What are successful recruitment and retention strategies for underserved populations? Examining physical activity interventions in primary care and community settings

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Abstract

The purposes of this review are to (1) describe recruitment and retention strategies for physical activity interventions focusing on underserved populations and (2) identify successful strategies which show the most promise for “best practices” recommendations to guide future research. The method used was systematic review. Data on recruitment and retention strategies were abstracted and analyzed according to participant characteristics, types of strategies used, and effectiveness using an ecological framework. Thirty-eight studies were identified. Populations included African American ($n=25$), Hispanic ($n=8$), or Asian ($n=3$) groups. Successful recruitment strategies consisted of partnering with respected community stakeholders and organizations, well-trained study staff ethnically, linguistically, and culturally matched to the population of interest, and use of multiple advertising channels. Successful retention strategies included efficient administrative tracking of participants, persistence, skillful teamwork, and demonstrating a positive, caring attitude towards participants. Promising recruitment and retention strategies correspond to all levels of ecological influence: individual, interpersonal, organizational, and societal.

Keywords

Recruitment, Retention, Underserved groups, Physical activity

BACKGROUND

With the passage of the Patient Protection and Affordable Health Care for America (PPACA) Act in March 2010 [1], the affordability and accessibility of the US health care system is expanding to include millions of individuals and their families. Despite many politically contentious aspects about how PPACA will be implemented, provisions of the law strengthen the primary care system and community health centers, particularly those providing care to underserved groups, through its mandate to “...promote preventive health care at all ages and improve public health activities

Implications

Practice: Effectiveness of recruitment and retention should be more systematically and explicitly reported to inform sustainability, reach, and clinical relevance of programs.

Policy: Research funding for interventions with underserved groups should support the personnel time, training and development required for meaningful formative research and recruitment and retention strategies.

Research: Given the importance of having ethnically- and linguistically-matched study leadership and staff, there should be resources directed to expand the research workforce at all levels to be more representative of underserved groups.

that help Americans live healthy lives...” [1]. PPACA also provides grants to states to provide Medicaid enrollees with incentives to participate in comprehensive health lifestyle programs and meet certain health behavior targets [2].

Recent data suggest that behavioral risk factors account for a greater portion of disparities than was previously thought [3]. The continuum of translational research, while initially conceived of as T0, (identification of problem and research opportunity), T1 (discovery or foundational research), and T2 (health application/efficacy research), has more recently grown to include T3 (moving evidence-based guidelines into health practice through implementation research) and T4 (evaluation of health outcomes on real-world, population health practice) [4, 5]. There is a critical need for data derived from T3 and T4 research, i.e., “real world” behavioral change research focused on underserved groups. One of the foremost challenges confronted by T3 and T4 research conducted with underserved populations is successful recruitment and retention of study participants.

Primary care settings offer great potential for successful recruitment and retention of underserved and underrepresented individuals and lower socioeconomic groups in health promotion research since primary care offers a trusted source of continuity across an individual's lifespan and often serves entire families or generations. Safety net clinics and community health centers hold promise for reducing disparities because they provide the largest proportion of primary health care services to medically underserved and vulnerable populations [6]. Since primary care providers are on the front lines of managing medical complications related to inadequate physical activity [7], there is more than ever an urgent need to accelerate the translation of health promotion research into community-based and primary care settings.

It is well documented that underserved groups, defined herein as members of ethnic or racial minority groups or persons with low income, are less likely to have sufficient physical activity according to recommended guidelines [8, 9] and are more likely to suffer a greater burden of disease related to inadequate physical activity [10–12]. Historically, underserved groups have not been well represented in clinical trials to promote physical activity; however, this appears to be changing due to recent interventions more inclusive with respect to ethnic and socioeconomic diversity [13–16]. Involving communities and coalitions from the inception of research, mobilizing social networks, and targeting culturally appropriate messages and messengers all appear to be important characteristics of ethnically inclusive studies [17].

Despite recent progress made in physical activity interventions focused on underserved groups, many challenges related to implementation and sustainability remain [18]. Effective translation of research results to clinical practice depends on successful implementation and sustainability. In particular, recruitment and attrition difficulties are frequently cited challenges, and calls have been made for future research to focus on adequate recruitment and retention in order to foster sustainability and reach [15, 18–20]. Retention is often thought to reflect the percentage of participants that are retained for post-intervention assessments, not necessarily the actual intervention. Yet, for an intervention to be sustainable, maximizing participation in the intervention is the key. Strategies may differ for optimizing retention for a study assessment versus participation for an intervention's sustainability. In this paper, we define successful recruitment as activities or strategies which yield the goal number of participants, ideally within a specified time frame. We considered successful retention to be strategies or activities which effectively kept participants in the study in sufficient numbers for planned analyses. Therefore, the goals of this paper are to: (1) describe the range of recruitment and retention strategies used in

physical activity intervention trials focused on underserved populations in primary care and/or community settings and (2) identify successful strategies which show promise for “best practices” recommendations to guide future research. Because of conceptual and actual overlap between community-based studies that explicitly or implicitly incorporate a primary care medical setting, or vice versa, we chose to include both primary care and other community settings in this review. For example, community-based interventions may potentially affect discussions between targeted patients and their primary care physicians. Similarly, interventions focusing on primary care often involve referral to community resources. Given the recent health care reform in the US with the anticipated expansion of primary care and emphasis on preventive health care, a secondary goal was to describe recruitment and retention strategies for any primary care-based interventions identified.

METHODS

The primary author conducted a systematic review of the literature involving US-based trials to promote physical activity and which focused exclusively on an underserved population. Three individuals (the primary author and two medical librarians) developed the search strategy. The primary author and a medical librarian next independently searched the literature using the same key words and MeSH terms. The inclusion criteria for the literature review were that the study/paper (1) focused on recruitment and/or retention as the main topic (specifically, provided descriptions of the recruitment/retention methods, results, and discussion of their effectiveness, typically in three or more paragraphs throughout the paper), (2) occurred in a US population, (3) was published in an English-language journal, (4) had physical activity as an outcome measure, (5) had either a randomized or quasi-experimental design, and (6) focused exclusively or predominantly (>75%) on underserved participants. Studies could include adults and/or children. Studies that did not describe the pre-defined underserved groups in the abstract or text were excluded.

The following databases were searched for studies published between 1998 and 2010: Ovid/Medline, HealthSTAR, CINAHL, PsycINFO, PubMed, Cochrane, and HealthSTAR. Additionally, we completed citation and bibliographic searches of retrieved articles' reference lists. We also contacted experts in the field of physical activity counseling interventions in an effort to obtain other relevant data. The primary author and the medical librarian conducted their searches independently; however, all search strategies were explicitly developed, executed, revised, saved, and compared together. The search terms (key words) are shown in Appendix 1.

The primary author reviewed titles and abstracts of all potentially relevant articles to determine if they met eligibility criteria for inclusion. For retrieved articles which met the inclusion criteria, the evaluation and abstraction of data for each study's content were organized as follows: demographic information, recruitment and/or retention activities described, outcomes measured (e.g., whether recruitment and retention goals met and how measured), and results reported. We used previously published criteria for reporting recruitment and retention results [21]. Using these pre-defined criteria, data were extracted from each eligible article and organized into a table.

Since the literature tends to describe underserved populations as "hard-to-reach" with many types of barriers to recruitment and retention, we organized successful recruitment and retention strategies according to multiple levels of ecological influence [22]. The ecological framework integrates skills and choices of individuals with services and support they receive from family, community, organizations, culture, and physical and policy environments [23]. For health promotion research focused on underserved populations, literature has highlighted the importance of the various ecological levels. For example, individual factors, the role of family and community, organizations, and the built environment [24–27], all are associated with physical activity in underserved groups. Therefore, we chose an ecological approach as a framework to organize our findings about recruitment and retention for physical activity trials for underserved groups. By providing a broad unifying framework, we developed an empirically informed set of recommendations for "best practice" to guide recruitment and retention efforts.

RESULTS

General findings—The search was completed in June 2010. The primary search team retrieved a total of 996 titles using our key words listed above. Thirty-eight studies met the inclusion criteria. Reasons for exclusion included that the abstract was not topic related to physical activity ($n=490$); was a descriptive paper, review, or essay ($n=322$); was not a US or underserved population ($n=77$); or had insufficient data on recruitment and/or retention ($n=69$).

Intervention characteristics—Interventions most commonly were group-based classes; also included were promotion of walking [28–34], individual, home-based lifestyle physical activity (physical activity type not specified) [35, 36], and mixed/multiple types of activity [33, 37–39]. The majority of interventions were either neighborhood- or community-based ($n=11$) or at community/cultural or recreation centers ($n=9$). Other intervention venues consisted of churches [33, 40–43], primary care clinics [29, 38, 44, 45], home-based [30, 36], health clubs [46–48], and schools [35, 49–53]. Persons

delivering the intervention varied; the interventionists' training and background experience were inconsistently described.

Study population characteristics—Of the 38 studies, most ($n=25$) focused on African American participants. Eight studies [29, 38, 48, 54–58] reported on Hispanic participants as all or part (50% or greater) of their study population of interest. Two studies purposively recruited a combination of Hispanic and African American participants [54, 56]. Three studies [39, 59, 60] focused on Asian populations, and two studies [37, 61, 62] had mixed/multiple ethnicities represented. The majority of interventions were for adults ($n=26$), with fewer numbers of studies describing recruitment or retention strategies for children ($n=6$) or family/parent-child dyads ($n=3$). Most studies ($n=27$) focused on urban populations, with smaller numbers of rural [29, 37, 44] or mixed [28, 55, 63] study environments. While all of the studies reported data on participants' ethnicity and/or racial background fairly consistently, income and educational level of participants were reported in differing ways. In the majority of cases, specific data were reported for educational level ($n=25$), income ($n=20$), or income via indirect measures such as receipt of public assistance, neighborhood- or area-based socioeconomic data as proxies for participants' educational or income levels ($n=8$).

Types of recruitment and retention methods used—All studies reported multiple recruitment methods, and all studies described specific partnerships that were formed between the research team and community organizations. All studies emphasized the importance of having the research team members ethnically and/or linguistically matched to the study population as much as possible. Most studies stated that the recruitment strategies and materials were developed collaboratively with the partnering community organization and/or community advisory board; however, the level of detail describing how they accomplished this varied.

The most common recruitment methods consisted of targeted advertisements (newspapers, television, radio, posters), targeted mailings and/or telephone calls via use of phone lists from organizations, direct neighborhood canvassing (street outreach, visits or presentations to neighborhood businesses or organizations, or door-to-door recruitment to homes), and community or health fair presentations. There were several examples of innovative recruitment methods: social marketing via direct mailings from a magazine subscription list [46, 47], pay stub advertisements [61], development of a DVD or audio materials for study promotion to lower literacy groups, use of charismatic, respected community or youth leaders to directly appeal [28, 37], timing or linking recruitment to a cultural tradition [59], storytelling [28], and carefully planning culturally tailored, interactive pre-intervention/informational sessions [28]. For example, Banks-Wallace and colleagues developed an in-depth pre-intervention recruitment

session for African American women which incorporated an adaptation of an African American folktale affirming the importance of culture and women working together to improve health. The story's theme was woven into the description of study goals and procedures and allowed the researchers to complete their recruitment efficiently. For those studies that reported on it, social networking/word-of-mouth was a very effective means of recruitment [30, 46, 47, 54, 64].

Retention methods were described by 28 of the 38 studies; the other studies that did not report on retention explicitly stated that their purpose was to describe only recruitment issues. As with recruitment, all studies had multiple retention strategies; retention strategies were usually described in much less depth, however. The studies with the highest retention rates emphasized the importance of *formative research* and *ongoing process evaluation* that they conducted to specifically maintain or enhance retention via a carefully designed, well-developed, appealing intervention [7, 30, 37, 38, 43, 45, 49, 50, 53, 55, 56, 58, 65].

Retention techniques were described as administrative and/or interpersonal strategies. Common *administrative retention strategies* were to obtain multiple alternate contact numbers for participants [37, 53, 64], make multiple (10–20) contacts with participants during the study period [31, 38, 39, 45, 53, 54, 57], and maintain detailed databases and tracking registries for participants [29, 37, 59]. Providing financial or other incentives, transportation, or childcare were also commonly mentioned [29, 37–40, 42, 43, 45, 46, 48–50, 54–59, 63, 64].

Among the *interpersonal strategies* described for retention were for the study team to be persistent [54], have a positive, caring attitude towards participants [28, 29, 36, 38, 59], demonstrate cultural sensitivity and respect for participants' life situations [28, 29, 36, 45, 49, 50, 56–60, 65, 66], meet regularly with community advisors and study staff for problem solving [34], and be flexible or accommodating to location and timing of study visits as much as possible [28, 29, 34, 36–38, 40, 59, 60].

Twenty-three of the 28 studies describing retention emphasized the importance of having bicultural, bilingual, and/or ethnically matched study team members as a key retention strategy [28, 29, 33–36, 38, 42, 43, 45–47, 49, 50, 54, 56–60, 63–66]. Beyond simply hiring bicultural, bilingual, or ethnically matched individuals to be on the study teams, studies also tended to have ethnically matched leadership influencing the questions framed and study design chosen [67]. Research leaders and staff also co-developed the specific retention strategies, the day-to-day monitoring of them, and problem-solving in culturally appropriate ways where applicable. For example, one study described how African American research team members affirmed potential participants' concerns about research based on the participants' prior experiences which had made them wary or mistrustful of the health

care system. The research team's affirmation helped them to retain participants [28]. Another study improved retention by timing the exercise intervention to occur after the Chinese New Year celebrations to accommodate family obligations and plans, and by using a well-qualified, charismatic Tai Chi instructor well-known to the local community [59]. All studies mentioned the importance of having study staff with strong interpersonal qualities and well trained in the protocol and procedures of the study.

Effectiveness of recruitment and retention methods used—Overall, 21 studies specified and met or exceeded their goal for recruiting their targeted number of participants. Seven of the 21 studies specified and met their goal for targeted timeline for recruitment. For retention, of the 28 studies that reported on retention, the retention rate ranged from 30% to 100%. Retention outcomes varied; they were typically defined as the percentage of those initially randomized and enrolled who completed post-intervention data collection. Duration of retention varied, ranging from 8 weeks to 5 years. The most frequent duration was 12 months ($n=13$) with most studies ($n=31$) 12 months or less. Table 1 summarizes the initial contacts, individuals eligible and screened, along with recruitment and retention rates (Table 2), for all studies with available information.

Studies reported on *why* recruitment or retention was effective—or ineffective—using many different methodologies. Some studies used qualitative techniques such as participant or researcher observations [28, 45, 59, 63], focus groups [43, 48, 68, 69], and participant interviews or surveys. Others used quantitative techniques such as analyzing tracking and enrollment registries according to recruitment strategy [46, 47, 49]. Others described mixed method approaches such as a process evaluation [53]. The studies with the highest retention rates had extensive formative research and prior experience with their community (or communities) of interest, used community input to develop the intervention carefully, had leadership and/or team members who were ethnically or linguistically matched to participants, and emphasized respect, caring, and frequent communication with participants. In some studies, it was difficult to discern whether goals for recruitment and retention had been set or met because this information was not always reported. Closely related constructs to retention—such as measures of participation or engagement [70] (i.e., attendance rates at intervention sessions)—were reported less frequently. When reported these rates tended to be much lower than overall study retention; that is, participants had lower rates of attending all intervention sessions but did complete follow-up assessments.

Primary care-based studies—Of the five primary care-based studies [29, 38, 42, 44, 45], recruitment and retention goals were variably described and not consistently met. Study samples ranged from 15 to 266 participants. Recruitment strategies mostly

Table 1 | Description of identified studies (n=38)

Author	Sample	Design/Intervention	Duration
Primary Care Settings			
Eakin et al. [88]	Latino adults; Primary care clinic in metropolitan Denver (n=200)	Two-group RCT of dietary and physical activity intervention	6 months
Martyn-Nemeth et al. [45]	Mexican-American adults in community-based clinic in Illinois (n=19)	Single-group pre/post-design of a culturally adapted exercise program for diabetic adults	6 months
Parra-Medina et al. [29]	Adult diabetics in rural, underserved counties in South Carolina (n=189)	Three-group community translation trial of two weight management interventions compared to usual care	12 months
Parra-Medina et al. [44]	African American women in community clinics in South Carolina	Two-group RCT to improve physical activity and dietary fat consumption	12 months
Paschal et al. [42]	African American adults in urban low-income area in Wichita, KS (n=134)	Single-group pre/post-design of a group-based health education and fitness program to improve blood pressure	9 months
Community Settings			
Banks-Wallace et al. [28]	African American women, community-based setting in mid-Missouri (n=21)	Single-group pre/post-design to promote walking	12 months
Beech et al. [66]	African American girls and their caregivers; YMCA and community center in Memphis, TN (n=60)	Three-group RCT to prevent excess weight gain	12 week
Chang [62]	African American and white mothers; the Special Supplemental Nutrition program for Women, Infants, and Children (WIC) in southern Michigan (n=129)	Two-group RCT of a healthy eating, physical activity and stress reduction intervention	10 weeks
Chen et al. [60]	Chinese American children and their mothers; Chinese language centers in San Francisco Bay area (n=67)	Two-group RCT to promote healthy weight and lifestyles	8 months
Chiang and Sun [39]	Chinese American adults; community centers in Massachusetts (n=128)	Two-group pre/post-design of a walking program	8 weeks
Escobar-Chaves [54]	African American and Latina women; Metropolitan Houston (n=260)	Two-group pre/post-design of a group exercise and walking intervention	8 weeks
Fitzgibbon et al. [35]	African American families in Chicago (n=734 for both studies)	Design: (1) "Hip Hop for Health" was a two-group RCT aimed at dietary fat reduction and increased physical activity. (2) The Fat Reduction Intervention Trial in African Americans (FRITAA) was a two-group RCT to reduce fat intake.	4 years (1) and 5 years (2)
Frierson et al. [61]	Adults; Metropolitan Houston (n=1,245)	Two-group RCT of efficacy intervention to promote walking	8 weeks
Gaston et al. [63]	African American women; 11 varied sites in Illinois, Washington, Florida, Maryland (n=134)	Multiple-group (ten intervention groups and two comparison groups) pre/post-design of diet and exercise intervention	12 months
Harralson et al. [48]	Latina adults; Latino-owned gym in Philadelphia neighborhood (n=225)	Single-group pre/post-design of a combined educational/exercise intervention	1 year
Hines-Martin et al. [34]	African American women; neighborhoods in Louisville KY (n=51)	Single-group pre/post-design to promote physical activity	6 months
Hovell et al. [57]	Latina adults; low-income community setting in North San Diego (n=251)	Two-group RCT of group exercise intervention compared to safety educational intervention	6 months
Keller et al. [31, 56, 57]	African American and Latina women; community settings in Texas (n=47)	Two single groups, pre/post-designs of walking interventions	N/R
Merriam et al. [55]	Population: Caribbean-origin urban Latino adults; community and cultural centers in Lawrence, MA (n=312)	Two-group RCT of usual care vs. intervention (locally adapted DPP) to promote lifestyle behavior change	1 year
Pekmezi et al. [58]	Latinas with low income; university-based research setting in Providence, RI (n=93)	Two-group RCT to promote physical activity	6 months
Prohaska et al. [40, 89]	African American adults; church-based settings in Chicago (n=123)	Single-group pre/post-design of a group-based exercise program	4 months

Table 1 | (continued)

Author	Sample	Design/Intervention	Duration
Resnicow et al. [43]	African American girls ages 12–16; Atlanta metropolitan area churches (<i>n</i> =137)	Two-group RCT of obesity intervention	1 year
Resnicow et al. [68]	African American adolescents; public housing developments (<i>n</i> =57)	Single-group pre/post-design of a physical activity/nutrition intervention	6 months
Resnicow et al. [69, 79]	African American adults; African American churches in Atlanta metropolitan area (<i>n</i> =1,056)	Three-group RCT with churches (<i>n</i> =16) as unit of randomization; intervention was to increase fruit and vegetable consumption and physical activity	1 year
Robinson et al. [65]	African American girls; after-school programs in Oakland and East Palo Alto, CA (<i>n</i> =61)	Two-group RCT to reduce TV and weight gain	12 weeks
Robinson et al. [90]	African American girls and their caregivers; after-school programs in Oakland, CA (<i>n</i> =261)	Two-group RCT to reduce weight gain	2 years
Rucker-Whitaker et al. [33]	African American women; churches and senior centers in Chicago (<i>n</i> =46)	Single-group pre/post-structured self-management intervention	6 weeks
Sharp et al. [64]	Adult Black women; university campus in Chicago (<i>n</i> =213)	RCT of culturally adapted intervention followed by weight loss maintenance intervention	6 months
Staffileno and Coke [36, 38]	African American women in Chicago (<i>n</i> =23)	Randomized, parallel group, single-blind trial to promote individualized lifestyle activity	8 weeks
Story et al. [50, 65]	African American girls 8–10 years old	Multi-center research program (GEMS) with centers in Houston, TX; Memphis, TN; Minneapolis, MN; and Palo Alto, CA	12 weeks
Story et al. [49]	African American girls; after-school program in Minneapolis, MN (<i>n</i> =54)	Two-group RCT to promote healthy eating and physical activity	12 weeks
Taylor-Piliae et al. [59]	Adult Chinese immigrants; community center in San Francisco (<i>n</i> =39)	Single-group pre/post-design to improve physical, psychosocial functioning	12 weeks
Wilbur et al. [31]	African American women; neighborhoods in Chicago (<i>n</i> =281)	Pre/post-design of a home-based walking intervention	12 months
Wilbur J. et al [30]	African American women in Chicago (<i>n</i> =281)	Two-group pre/post-design to promote home-based walking	48 weeks
Wilson et al. [53]	6th grade students; 24 middle schools in South Carolina (<i>n</i> =1,422)	Group-randomized cohort design (three intervention and three comparison schools) to promote healthy eating and physical activity	4 years
Yancey et al. [46]	Same as above	Same as above	Same as above
Yancey et al. [47, 65]	African American women; Black-owned community health club in Los Angeles	Two-group RCT of a diet/exercise intervention vs cancer screening/prevention education	12 months

RCT randomized controlled trial

made use of patient lists from electronic health records or other patient registries, with letters and follow-up phone calls to potentially eligible participants. Most studies described the importance of soliciting input from staff, tailoring activities to suit the clinical environment, and having bilingual, well-trained research staff. Three studies reported retention rates, which ranged from 55% to 84%. Most studies reported that reasons for attrition were related to poor health, transportation difficulties, childcare, or other family obligations.

Figure 1 shows the most successful recruitment and retention strategies, framed within an ecological perspective, to develop “best practices” recommendations for future research in the field. As seen from Fig. 1, successful strategies encompassed all levels of ecological influence. Having a bicultural, ethnically,

and/or linguistically matched research team was important for both recruitment and retention. Other important attributes were for the research team to have strong interpersonal skills, respect, and cultural sensitivity towards participants. Administrative flexibility and organization, persistence, and allowing for adequate time, staffing, and resources were important. Using a variety of methods, tracking progress closely, and consulting with team members and community advisors were also very important.

DISCUSSION

This review adds to the existing literature by (1) exploring the relationship between strategies and outcomes for recruitment and retention and (2)

Table 2 | Recruitment and retention results for the identified studies (*n*=38)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Primary Care Settings				
Eakin et al. [88]	Bilingual staff	Initial contacts (<i>n</i>): 605	Alternative contact numbers	Retention rate: 68.5% (<i>n</i> =137) at 6 weeks, 81% (<i>n</i> =162) at 6 months
	Partnering with community health center	% screened: 57% (<i>n</i> =345)	Making at least ten call attempts to locate participants, varying days and times	
	Use of electronic medical records	% eligible: 75% (<i>n</i> =258)	Maintenance of detailed database and tracking registry	Goal met: Yes
	Letters mailed to eligible patients from physicians	% enrolled (and <i>n</i>) from initial contacts: 33% (<i>n</i> =200)	Home visits	
	Follow-up phone calls	Length of time: 19 months	Flexible study design	
	Translation and cultural adaptation of intervention materials	Goal met: Yes	Regular staff meetings	
	Soliciting ongoing consultation			
Martyn-Nemeth et al. [45]	Soliciting input from community-based nurses	Initial contacts (<i>n</i>): N/R	Culturally appropriate music	Retention rate: 84% (<i>n</i> =16)
	Diabetic nurse educator familiar with the Hispanic community	% screened: N/R	Exercise sessions scheduled as clinic visits	Goal met: Yes
	Flyers posted in clinic with suggestion boxes	% eligible from those screening: N/R	Phone calls made for each missed session	
	Incentives	% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =19	Creative, periodic incentives (T-shirts, caps, socks, foot-care kits, water bottles, \$10 gift cards, pedometers, copies of dance music and maracas)	
		Length of time: N/R	Bilingual facilitators	
		Goal met: Yes	Minimal written materials	
			Pedometers	
Parra-Medina et al. [29]	Partnering with statewide Primary Care Association	Initial contacts (<i>n</i>): 1,106	Incentives (financial, transportation)	Retention rate: 81.5% at 12 months
	Support from key stakeholders	% screened: 60.6% (<i>n</i> =143)	Having a caring/concerned attitude	Goal met: N/R
	Involved staff in decisions about hiring	% eligible: 21.3% (<i>n</i> =236)	Communication skills training for staff	
	Study staff on site to directly help health center	% enrolled from initial contacts: 17% (<i>n</i> =189)	Flexibility and accommodations to schedules and life situations of participants	
	Staff trained extensively, with recertification every 6 months	Length of time: N/R	Detailed tracking systems	
	Potentially eligible participants via medical record review	Goal met: N/R		
	Prescreening telephone call			
	Two screening, one randomization visit			
Parra-Medina et al. [44]	Prior knowledge and experience of PI working in site settings	Initial contacts (<i>n</i>): 1,623	N/A	N/A
	Recruitment letters generated from scheduling system at health centers	% screened: 29% (<i>n</i> =465)		
	Study brochures	% eligible from those screened: 75% (<i>n</i> =350)		
		% enrolled (and <i>n</i>) from initial contacts: 16% (<i>n</i> =266)		
		Length of time: 2 years		
		Goal met: No		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Paschal et al. [42]	Media releases to news stations	Initial contacts (<i>n</i>): N/R	Program situated in primary healthcare facility in community	Retention rate: 70% (<i>n</i> =94) at 6 months; 55% (<i>n</i> =74) at 9 months
	Radio announcements	% screened: N/R	Financial incentives	Goal met: No
	Outreach to African American churches	% eligible from those screening: N/R	African American staff	
	\$150 stipend over 9 months	% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =134	Interactive group curriculum	
		Length of time: N/R		
		Goal met: N/R		
Community Settings				
Banks-Wallace et al. [28]	African American staff	Initial contacts (<i>n</i>): 38	N/A	N/A
	Flyers in church bulletins and community	% screened: 65% (<i>n</i> =25)		
	Word of mouth	% eligible: N/R		
	Referrals from practitioners	% enrolled from initial contacts: 55% (<i>n</i> =21)		
	Radio talk show	Length of time: 3 months		
	Culturally tailored pre-intervention (informational) sessions	Goal: No		
Beech et al. [66]	Public service announcements on African American radio stations	Initial contacts (<i>n</i>): 75	Guided by formative research	Retention rate: 100%
	PIs on live radio talk shows	% screened: 60	Extensive, carefully designed intervention activities for each study arm.	Goal met: Yes
	Flyers at schools	% eligible from those screened: 80%	Varied, novel, interactive activities	
		% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =60	Well-trained interventionists, representative of community	
		Length of time: 2 months		
		Goal met: Yes		
Chang MW [62]	Community partnerships with WIC centers	Initial contacts (<i>n</i>): 1,007	Formative research	Retention rate: 40–51% per school
	Peer advisory group formed	% screened: 33.9% (<i>n</i> =342)	Flexibility of procedures	Goal met: No
	Formative research	% eligible from those screening: 56.7% (<i>n</i> =194)	Alternate phone numbers	
	Recruiters received cultural sensitivity and communication skills training	% enrolled (and <i>n</i>) from initial contacts: 12.8% (<i>n</i> =129)	Toll-free study number	
	DVD to provide overview of study	Length of time: 2 months	Continuity of staff with participants	
		Goal met: Yes	Computerized tracking system	
			Reminder letters and thank-you notes after each interview	
			Birthday and holiday cards	
			Financial incentives at multiple points in study	
Chen et al. [60]	Partnership with Chinese language programs in the area	Initial contacts (<i>n</i>): 92; % screened: 78.2% (<i>n</i> =72)	Interactive design	Retention rate: 85% (<i>n</i> =57)
		% eligible from those screening: 93% (<i>n</i> =67)	Culturally appropriate information presented	Goal met: Yes
		% enrolled (and <i>n</i>) from initial contacts: 72.8 (<i>n</i> =67)	Feasibility/accessibility addressed	
		Length of time: 16 months		
		Goal met: Yes		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Chiang and Sun [39]	Snowball sampling	Initial contacts (<i>n</i>): N/R	Research staff had telephone contact weekly	Retention rate: 93% (<i>n</i> =128)
	Partnerships with a variety of community agencies: Chinese churches, a Chinese community center, and Chinese outpatient medical clinics	% screened: N/R	Incentives (pedometers)	Goal met: Yes
		% eligible from those screening: N/R	Attainable goal-setting emphasized	
		% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =137		
		Length of time: 1 year		
		Goal met: Yes		
Escobar-Chaves et al. [54]	Formative work with focus groups	Initial contacts (<i>n</i>): 656	Financial compensation	Retention rate: 85.4 (<i>n</i> =222)–98.8% (<i>n</i> =257)
	TV and radio ads	% screened: 65.4% (<i>n</i> =386)	Convenience of meetings (both location and timing)	Goal met: Yes
	Presentations at health fairs and churches	% eligible: 89.9% (<i>n</i> =590)	Transportation provided	
	Advertisements in community newspapers	% enrolled from initial contacts: 39.6% (<i>n</i> =260)	Advance planning with logistics/appointments	
	Bilingual/bicultural posters	Length of time: 27 months	Frequent (as many as 12) contact/phone calls	
	Advisory board	Goal met: Yes	Well-trained study staff	
	Research staff matched by language and ethnicity			
Fitzgibbon et al. [35]	(1) “Hip Hop for Health”: recruited through well-known after-school program; follow-up mailings and phone calls. Study site was established at housing complex also.	Initial contacts (<i>n</i>): 5,180 for FRITAA +1,350 (HHH)	N/A	N/A
	(2) FRITAA: community public awareness campaigns; house-to-house canvassing; telephone recruitment	% screened: N/R		
		% eligible: N/R		
		% enrolled (and <i>n</i>) from initial contacts: 8.1% (<i>n</i> =420 for FRITAA) and 23.2% (<i>n</i> =314 for HHH)		
		Length of time : 3 years for Hip Hop to Health, 18 month for FRITAA		
		Goal met: Yes		
Frierson et al. [61]	News ads, some of which were targeted to diverse racial/ethnic groups	Initial contacts (<i>n</i>): 1,245 (260 black)	N/A	N/A
	Health fairs	% screened: 493 (92 black)		
	Radio ads	% eligible: 256 (36 black)		
	Pay stub ads	<i>n</i> enrolled from initial contacts: 249 (34 black)		
	Worksite ads	Length of time: N/R		
		Goal met: No		
Gaston et al. [63]	Buy-in from directors of programs in recruitment settings	Initial contacts (<i>n</i>): N/R	African American female midlife group leaders	Retention rate: 79% (<i>n</i> =106) at 10 weeks, 31% (<i>n</i> =42) of initial enrollees at 6 months, 39% (<i>n</i> =52) at 12 months
	African American female co-leaders of the project	% screened: N/R	Participants given \$10 per session to defray transportation or childcare costs	Goal met: N/R
		% eligible from those screening: N/R		
		% enrolled (and <i>n</i>) from initial contacts: 134		
		Length of time: N/R		
		Goal met: N/R		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Harralson et al. [48]	Partnerships with existing programs at women's wellness center of an urban community-based organization serving low-income women	Initial contacts (<i>n</i>): N/R	Financial incentive(\$40 for pre- and post-test surveys)	Retention rate: 52% (<i>n</i> =118)
		% screened: N/R	Weekly drawing for \$10 gift certificate	Goal met for retention: No
		% eligible from those screening: N/R	\$100 gift certificate drawing based on max attendance	
		% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =225	Childcare and tokens for transportation provided	
		Length of time: 20 months		
		Goal met: Yes		
Hines-Martin et al. [34]	Formative research and detailed strategic planning	Initial contacts (<i>n</i>): 244	Maintaining relationships with community and center	Retention rate: 81.7% at 6 months
	African American staff and/or longstanding community members	% screened: N/R	Respect and flexibility for participants	Goal met: Yes
	Use of flyers, word-of-mouth, community meetings, health fairs	% eligible: 72.1% (<i>n</i> =176)	Childcare provided	
		% enrolled (and <i>n</i>) from initial contacts:42.6% (<i>n</i> =104)	Integrating social and educational activities into protocol	
		Length of time: less than 3 months	PI very visible	
		Goal met: Yes	Team present in community events	
Hovell et al. [57]	Presentations to local schools,at retail outlets, in waiting rooms, and door-to-door	Initial contacts (<i>n</i>): N/R	Continuous, vigorous outreach	Retention rate: 91% at 6 and 12 months
	Small group slide presentation of study given in Spanish	% screened: N/R	Exercise buddies/ compadres	Goal met: Yes
		% eligible from those screening: N/R	Phone calls from Spanish-speaking staff for each missed class	
		% enrolled (and <i>n</i>) from initial contacts: 151	Home visits for more than three missed classes	
		Length of time: N/R	Different staff involved until pt either returned or officially dropped out	
		Goal met: N/R	Used post-intervention monthly mailings and holiday, birthday cards	
			Multiple incentives built in for attendance	
			Provision of childcare and tutoring program	
Keller et al. [31, 56, 57]	N/A	Initial contacts (<i>n</i>): N/A	Formative work (focus groups) to inform intervention design with specific strategies to address safety	Retention rate: 48%, 55%
		% screened: N/A	Convenience, flexibility	Goal met for retention: No
		% eligible from those screening: N/A		
		% enrolled (and <i>n</i>) from initial contacts: N/A	Childcare provided	
		Length of time: N/A	Promoters and lay health advisors for support	
		Goal met: N/A		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Merriam et al. [55]	Patient lists from health center registry	Initial contacts (<i>n</i>): 2,638	Not specifically discussed	Retention rate: 93% (<i>n</i> =290) at 1 year
	Mailing invitations from health center	% screened: 36% (<i>n</i> =949)	Transportation provided as needed	Goal met: Yes
	Telephone recruitment calls	% eligible: 41.2% (<i>n</i> =391)		
	Public service announcements	% enrolled (and <i>n</i>) from initial contacts: 11.8% (<i>n</i> =312)		
	Guest spots on local Spanish TV, advertisements in bilingual news	Length of time: 34 months		
	Fliers in Senior Center newsletter	Goal met: No		
Pekmezı et al. [58]	Partnerships with community-based organizations	Initial contacts (<i>n</i>): 388	Formative research process to culturally adapt intervention	Retention rate: 87% (<i>n</i> =81)
	Advertisements in Spanish-language newspapers and radio stations	% screened: 81.1% (<i>n</i> =315)	Proactive strategies to explicitly address barriers developing “brand” (Seamos Activos), logo	Goal met: Yes
		% eligible from those screening: 29% (<i>n</i> =93)		
		% enrolled (and <i>n</i>) from initial contacts: 23.9% (<i>n</i> =93)		
		Length of time: 6 months		
		Goal met: Yes		
Prohaska et al. [40, 89]	N/A	Initial contacts (<i>n</i>): N/R	Church setting familiar to participants	Retention rate: 57% (<i>n</i> =70)
		% screened: N/R	Existing social structure and support	Goal met: Yes
		% eligible from those screening: N/R	Offering free program	
		% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =123	Flexibility in program for all fitness levels	
		Length of time: 1 month		
		Goal met: Yes		
Resnicow et al. [68]	Public housing developments	Initial contacts (<i>n</i>): N/R	Interactive intervention sessions	Retention rate: 98% (<i>n</i> =56 completed post-assessments); 55% (<i>n</i> =31) completed final six sessions
	Presentations	% screened: N/R	Use of multiple incentives healthy meals provided	Goal met: Yes/No
	Posters and flyers	% eligible from those screening: N/R	Camaraderie/social support	
	In-person recruiters	% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =57;		
	Home-based consent process and baseline data collection	Length of time: N/R		
		Goal met: Yes		
Resnicow et al. [69, 79]	Extensive formative research	Initial contacts (<i>n</i>): N/R	Extensive formative research guided the development of the intervention materials; multiple focus groups	Retention rate: 86% (<i>n</i> =906) at 1 year
		% screened: N/R		Goal met: Yes
		% eligible from those screening: N/R		
		% enrolled (and <i>n</i>) from initial contacts: 1,056		
		Length of time: N/R		
		Goal met: Yes		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Resnicow et al. [43]	Church liaisons hired as hourly employee	Initial contacts (<i>n</i>): N/R	Extensive formative research to develop themes and content areas for intervention.	Retention rate: 84% (<i>n</i> =123) at 6 months, 73% (<i>n</i> =107) at 12 months Goal met: N/R
	Churches received \$500 incentive for 15 girls enrolled, plus additional \$200 if 20 girls enrolled	% screened: N/R		
		% eligible from those screening: N/R		
		% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =137		
		Length of time: N/R Goal met: N/R		
Robinson et al. [65]	Presentations at community centers and after-school programs	Initial contacts (<i>n</i>): N/R	Extensive formative research	Retention rate: 98.4%
	Youth leaders	% screened: N/R	Frequent classes at multiple sites	Goal met: Yes
	Posting fliers	% eligible from those screening: N/R	Serving healthy snacks	
		% enrolled (and <i>n</i>) from initial contacts: 61	Homework period	
		Length of time: 10 weeks	Dance classes varied	
		Goal met: Yes	Home visits	
			African American female role model	
			African and African American cultural themes and values	
			TV time managers	
			Newsletters	
			Holistic concept of health	
			Control group planning	
Robinson et al. [90]	Developed from formative research	Initial contacts (<i>n</i>): N/R	N/A	N/A
	Targeted low-income neighborhoods around schools	% screened: <i>n</i> =543		
	Presentations, flyers distributed to girls at schools and parents at after-school programs, schools, churches, neighborhood events	% eligible from those screened: 58% (<i>n</i> =316)		
	All assessments performed in girls' homes	% enrolled (and <i>n</i>) from initial contacts: 83% (<i>n</i> =261)		
	Eligibility criteria kept as liberal as possible	Length of time: 16 months Goal met: Yes		
Rucker-Whitaker et al. [33]	Opportunistic recruitment from senior center and two churches	Initial contacts (<i>n</i>): N/R	African American peer leaders/role models	Retention rate: 100% Goal met: Yes
		% screened: N/R		
		% eligible from those screening: N/R % enrolled (and <i>n</i>) from initial contacts: <i>n</i> =46		
		Length of time: N/R		
		Goal met: N/R		
Sharp et al. [64]	Directly handing out flyers/brochures in public spaces	Initial contacts (<i>n</i>): N/R	African American instructors	Retention rate: N/R
	Door-to-door canvassing of area within 2-mile radius of site	% screened: 690	Varied range of aerobic activities offered	Goal met: N/R
	Word-of-mouth from church and community leaders	% eligible: 39% (<i>n</i> =266)	Supplemental optional social activities	
	Mass email at local university	% enrolled (and <i>n</i>) from initial contacts: 31% (<i>n</i> =213)	Pedometers provided	
		Length of time: 2 years Goal met: Yes		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
Staffileno and Coke [36, 38]	Blood pressure screenings	Initial contacts (<i>n</i>): N/R	Identifying and overcoming participants' barriers	Retention: 95.8% (<i>n</i> =23)
	Physician referrals	% screened: 136	Developing strong relationships	Goal met: Yes
	Posting flyers and brochures	% eligible: 26% (<i>n</i> =35)	Social support	
	Work-site presentations	% enrolled from initial contacts: <i>n</i> =24	Demonstrating respect	
	Networking, word-of-mouth	Length of time: 19 months	Flexibility in scheduling study visits	
	Advertisements via newspaper, radio	Goal met: No	Training of research staff with aforementioned skills	
	Internet sources.			
Story et al. [49]	N/A (see other Story et al. references in this table [50, 65])	Initial contacts (<i>n</i>): N/R	Well-trained African American staff	Retention rate: 98% (<i>n</i> =53)
		% screened: N/R	Fun activities/programming	Goal met: Yes
		% eligible from those screening: N/R	Cultural tailoring based on formative research	
		% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =54	Interactive, varied classes	
		Length of time: N/R	Incentives built in	
		Goal met: Yes	Healthy snacks provided	
			Transportation provided	
			Location convenient (school)	
			Weekly family packets	
			Family night events	
			Use of active control group (self-esteem)	
Story et al. [50, 65]	Radio announcements	Initial contacts (<i>n</i>): N/R	N/A	Retention rate: N/A
	Direct appeal to religious and community leaders	% screened: N/R		Goal met: N/A
	Flyers at schools and community centers	% eligible from those screening: N/R		
	Internet	% enrolled (and <i>n</i>) from initial contacts: <i>n</i> =210		
	Information sessions	Length of time: N/R		
	Direct appeal by PI	Goal met: Yes		
	Presentations at community events			
	Letters to students and parents			
Taylor-Piliae et al. [59]	Partnership with a community-based agency	Initial contacts (<i>n</i>): 60	Tracking attendance	Retention rate: 97.4% (<i>n</i> =38)
	Use of multimedia (radio, flyers, news ads, brochures left in a variety of locations) approach in Chinese and English	% screened: 86.6% (<i>n</i> =52)	Convenient location	Goal met: Yes
	Bilingual communication	% eligible: 75% (<i>n</i> =39)	Bicultural/bilingual study personnel	
	Demonstrating cultural sensitivity	% enrolled from initial contacts: 65% (<i>n</i> =39)	Personal encouragement	
		Length of time: 3 weeks	Qualified/charismatic Tai Chi instructor	
		Goal met: Yes	Respect for Chinese cultural beliefs, norms and values	
			Incentives	
Wilbur et al [30]	African American, female staff	Initial contacts (<i>n</i>): 696	N/A	N/A
	Formative work to develop recruitment materials	% screened: <i>n</i> =67.3% (<i>n</i> =469)		

Table 2 | (continued)

Author	Recruitment Methods	Recruitment results	Retention methods	Retention results
	Community advisory board	% eligible: 40.4% (<i>n</i> =281)		
	community presentations, health fairs	% enrolled from initial contacts: 40.4% (<i>n</i> =281)		
	Broad community dissemination of print materials	Length of time: 28 months		
	Email announcement to worksites	Goal met: Yes		
	Childcare made available			
	Promptly returned calls and made as many as 10 attempts to respond to callers			
Wilbur et al. [31]	Occurred via two federally qualified health centers serving low- and middle-income populations; see other Wilbur et al. paper in this table [30]	Initial contacts (<i>n</i>): Not reported in this paper (see other Wilbur reference in this table)	Multiple attempts made to contact participants	Retention rate: 82–97% at 24 weeks, 30–44% at 48 weeks
		% screened: N/R		Goal met: N/R
		% eligible from those screened: N/R		
		% enrolled (<i>n</i>) from initial contacts: 281		
		Length of time: N/R		
		Goal met: N/R		
Wilson et al. [53]	Parent orientations at school events to get parental consent	Initial contacts (<i>n</i>): 2,500–3,000	Detailed tracking database	Retention rate: 40–51% per school
	Pep rallies	% screened: 52.1–62.5% (<i>n</i> =1,563)	Phone scripts with follow-up actions	Goal met: No
	Homeroom visits	eligible from those screening: 90.9% (<i>n</i> =1,422)	Updated contact information	
		% enrolled (and <i>n</i>) from initial contacts: 47.4–56.8% (<i>n</i> =1,422)		
		Length of time: 4 years		
		Goal met: Yes		
Yancey et al. [46]	N/A	Initial contacts (<i>n</i>): 2009; % screened: 44.4% (<i>n</i> =893)	Convenient site/centrally located	Retention rate: 70–72%
		% eligible from those screened: 95% (<i>n</i> =845); % enrolled (and <i>n</i>) from initial contacts: 20% (<i>n</i> =393)	Black-owned fitness facility	Goal met for retention: N/R
		Length of time: 18 months	Free 1-year membership provided	
		Goal met: Yes		
Yancey et al. [47, 65]	African American leadership (PI) and study staff.	Initial contacts (<i>n</i>): 2009	N/A	N/A
	Recruitment materials containing ethnically relevant Afrocentric messages, themes, and format	% screened: 44.4% (<i>n</i> =893)		
	Mass media including radio public service announcements, flyers in community sites, direct mail	% eligible from those screened: 95% (<i>n</i> =845)		
	Social networking	% enrolled (and <i>n</i>) from initial contacts: See following reference; Length of time: 18 months		
		Goal met: Yes		
N/A not applicable (not focus of paper), N/R not reported or unknown				

guiding the development of “best practices” recommendation for future research in the field, framed within an ecological perspective (Fig. 1). Many of

the successful strategies highlighted in Fig. 1 echo the themes expressed in qualitative work from diverse cultures as well as the perspectives of

Fig 1 | Ecological levels of influence with corresponding successful recruitment and retention strategies

research recruiters themselves [71–76]. Different methodologies (qualitative, quantitative, mixed) may be used to translate and evaluate recruitment and retention strategies in different settings.

A major theme evident from this review is the critical importance of extensive formative research to develop recruitment and retention strategies that take into account the unique study site, context, or population-specific attributes. Formative work is optimized by community engagement and empowerment in all phases of the study [77, 78]. Several studies with high retention rates also tended to describe significant time and effort to design the intervention (and control group) to be as appealing as possible, culturally tailoring, and making the intervention highly interactive [65, 66, 79]. Therefore, in order to translate research findings into other clinical and community settings, consideration of contextual factors is essential. Depending on the context, one or more levels of ecological influence may be particularly salient.

We found an extremely limited and uneven evidence base related to successful recruitment and retention in primary care settings. However, other recent interventions in primary care or general medicine settings have been effective [7, 80–83], though challenging to implement [84], so this area may also be worthy of further study.

There were gaps in our existing knowledge base apparent from this review. Effectiveness of recruitment or retention was defined differently in the studies we reviewed. As a result, it was challenging to analyze recruitment and retention consistently across studies due to variability in reported versus unreported or unknown data. There is limited information from the participants' perspectives on what was most valuable or important to them for facilitating recruitment or retention, though there are reports of facilitators and barriers to physical activity in culturally diverse groups [72, 76, 85]. Also, the small number of family and rural interventions suggests that more research is needed in

these areas. Since results were inconsistently analyzed by education or income level, we do not know the extent to which recruitment or retention methods may have differentially affected individuals with low-income or low-educational attainment. Innovative approaches and use of social networking were described in a limited fashion overall, though we did discover some intriguing, creative strategies worthy of further study.

Overall, the studies reported moderately or extremely high recruitment and retention rates, raising the question of to what extent publication bias limits our understanding of less effective methods and outcomes. The results of this review highlight the complexity and difficulty of defining and achieving “sufficient” recruitment and retention. Goals (and reporting standards) for recruitment and retention should be discussed not just in terms of numbers of participants recruited and retained, but also time and staff development required [86].

There are limitations that should be kept in mind when interpreting the results from this review. First, the data were abstracted by one reviewer which may have introduced reviewer bias. Another limitation is that the “gray literature”—i.e., other programmatic evaluations, internet-based sources, or other work not published in the bibliographic databases described herein—was not searched, which may have limited the yield of relevant findings. The selection criteria for this review excluded non-US-based studies, which may have provided additional information as well. Finally, due to the challenging nature of recruitment and retention for underserved populations, this review may have been subject to publication bias, thus limiting the generalizability of these findings.

CONCLUSION

In order to successfully recruit and retain individuals from underserved groups into physical activity inter-

vention trials, promising strategies correspond to all levels of ecological influence. Successful recruitment and retention is grounded in having a well-trained, bicultural, and/or ethnically and linguistically matched research team, cultural tailoring of the intervention, administrative competence, strong community partnerships, and interpersonal skills.

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APPENDIX 1

Search terms used for review.

Physical activity, patient selection, clinical trial, research, motor activity, intervention, exercise, locomotion, program, rural/rural areas, patient education, feasibility, poverty/poverty areas, sports, pilot, African American, Asian American, recruitment, Hispanic, ethnic groups, retention, minority groups, educational status, walking, physical fitness, resistance training, prevention, ambulatory care, primary health care, bicycling, internal medicine, pedometer, accelerometer, community health centers, recreation, senior center, physicians/family, and socioeconomic factors

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