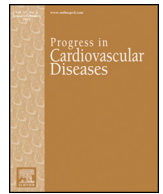




Contents lists available at ScienceDirect

Progress in Cardiovascular Diseases

journal homepage: www.onlinepcd.com



Increasing physical activity in the community setting

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ARTICLE INFO

Keywords:

Exercise
Physical inactivity
Health promotion
Community-based

ABSTRACT

Physical activity (PA) is beneficial for both mental and physical health, yet many individuals do not meet PA recommendations. There are a multitude of approaches to increase levels of PA and the role of the community is one area of growing interest. This review discusses the community environment as well as programs within the community and their influence on PA levels. Despite some research limitations, there are clear factors associated with community-based PA. Strategies that improve the built environment along with community-based programs have shown success, although differences between the characteristics of communities can mean strategies to promote PA are not universally effective. Additional research is needed on effective strategies that can be tailored to the characteristics of the community to increase PA. Further, public health interventions and policies should consider the role of the community when aiming to increase PA levels.

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Introduction

The benefits of physical activity (PA) are well-established. Performing adequate levels of PA is associated with improved physical health and quality of life including decreased risk for early mortality, cardiovascular disease, and some forms of cancer.^{1,2} Evidence also indicates psychiatric and neurological benefits to PA as adequate PA levels are associated with decreased risk for depression and dementia.^{1,2}

Further, PA is the primary factor for improving cardiorespiratory fitness, which is considered a clinical vital sign.^{3,4} Recognizing the importance of PA for health and well-being, PA recommendations for the United States (U.S.) were first published in 1995 by the Centers for Disease Control and Prevention and the American College of Sports Medicine.⁵ Various updates have since been published from a variety of domestic and international organizations. However, despite the well-known PA benefits⁶ and recommendations, PA is still at historically low levels and is the fourth leading risk factor for global mortality.^{7,8}

PA can be categorized into four different domains: 1) occupational; 2) domestic; 3) transportation; and 4) leisure time.⁹ Over the years, technological and societal changes have impacted each of these domains and led to a gradual decline in overall daily PA levels.^{10–12}

Abbreviations: PA, Physical Activity; U.S., United States.
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The degree of change that has taken place can be illustrated by comparing modern society with the Old Order Amish, a traditional agrarian society. The Old Order Amish refrain from using modern technology and live in a way similar to that of the late 1800's with much of their day centered around farming, cutting firewood, and maintaining the household. Amish adults accumulate an average of 48 h/wk. of moderate- to vigorous-intensity PA,¹³ which is substantially greater than the 2.7 h/wk. obtained by adults in modern society with modern technology.¹⁴

The original PA guidelines largely targeted the leisure time domain by promoting exercise.⁵ Although the percentage of American adults participating in exercise/leisure time PA has slightly increased,¹² the PA patterns of the Amish indicate the importance of other domains for further increasing daily levels of PA. Thus, there is clearly a need to explore alternative strategies to promote PA. Other reviews in this Special Edition examine the impact of the workplace and school environment.^{15,16} Another area of growing interest is the role of the community on PA levels. Researchers are beginning to establish that differences in the community, much like those observed between modern and Old Order Amish societies, can have a significant impact on PA.

Communities vary considerably and are constantly evolving. With the industrial revolution, there was a significant influx of individuals living in urban environments. In the U.S. in the mid 1900's, individuals moved out of the cities towards newly constructed suburban communities with lower density developments. These differences and changes to communities have a variety of impacts, many of which can influence determinants of PA such as dependence on motor vehicles, safety, social support networks, and the presence of mixed use developments.^{17,18} There are a number of other community factors that intuitively should impact PA, yet the current body of scientific research is limited. Reviews and meta-analyses on community interventions have identified issues with study designs that lack randomization, different types of biases, inadequate program durations, differences in implementation settings, and concerns surrounding the reliability of PA measures.^{19–22} A central limitation to the research is the small number of studies implementing the gold-standard randomized control trial design. While there have been some randomized control trials,²³ much of this field relies on observational or cross-sectional study designs. Additionally, differences between communities often mean strategies to promote PA are not universally effective. The result of these limitations is that the research on the impact of community interventions is mixed. Nonetheless, there are still clear factors associated with community-based PA and health

organizations have begun to recognize the role of the community for promoting PA.^{24,25} The present paper provides a review of how the community environment and community-based programming can influence PA levels. Some of the limitations and knowledge gaps are discussed as well as future directions for continuing research in this field.

The community environment and PA

Communities are often characterized by their natural and built environments. The natural environment can be defined as those features that are natural to the community such as the weather and topography. The built environment is comprised of the physical man-made structures and includes buildings, parks, road/trail networks, and transportation options within the community.¹⁷ Increasing interest has spurred a growing body of research on how the environment contributes to community PA levels. Although there are limitations to much of the current research, evidence indicates both the natural and built environments can impact the health of individuals and the accumulation of PA (Fig. 1). For example, a review by Chan and Ryan²⁶ highlighted that weather conditions such as wind, temperature, and precipitation can reduce PA levels, with some estimates suggesting impacts on PA of up to 20%. In addition, hilly topography and enjoyable scenery have also been shown to be determinants associated with higher PA.²⁷ While the natural environment is important, humans have a greater ability to alter their built environment and more research has focused on this aspect. Accordingly, the following section will focus primarily on the role of the built environment in promoting PA.

Green space

Green space includes parks, gardens, sports fields, and undeveloped land with natural vegetation. Primarily considered part of the built environment, albeit influenced by the natural environment, this green space is associated with improved markers of health and well-being. Research has shown green space access is associated with improved markers of mental health including lower stress²⁸ and depression.^{29,30} Some research also suggests greater access to green space is associated with lower risk for obesity, although findings on this physical health marker are not consistent.²² Nevertheless, it is well established that higher levels of PA can improve both mental and physical health,¹ thus

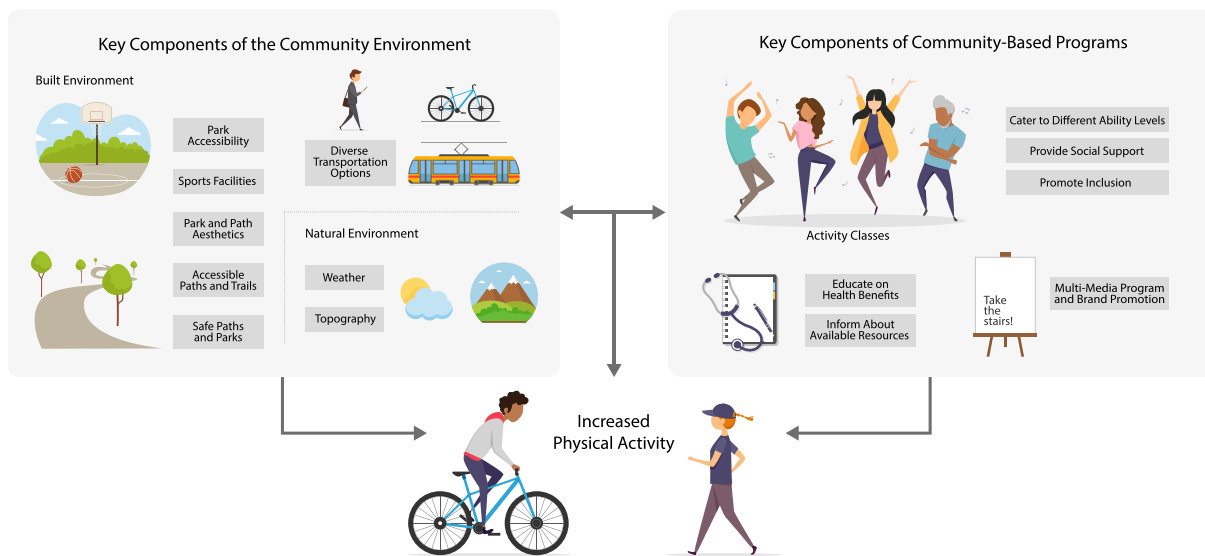


Fig. 1. The community environment as well as community-based programs can support the promotion of physical activity. Key components of the environment and community-based programming are highlighted. Increases to physical activity can come from improvements to the community environment, the implementation of community-based programs, or a synergistic combination of both.

conceptually, many of the positive relationships between green space and health can be attributed to green spaces providing an opportunity for individuals to perform PA.^{27,30} In agreement with this conceptual model, researchers have shown green spaces are associated with increased PA in both children and adults.^{22,31–37} This positive relationship has been found across a variety of green spaces such as parks^{22,31,32,34} and greenway trails.³³ Access to green space, as defined by the distance from the home also plays an important role, with one study finding those who lived within 1 mile of a park had an average of 38% more exercise sessions each week.³⁴ Others have also shown the distance of green space from the home is associated with the frequency of visitation^{29,32,34} indicating the importance of nearby access to green space.

Of note, the availability of green space alone does not ensure increases in PA as there are a variety of factors that can influence PA within green spaces. For example, aesthetics, safety concerns, and features such as sports fields and tracks can impact PA levels.³⁰ Additionally, while traveling to a park may include some PA, the time within a park can involve sedentary pursuits and research has found that this is the most common activity for park visitors.^{30,34} In fact, one study found 66% of park users were sedentary.³⁴ Organized activities could be a way to increase PA within green spaces and parks within the community. Findings indicate organized activities are associated with greater usage of park areas and are therefore a way to potentially increase PA.^{30,34,38} Thus, improved green space access in conjunction with many of the organized community programs described later in this review could help to increase PA at the community level.

Active transportation

A recent American Heart Association Policy Statement recognizes that communities should promote PA through active transportation.³⁹ Active transportation, defined primarily as walking or cycling, is influenced by a variety of built environment factors. The term “walkability” is often used to define how welcoming an area is to walking and generally considers safety, street connectivity, and the density of residential, retail, and public transport facilities. As such, areas with greater walkability are associated with higher rates of PA^{40–42} and lower rates of obesity, diabetes, and hypertension.⁴³ Findings from one study showed that compared to the least walkable neighborhoods, daily moderate to vigorous PA levels in the most walkable neighborhoods were 10–19 min greater across varying adult age ranges.⁴¹ There is also some evidence to indicate the built environment can impact the PA of children.^{41,44,45} For example, communities with greater walkability were associated with an average of 13 min more of self-reported active transportation per day.⁴¹ This relationship between walkability and active transportation in children though, is not always reported^{33,46} and may be due to a number of other factors such as parents’ perceptions of safety.⁴²

Similar to walkability, the built environment also influences the prevalence of cycling.^{33,42,47–50} This is particularly evident when comparing cycling rates between European countries and the U.S. where cycling infrastructure is greatly lacking. One study highlighted that only 1.7% of the U.S. population performs any cycling, which is substantially less than the 14.1% observed in a German population.⁵¹ These differences in active transportation have consequences as illustrated by Bassett and colleagues who showed an inverse relationship between active transport and obesity prevalence across countries.⁵² Recent technological developments and policies also play a role in how the built environment can impact cycling. Bike share programs are an excellent example of technological advances and involve short-term access to a bicycle that can be used for transportation trips. A bike share program increases opportunities for cycling with research indicating that on average, 60% of bike share trips are used in place of other sedentary transportation options.⁵³ Electrically assisted bicycles (“e-bikes”) are another relatively recent technological advancement that can be used to

overcome some of the common barriers associated with active transportation as they provide modest electric motor assistance when the rider is pedaling. E-bikes can help individuals meet PA recommendations⁵⁴ and a recent review indicated that individuals with an e-bike replaced 20–86% of car journeys with riding an e-bike.⁵⁵ However, due to safety concerns, a number of communities have policies that limit the use of e-bikes on established cycling infrastructure. These policies reduce opportunities for PA promotion within the community yet some evidence indicates e-bikes do not present a greater safety risk than traditional bicycles.⁵⁴

While the uptake of active transportation is influenced by the built environment, increasing PA in the community setting through active transportation requires multiple interconnected strategies.^{35,39,42} For one, within the U.S. it is more dangerous to walk or ride a bicycle than to drive a car.⁵⁰ Aspects of the built environment such as sidewalks and protected bicycle lanes can improve safety yet increased enforcement of traffic laws or alterations to traffic laws that lower speed limits are also effective at increasing the prevalence of active transportation.^{39,42,48,56,57} Further, programs that educate and encourage active transportation can be effective for both children and adults.^{39,48,58,59} For example, a 71% relative increase in the proportion of students walking or cycling to school has been reported with “Safe Routes to School”,⁵⁹ which encourages active transportation to school through education, infrastructure improvements, and increased traffic enforcement. Combining different transportation models can also be effective for increasing PA levels. The use of public transportation requires users to walk short distances and is therefore associated with increased transportation-related PA^{37,42,60} as well as meeting PA recommendations.⁶¹ Accordingly, projects that concurrently target policies, programs, and the built environment have been shown to have a greater impact on the levels of active transportation in a community.⁴⁸ Changes that promote active transportation are also often associated with increases in leisure time PA,³⁶ thus further increasing overall PA levels within the community.

Community-based PA programming

Community-based PA programming is appealing as a means to increase PA levels because these programs can address a number of different determinants and barriers to PA. Additionally, community-based programs can be implemented to target all of the domains of PA and can occur in a number of different settings including parks, workplaces, and places of worship.¹⁸ Programs typically incorporate multiple components and can be administered in a variety of ways with the goal of increasing PA levels across the local population (Fig. 1). Some observational or cross-sectional research indicates community-based programs can effectively increase PA levels. Reviews of randomized control trials are mixed with one suggesting there is not enough evidence that programs increase PA¹⁹ and another suggesting increases in PA that were sustained for at least 3 years.²³ Nonetheless, community-based programming and campaigns are an essential part of the World Health Organization’s Action Plan to promote PA and improve global health.²⁴ The following section discusses important components associated with programs and some of the common techniques utilized to administer programs.

Components of community-based programs

To increase PA levels, community-based programs often incorporate a number of common components. One of the primary components and a defining characteristic of community-based programs is the focus on social networks. Programs that build social elements address a number of commonly cited determinants of PA.^{18,27} Social support systems reduce concerns related to safety⁴² and can help with the motivational aspects to maintain or begin increasing PA levels.^{42,62} When participants develop a sense of accountability with each other, beneficial PA patterns

can be reinforced and sustained.^{42,62,63} The importance of accountability is highlighted in **Box 1** with FitFam and the November Project™, both originally founded by individuals wanting a buddy system to help them stay active through winter months. The social elements of programs can also address the social needs of participants. A finding from a study on parkrun (**Box 1**) showed that social-level factors were a significant predictor for why individuals chose to participate in the community-based run/walk program.⁶⁴

Another important component of community-based programs is the goal of increasing PA across the population. In practice, this means many programs typically involve activities for different ability/fitness levels and are free for participants (see **Box 1** for examples such as FitFam, the November Project™, and 3 WINS Fitness). Programs that offer options to a variety of ability levels allow for different personal goals from participants, which may contribute to better results.²¹ Catering to underserved populations or a range of ability levels also promotes inclusion and can expand the reach of programs (e.g. 3 WINS Fitness). This helps to overcome some of the challenges associated with increasing PA in underserved populations⁶⁵ and therefore increases PA across the entire population of a community. Programs that do not require payment can further expand the ability to increase PA across the population and may help reduce health disparities.⁶²

A key component of many community-based programs is also education. Some barriers associated with participating in PA revolve around a lack of knowledge and include concerns about appropriate amounts of PA as well as how to use exercise equipment.⁶⁶ To overcome these barriers, programs can provide resources regarding how to perform PA safely and appropriately.⁴² Programs can also raise awareness about opportunities or environmental features/facilities within the community to increase PA.⁴² This information can be provided in written form or many in-person programs utilize parks, hiking trails, and/or exercise facilities within the community to demonstrate available resources (e.g., FitFam, the November Project™, and 3 WINS Fitness [**Box 1**]). Educating individuals on the health benefits associated with PA is another strategy that can be employed to increase PA levels⁴² and can help change social norms that promote inactivity.¹⁸ Community programs with a significant focus on education include “Bike-to-Work Days” and the Healthy Lifestyle Center Muncie (**Box 1**).

Implementing community-based programs

There are a number of different methods for implementing or promoting community-based programs. One method of implementation is through the use of mass media, which alone includes various forms. Point-of-decision prompts are a simple form of mass media that involve the use of signs to alter behavior. To promote PA, signs typically include educational messages about the benefits of PA as well as motivational messaging to promote PA.⁴² These point-of-decision prompts have effectively been used to increase stair usage in a number of different environments^{42,62} with one study showing a 6% increase in the use of stairs in a shopping mall setting.⁶⁷ Other forms of mass media such as internet, television, and print are also valuable tools for implementing community-based programming. These forms of mass media provide an opportunity to inform individuals about the intentions of a program as well as provide a platform to educate individuals about the importance of PA.⁶⁸ Additionally, mass media can help a program build a brand and a following, which are important considerations for creating successful and sustainable programs.⁴² Many of the programs highlighted in **Box 1** have incorporated mass media through a strong online presence and this has contributed to their growth and reach across the community.

Along with mass media, another important tool for implementing community-based programs is engaging the community in-person. This engagement can take place at meetings within schools or places of worship, at community events, and during general canvassing within the community. For programs that target the leisure time domain of PA

Box 1

Community-based programs take many different forms and target different physical activity domains. As highlighted in the examples below, these programs are often free, involve a strong online presence, promote inclusion, are available for all ability/fitness levels, and build a strong sense of community. Although some of these programs have not been objectively evaluated, subjective reports suggest promising outcomes with people participating on a regular basis and programs increasing their reach outside of their original communities.

- Started in 2015, FitFam (<https://www.wefitfam.com>) is a program that originated as a group of community members wanting to stay active through the winter in Shanghai, China. The program has since grown to multiple cities worldwide and offers over 50 weekly events including high-intensity interval training, running, yoga, and fitness boxing. Community volunteers lead the free events and participants are not required to have any previous experience or exercise equipment.
- Founded in 2004 in Teddington, UK, parkrun (<https://www.parkrun.com/>) is a program that hosts free 5 km and 2 km events for participants to walk, jog, or run. Events are now held weekly by local volunteers in 20 countries around the world. The program promotes inclusiveness, wellbeing, and social connections within the community. Research has been conducted on parkrun with 371 participants in Australia surveyed.⁶⁴ Results showed that the program was able to attract groups that are typically hard to engage, as participants were predominantly women (58%), 35–53 years old (54%), and occasional or non-walkers/runners (53%). Forty-four percent were also reported to be overweight or obese. Of note, social-level factors were an important reason for participation.
- November Project™ (<https://november-project.com/>) is another program initially started with the goal of helping members maintain fitness through the winter months. The program began in Boston, MA and has since evolved into a nonprofit organization (501(c)(3) organization) with more than 50 worldwide locations. Similar to FitFam, November Project™ is offered for free, promotes the inclusion of various fitness/ability levels, and does not require participants to have any exercise equipment.
- The 3 WINS Fitness program (<https://3winsfitness.com/>) was created in 2011 with a partnership between 5 California State universities and George Washington University in Washington DC. The originating university, California State University, Northridge now has 6 locations (5 in public parks) serving over 300 participants (88% Latinx and 83% overweight or obese). The free program is delivered by kinesiology students from local universities and is intended to reach underserved communities (e.g. Latinx community) as well as various fitness and ability levels. Research has demonstrated that the program more than doubles the number of visitors in a park as well as increases the physical activity performed in the park.^{38,74}
- “Bike-to-Work Days” are part of National Bike Month established by the League of American Bicyclists in 1956 (<https://www.bikeleague.org/>). Throughout National Bike Month and culminating in a Bike-to-Work Day, various free educational and motivational materials are distributed to promote cycling as a form of active transportation. Although originally started by the League of American Bicyclists, different organizations and advocacy groups around the world now lead many of the community events. Research

conducted on “Bike-to-Work Days” has shown these programs are effective at increasing the number of individuals cycling for transportation with cycling counts increasing by 25% in the month following the event.⁴⁸

- The Healthy Lifestyle Center Muncie (<https://www.hlcmuncie.com/>) was created in 2017 in Muncie, IN with the goal of improving health and well-being in the community. This program focuses on educating the community about the importance of lifestyle for health by providing free resources and interactive workshops. Additionally, they provide personalized consultations to help individuals increase physical activity levels and make other beneficial lifestyle changes. This community-based program is delivered by an interprofessional team of healthcare students at Ball State University, with faculty supervision.

(e.g., FitFam, parkrun, the November Project™, 3 WINS Fitness [Box 1]), in-person classes or activities are the primary component of the program and are where participants increase PA. Other programs that do not involve classes and are instead more focused on education (e.g. “Bike-to-Work Days” and the Healthy Lifestyle Center Muncie) also benefit from in-person engagement. Promotional activities at community events can further increase knowledge about program messages and may lead to a greater increase in PA levels.⁶⁸ Importantly, the impact of a program can be higher when the program is brought to the community rather than requiring community residents to travel to a different location.

Opportunities moving forward

Projects that modify the built environment of a community or implement community-based PA programs can be time consuming and costly. As such, supportive governmental and organizational policies are needed as they often provide the necessary funding and assistance for these interventions. Some national and international organizations have created recommendations and plans that promote community interventions^{24,25,39} and a separate review in this Special Edition discusses other public health policies for promoting PA.⁶⁹ Additional policies though, can help to further community changes that will lead to improvements in PA. An important consideration for these future policies is that community interventions have differential effects on individuals and the communities in which they reside.^{21,42,58} As such, it is important to have the community involved with developing policy decisions to maximize the beneficial impact on community PA levels.⁵⁸ Furthermore, multiple changes to the community (e.g., building a park combined with community-based programming) often have a greater impact than single changes and this should be reflected in future policies.⁶²

Future research is needed to facilitate and guide the development of future policies. As discussed earlier though, current research on community-based interventions has limitations primarily related to study designs. Studies are often constrained to observational or cross-sectional designs due to the difficulty of conducting the traditional gold-standard research study, the randomized control trial. However, other study designs can still be beneficial, can address current gaps in knowledge, and should be implemented by future researchers.⁷⁰

The sustainability of community interventions is another concern and topic for future research, primarily related to community-based programming. The costs associated with maintaining a PA program can limit the sustainability. Further, as discussed by Reis and colleagues,⁷¹ programs need to become embedded within the community to ensure sustainability. Novel partnerships and opportunities can address these concerns. The 3 WINS Fitness program and Healthy Lifestyle Center Muncie (Box 1) exemplify promising approaches to provide

community-based PA programming by partnering with local universities to have faculty and students deliver programs. Acknowledged as being essential for increasing population PA levels,⁷² these university faculty and students provide a significant resource of educated and trained individuals with expertise in PA to support or lead the PA programming in communities. In return, university faculty meet requirements to provide service and students obtain practical work experiences. For the 3 WINS Fitness program, these partnerships and scaling strategies have allowed it to become sustained without external funding. In addition, both programs have become increasingly embedded within the community as the programs and services do not require significant travel and instead are performed in the communities where participants reside. With an increased popularity of university exercise science programs and over 28,000 bachelor's degrees in exercise science awarded in the U.S. in 2016–2017,⁷³ this model could be implemented in a number of other communities to increase PA.

Summary

As highlighted in this review and summarized in Fig. 1, evidence indicates the community can influence PA levels. Aspects of the built environment, such as green spaces, have been shown to be positively associated with PA. In addition, various programs within the community have found increases in PA and there are numerous opportunities for future programs to build off of the successes of previous or current work. Some evidence also indicates or suggests projects that combine changes to the built environment along with programs that promote PA are the most effective at increasing PA in the community. It is also important to acknowledge that there is individual variability between communities and different community-level approaches are needed to increase PA across the population.

Further research is needed to better understand the impact of the community on PA. There are a variety of limitations to the current research and a difficulty associated with conducting research in this field is that it does not lend itself towards the randomized controlled trial, the classic gold standard study design. Recognizing these limitations and designing future research that addresses these issues will be important for better understanding how the community impacts PA levels. This will allow governments, organizations, community members, and all interested parties to design better interventions to help increase PA levels and therefore improve health.

Declaration of Competing Interest

None.

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