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SYNOPSES AND GUIDELINES

Physical activity: a synopsis and comment on "community-wide interventions for increasing physical activity"

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Abstract

In this synopsis, we summarize and comment on Baker and colleagues' Cochrane review of studies on the population-level impact of community-wide physical activity (PA) interventions. Insufficient PA remains a major public health problem. Community-wide interventions offer an opportunity to extend reach by increasing the proportion of the population experiencing the intervention. A previous Cochrane review of community-wide PA interventions concluded that evidence for effectiveness was mixed. Hence, Baker and colleagues incorporated new data about community-based PA interventions. This Cochrane review concluded there is an overall lack of evidence that community-wide interventions improve PA outcomes at the population level. Recommendations are that future research should use high quality research design, more explicitly test ways to increase reach, and utilize objective measurements of PA to increase validity. We suggest that future research should first optimize the intervention by systematically evaluating treatment components and selecting a maximally efficient and effective treatment package.

Keywords

Community-wide interventions, Physical activity, Multi-strategic interventions, Review

Implications:

Researchers: To increase confidence in the validity of evidence about the effectiveness of community-wide physical activity interventions, researchers should continue to improve the research design, reporting, and outcome assessment quality of relevant studies.

Practitioners: Because physical activity has clear health benefits, practitioners should encourage their patients to be active and should support research to evaluate community-wide physical activity interventions.

Policymakers: Policymakers should monitor the findings of research about multi-strategic, community wide interventions and be thoughtful about programs for which they advocate.

INTRODUCTION

This synopsis describes and comments on Baker and colleagues' Cochrane review of community-wide, multi-strategy interventions to increase physical activity [1]. Physical inactivity is prevalent around the globe and is consistently a risk factor for the acquisition of chronic diseases (e.g., type II diabetes) [2, 3]. Since a majority of adults fail to meet recommended PA levels, community-wide intervention strategies appear promising because of their potential to expose a large proportion of the population to PA-facilitating intervention. Increasingly, community-wide interventions use multiple approaches to address a variety of inactivity determinants and to reach disadvantaged sectors of a population [1, 4]. To address the contradictory effectiveness evidence identified in prior reviews, Baker and colleagues proposed a logic model. The model separates community interventions into two phases: (1) community strategy development and planning and (2) implementation action [1]. After locating each study within these phases, the authors assessed level of study bias and intervention effects on the community at hand. The overall objective of the review was to provide information that helps decision-makers, such as community stakeholders and policy makers, to evaluate, select, and implement community-wide PA interventions.

METHODS

Search strategy

To find relevant studies, Baker and colleagues searched a number of databases (e.g., The Cochrane Library, MEDLINE) and reference lists from articles published between January 1995 and January 2014. They also consulted experts. To be included, studies were required to be randomized controlled trials (RCTs), quasi-experimental designs with a control group, interrupted time-series studies, or prospective controlled cohort studies and to have a minimum of

6 months between the start of intervention and outcome assessment [1]. Articles were excluded if intervention was targeted at people who were not representative of the community's characteristics, or if the sample excluded some demographic subgroups or included groups that were not "free living" (e.g., incarcerated, inpatient) [1]. Studies also were excluded if the study did not implement at least two of six strategies that the authors defined as central to "integrated community-wide intervention": social marketing, communication strategies (e.g., websites, flyers), individual counseling regarding physical activity by health professionals, working with organizations (volunteer, governmental, or non-governmental) to encourage PA, working within community settings (e.g., schools, community centers), or environmental change (e.g., creating walking trails) [1]. A final inclusion criterion required all studies to have physical activity as the primary outcome, measured either subjectively or objectively.

Data collection

After screening for inclusion criteria, two reviewers determined where each intervention fit best within the review's two-phase model. They then assessed the studies as having low, medium, high, or unclear risk of bias in each of five domains: selection, performance, attrition, detection, reporting, and "other", and, on that basis, assigned each study an overall risk of bias [1].

To determine whether differences in intervention "intensity" could explain discrepant outcomes, Baker and colleagues characterized each intervention as "high," "medium," "low," or "unclear" intensity depending on the degree to which it engaged community stakeholders and partnerships, incorporated multiple intervention levels (e.g., individual, social, or environmental), had high reach, magnitude, or cost per person, and was considered intensive by the study authors [1].

RESULTS

The authors identified 33 studies addressing 267 total communities that met criteria for inclusion in the review [1, 5]. Almost all of the studies involved partnerships with local governments or non-government organizations (NGOs), but only four employed all six of the strategies that Baker and colleagues identified as characterizing an integrated community PA intervention. The most frequently employed theoretical perspective was the ecological model (9), followed by stages of change (6); a number of studies (11) did not state their theoretical model. Ten interventions were characterized as "high intensity," 14 were of "medium intensity," and 9 were of "low intensity." Low intensity studies were of low cost, achieved limited actual population reach (although intended to target an entire community), or were considered minimally intensive by the original study's authors. Most moderate intensity interventions targeted other behaviors in addition to PA (e.g., smoking, diet).

More studies in the updated review than in its predecessor utilized a randomized design: five RCTs and three cluster randomizations were included, as compared to just one RCT in the original review. Another notable improvement was in studies having low risk of bias: four of the eight studies utilizing randomization were labeled as "low risk," up from zero in the original review. Most studies considered as "high" and "unclear" risk of bias either did not use random assignment to groups, found baseline differences despite randomization, or did not properly operationalize variables [1]. Hence, while documenting some overall improvement in study methodology, the updated review continues to highlight clear methodological flaws in research design and outcome assessment that have hindered studies in this area.

The review concluded that, overall, the interventions did not produce a significant improvement of PA among communities. Only five of the 10 studies with higher intensity treatments reported some increase in PA, but findings were inconsistent. Null results were found in both dichotomously and continuously measured PA and included, but were not limited to no increases in leisure time physical activity, no differential increase in physical activity between experimental and control communities, no changes in the proportion of a population achieving 30 min of MVPA 5 days per week, and no difference between communities in average daily minutes of MVPA as measured by both accelerometry and 4-month recall [1]. Positive changes most likely to be observed included increased use of trails and pathways [6, 9], attendance at walking programs [6], supervised leisure time activity in school-aged adolescents [10] and daily walking [11]. The four high quality studies showed no overall effect of community-PA interventions, although one [6] did observe increased walking.

CONCLUSIONS

Despite the availability of new research on multi-component, community-wide PA interventions, an updated Cochrane review concludes that there remains a lack of evidence that these interventions increase PA at a population level [1]. An encouraging trend noted by the reviewers is that many of the more recent studies [6, 12–14] were of higher quality, involved less bias, increased use of randomization and some use of wearable accelerometers to measure PA more objectively and accurately (as compared to self-report) [6]. However, even these high quality studies did not show that intervention increased PA within their community samples. Common methodological limitations were that some of the studies (10 of the 33) did not incorporate random assignment or a control group, had selection bias due to the use of convenience samples, and used non-validated outcome metrics.

Strengths of the review included the diversity of studies (e.g., conducted worldwide across all incomes),

the use of government or NGO partnerships, and the use of communication strategies, whether through health professionals or mass media. Of interest was the finding that studies conducted in China showed consistently high levels of participation in PA interventions [7, 8]. The authors speculate that the Chinese population, at least at present, might show unusually strong receptivity to community PA interventions. However, the studies conducted in China also had high or unclear bias levels, both generally and also with regard to selection biases; hence, their validity is unclear.

Comment

Despite new research, the updated Cochrane review by Baker and colleagues continues to fail to find evidence that multi-component community-wide PA interventions increase PA. An encouraging trend since the prior Cochrane review is the greater use of RCTs and lower risk of bias evident in newer studies. Continued attention to reducing bias in study design and higher quality research implementation and reporting remains needed, as it holds the potential to increase confidence in the validity of the evidence base to evaluate the effectiveness of community-wide PA. One methodological issue warranting attention is the need to maintain consistency between the specific PA behavior that the intervention targets and the PA outcome that the study assesses. It may be noteworthy that many studies that failed to detect significant intervention effects used broad outcome assessments (e.g., MVPA), whereas positive studies assessed specific behaviors (e.g., walking) that may have been more directly targeted by the study intervention. Researchers need to align their intervention target with their outcome assessment in order to fairly and accurately evaluate the impact of PA intervention.

Also important for quality evaluation is increased use of objective measures of PA. The use of wearable devices (e.g., Actigraph or ActivPAL) that generate validated measures of PA would increase measurement precision and validity. By preventing known sources of error associated with self-reported PA [17], objective activity assessment can enhance researchers' confidence about being able to accurately detect whether an intervention increased PA [15, 16].

Making improvements in research and reporting quality will go a long way toward increasing confidence that the body of research evidence about physical activity intervention reflects meaningful information. Going beyond that to actually increase PA in the population will likely require further enhancements and intervention optimization. Additional work is needed to master how to reach and engage entire communities so that a majority are exposed to PA intervention. Future studies may consider specific methods drawn from community-based participatory research (CBPR) to increase the community's engagement in the intervention, in addition to the six strategies discussed by Baker and colleagues to strengthen community integration. For example, Suminski and colleagues (2009) used CBPR to create a physical activity program for a community by designing the program with actual individuals who would benefit from the intervention. They created a "leadership committee," composed of both research coordinators and community members to shape the intervention. The investigators found the community members' contributions invaluable in explaining community history and providing access to resources [18]. Community members also reached out to local small businesses to consider sponsoring initiatives that would increase the success of the program [18].

Increasing the potency of community PA interventions will benefit from an understanding of which intervention components are most impactful and the mechanism(s) by which they increase PA in the population at large. The application of multi-phase optimization strategies (MOST) adapted from engineering sciences may be helpful for systematically augmenting intervention potency, reach, and efficiency. MOST provides a framework that allows systematic evaluation of treatment components and policies to optimize an intervention so that it is as good as possible before being formally tested in an RCT. The MOST framework is applicable to community level as well individual interventions, particularly because an intervention can be optimized to any criterion. Examples of optimization criteria include requiring that the optimized intervention include no inactive treatment components, or that the final intervention package be implementable for a cost of less than $20 per person, or that it maximize population reach or cost-effectiveness to a pre-specified threshold [19].

For example, consider developing a community PA intervention that aims to increase the proportion of a population meeting public health guidelines for achieving 30 min per day of moderate-vigorous physical activity (MVPA). A MOST approach to creating an efficient intervention might optimize to the criterion of having an intervention that could achieve the maximum percent of adult community residents meeting the PA goal at a cost not to exceed $20 per community member. The optimization strategy might segment the population by randomizing one adult per household to a factorial experiment to test the effectiveness of a number of potential intervention components that vary on cost: e.g., PA guidance directly mailed to household; e-mailed enrollment in an online physical activity support community; provision of a pedometer; home visit from a community activity champion; financial incentive for PA goal attainment. The optimized intervention would involve the package of components that both cost less than $20/person and maximized the proportion of community members who attained at least 30 min of MVPA/day. Studying and optimizing treatment components in such a manner increases the odds of developing engaging and cost-effective intervention strategies to improve public health. We contend that it is premature to

dismiss as unfeasible the goal of intervening to increase community level PA until candidate intervention approaches have been systematically optimized.

Key Question: How effective are community-wide, multi-strategic interventions for improving physical activity at the population level?

Compliance with ethical standards

Conflict of interest: The authors declare that they have no conflicts of interest.

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