18–65 years old people, in precontemplation, contemplation or preparation based in transtheoretic model of behaviour change
Keyserling et al.[18]	USA	53 (100%)	Community / Community Health Centre	40–64 years old low-income woman
Koniak-Griffin et al.[19]	USA	45 (100%)	Community / Community Health Centre	Low-income overweight Latin-based woman with 35–64 years old
McMurdo et al.[20]	SCO	77 (100%)	Primary Health Centres	≥70 years old physically inactive people
Opdenacker et al.[21]	BEL	67 (52%)	Community	≥60 years old physically inactive people
Schulz et al.[22]	USA	47 (nd)	Community / Community Associations	>18 years old Latin-based or African American people
Warner et al.[23]	GER	70 (75%)	Community	≥64 years old people
Wilbur et al.[24]	USA	53 (100%)	Community	40–65 years old physically inactive African American woman

BEL = Belgium; GER = Germany; nd = not described; SCO = Scotland; USA = United States of America

Table 2 – Intervention characteristics and physical activity assessment (n = 9)

Reference	Analysed no. (per group)		Intervention length; Implementers of the intervention	Intervention	Tool used for physical activity assessment
	INT	CON			
Castro et al.[16]	20[(a)]	10	12 months; Health Specialists and Physically Active Voluntaries	Educational content offered through 14 telephone calls, which could be done either by a specialist or by a previously trained volunteer. Based on Cognitive Social Theory.	Accelerometer MTI Actigraph
Fitzsimmons et al.,[17]	39[(b)]	40	12 months; Health Specialists	Receipt of pedometer and permanent individual counselling (face-to-face and via telephone). Members of the Control group also received pedometers.	Pedometer Omron HJ-109E
Keyserling et al.[18]	106[(c)]	106	12 months; Community Health Workers	Intervention divided into two phases of six months (intensive and maintenance). Were developed Individual counselling activities, group sessions, mailing and telephone calls. The Control group received a pamphlet about physical activity and healthy eating.	Accelerometer Actigraph
Koniak-Griffin et al.[19]	98	95	6 months; Community Health Workers	Eight educational meetings (classes), home visits and follow-up by telephone calls were done. The Control group received training in disease prevention, environmental disasters and home safety (children and the elderly).	Accelerometer Kenz Lifecorder Plus
McMurdo et al.[20]	53[(d)]	66	6 months; Research Team	Educational meetings, counselling, educational pamphlet delivery and telephone monitoring were done.	Accelerometer RT3 Triaxial Research Tracker
Opdenacker et al.[21]	40[(e)]	46	11 months; Health Specialists	Individual follow-up (that generated a physical activity adapted program, involving resistance, strength, and flexibility activities). Counselling with Psychologists. Were also done group activities and monitoring by telephone calls. Based on Cognitive Social Theory.	Accelerometer RT3 Tri-axial Research Tracker; Pedometer Yamax Digiwalker
Schulz et al.[22]	388		8 months; Community Health Workers	Three weekly walking activities (between 45–90 minutes). The Control group received intervention from the eighth week after the baseline.	Pedometer Omron JH 112
Warner et al.[23]	84[(f)]	67[(g)]	14 months; Psychologists with Ph.D.	Counselling practices and education-based meetings.	Accelerometer Geneactiv
Wilbur et al.[24]	62[(h)]	52	12 months; Nursers	Six group meetings, Individual telephone calls. Based on Cognitive Social Theory.	Accelerometer

a = Accelerometer-based analyses were directed for a sub-sample of 30 people (20 from two intervention groups and 10 from the control group); (b) = Pedometer-based walking programme plus physical activity consultations; (c) = Enhanced Intervention group; (d) = Behavior change intervention group; (e) = Lifestyle intervention group; (f) = Intervention group with views-on-ageing component; (g) = Passive control group; (h) = Group meetings plus personal calls group.

Discussion

The aim of this study was to evaluate the effects of community-based RCT on PA levels in adults, considering the evidence from studies using objective methods to assess PA. Our systematic review found positive results in four interventions designed to increase the number of steps per day[17,19,21,22] and in two interventions designed to increasing moderate and vigorous PA levels[16,21].

Regarding the operational aspects of the interventions, with the exception of a strategy based on three-times a week walking sessions[22], all the included interventions were based on educational activities, involving practices such as individual and group counselling, home visits and telephone calls. Our findings corroborate the evidence of a previous review, where it was pointed out that multicomponent interventions, based on educational activities, are
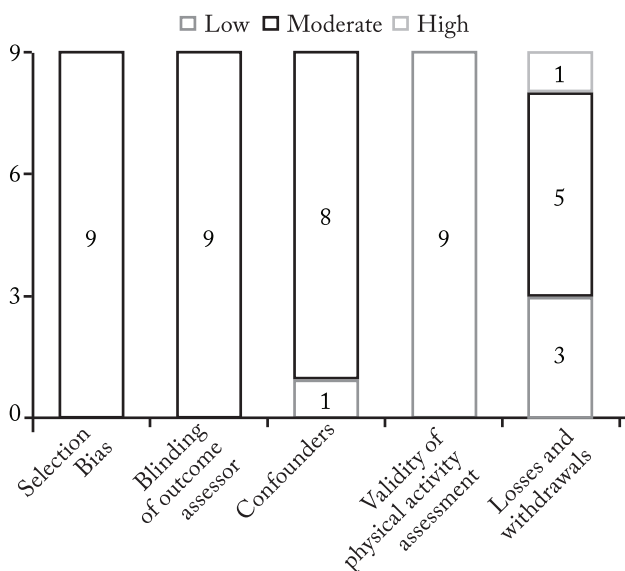
Figure 2 – Risk of Bias of included studies (n = 9)

Table 3 – Synthesis of results (n = 9)

Reference	Indicator: Number of steps per day
Fitzsimmons et al.[17]	A significant main effect of time was found for step-counts but there was no significant interaction effect (p < 0.001). Post-hoc tests showed significant increases in steps/day between: pre-intervention and 48 weeks (p < 0.001).
Koniak-Griffin et al.[19]	The groups differed significantly (controlling for age) in their change from baseline to nine months (p = 0.04).
Opdenacker et al.[21]	For the Intervention group the increase from pretest to post-test was significantly larger than the Control group with respect to daily steps
Schulz et al.[22]	Participants in the intervention group increased steps significantly more during the initial eight-week intervention period, compared to the control group (p = 0.000).
Wilbur et al.[24]	The overall condition by-time interaction effect was nonsignificant indicating an absence of differential rates of change over time across the groups (p = 0.135).
Reference	Indicator: Levels of moderate and vigorous physical activity
Castro et al.[16 (a)]	The physical activity groups differed significantly from the control group: 22.4 minutes per hour versus 5.7 minutes per hour (p = 0.007).
Keyserling et al.[18]	The relative differences between groups were not statistically significant (multivariate model, for moderate PA at six and 12 months) (p = 0.12).
McMurdo et al.[20]	After adjustment for baseline differences, accelerometry counts increased significantly more in the Intervention group at three months than in the Control group (p = 0.002). By six months, accelerometry counts in both intervention groups had fallen to levels that were no longer statistically significantly different from baseline.
Opdenacker et al.[21]	For the lifestyle group the increase from pretest to post-test was significantly larger than the control group with respect to active transportation and total physical activity
Warner et al.[23]	Neither physical activity measure increased in the Intervention group as compared to the Control group at any point in time.

effective in promoting physical activity in populations of low socioeconomic status[25]. Also, education-based strategies show promising results in promising results in increasing PA levels and are well recommended[26].

On the other hand, it is noteworthy pointing out that in many cases, only the educational practice is insufficient to change certain behaviours[27], which requires, in this sense, greater approximation of professionals and multisectoral efforts for the discussion, planning and implementation of community-based strategies for PA promotion[28]. In addition, strategies also could focus on the other important individual changes, such as self-efficacy, empowerment and reduction of perceived barriers for PA.

On the practice of counselling, the present synthesis reinforces the evidence of two previous syntheses[29,30] and, as in the study of Breckon et al.[31] warns of the need for further efforts about its development and reporting, in theoretical bases, description and modes of operation. We highlight the importance of counselling practices in the extended routine of primary health care, which can also predict the involvement of different health specialists in the activities, who can also apply questionnaires and PA recalls, in order to recognize and discuss the main barriers to the practice of PA and development of educational activities[32].

Telephone support is presented in the literature as an important alternative, not only in relation to PA, but also for healthy eating[33,34]. In order to add to the counselling practices (individual or in group), the present synthesis suggests that the introduction of telephone calls can also be a potential strategy for increasing PA levels in the community setting.

Most of the interventions that presented significant PA levels were implemented during 11 and 12 months. Although other positive effects have been observed in shorter interventions (six and eight months), we suggest that the actions provided for in the research protocols be maintained, favouring the maintenance of the behaviour[35].

Health specialists and CHW have implemented most of the included interventions. Considering their continuous insertion in the communities, CHW represents important actors in primary health care actions and corroborating previous evidence[36], we suggest that the CHW could receive more extensive training and play broader roles in PA promotion actions in the communities.

Most of the included interventions targeted specific samples, such as women, populations with ages over

45 years, lower socioeconomic level populations and physically inactive persons. Although all the included studies were conducted in high-income countries, according to the World Bank classification, a considerable part of the evidence supporting this synthesis has been found in populations living in different situations of vulnerability.

Since the socioeconomic issue is determinant for the PA practice, particularly in leisure time[37,38], we highlight the need for public policies and community strategies that have the purpose of reducing inequities, increasing access and possibilities for PA. Recognizing the importance of the socioeconomic factors, we highlight the need for public policies and community-based strategies aimed at reducing inequity, increasing access and possibilities for PA.

The decision to only include RCT with over six-month interventions and PA assessed by objective methods were to improve comparability between them and to provide evidence that could help future studies, recognizing the high heterogeneity indicated by a previous review[11]. Although the literature points to a minimum period of six months for behavioural changes[10], many interventions were implemented in shorter periods of time than recommended, leaving questions as to whether their positive results were due to the acute effects of these interventions.

Also, we recognize that although objective methods produce measures that are less overestimated than questionnaires, as has already been pointed out, advances are required for motion sensors to become the most complete for PA assessment[39,40]. Thus, it should be pointed out that six studies also used questionnaires to PA assessment, as a support tool to identify type(s) of PA performed, settings and intensity of the activities[16–18,21,23,24].

As main limitations of this review, we highlight that the synthesis does not allow generalizations. Similar to a previous study[11], high heterogeneity among populations, strategies applied in the interventions and methods for PA evaluation were observed, suggesting that all these specificities need to be taken into account in formulation of future community-based strategies for strategies for increasing PA levels.

In conclusion, most of the studies included showed the potential of community-based interventions to increase the number of steps per day. It is important that future studies discuss operational strategies of interventions, such as counselling and home visits.

Conflict of interest

Author's contributions

Guerra PH, conception of central idea of the study, elaboration of systematic searches, assessment of titles/abstracts, full texts and risk of bias, development of the synthesis, analysis of the results and writing of the text; Ribeiro EHC, elaboration of systematic searches, assessment of titles/abstracts, full texts and risk of bias, analysis of results and text review; Lima TR, risk of bias assessment, analysis of results and text review; Andrade DR, analysis of results and text review and Loch MR, analysis of results and text review.

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