Who Participates in Physical Activity Intervention Trials?

Lauren Ashleigh Waters, Benécide Galichet, Neville Owen, and Elizabeth Eakin

Background: Taking a representative snapshot of physical activity intervention trial findings published between 1996 and 2006, we empirically evaluated participant characteristics, response and retention rates, and their associations with intervention settings. Methods: A structured database search identified 5 representative health behavior journals, from which 32 research reports of physical activity intervention trials were reviewed. Interventions settings were categorized as workplace, healthcare, home- or community-based. Information on participant and intervention characteristics was extracted and reviewed. Results: The majority of participants were Caucasian (86%), women (66%), healthy but sedentary (63%), and middle-aged (mean age = 51 years). Intervention response rates ranged from 20% to 89%, with the greatest response rate for healthcare and home-based interventions. Compared with nonparticipants, study participants tended to be women, Caucasian, tertiary-educated, and middle-class. Participants in workplace interventions were younger, more educated, and healthier; in community-based interventions, participants were older and more ethnically diverse. Reporting on education and income was inconsistent. The mean retention rate was 78%, with minimal differences between intervention settings. Conclusions: These results emphasize the need for physical activity interventions to target men, socioeconomically disadvantaged, and ethnic minority populations. Consistent reporting of response rate and retention may enhance the understanding of which intervention settings best recruit and retain large, representative samples.

Keywords: interventions, adults, participant characteristics, settings, review

The associations between physical inactivity and increased risk of several chronic diseases have been well-documented. While risk of chronic diseases related to physical inactivity affects all socioeconomic groups, some are at greater risk than others. Socioeconomically disadvantaged, underserved, and ethnic minority groups bear a significant portion of the chronic disease burden. A review of the evidence on socioeconomic variations in adult health behaviors in the USA revealed increasing inequalities in physical activity participation, despite a declining prevalence of inactivity in many states. It is thus important that higher-risk subgroups are part of the evidence base on which future physical activity programs are to be developed. Recent reviews suggest that physical activity intervention trials have been better able to recruit some groups (particularly Caucasian middle-class, middle-aged women) than other groups (men, ethnic minorities, and the socially disadvantaged).

Reviews of the physical activity intervention literature have largely focused on the efficacy of interventions. Given the broad scope of the literature, reviews have also tended to evaluate intervention outcomes, most often evaluating these in relation to specific target populations (older adults, disadvantaged); intervention settings (primary care-based, school-based, workplace-based); intervention delivery modalities (telephone, tailored print, website); or the theoretical basis of the intervention. Such reviews have made mention of the disproportionate number of Caucasian, middle-aged, middle-class women participating in physical activity intervention trials. For example, a review by van der Bij et al (2002), which sought to describe the effectiveness of physical activity interventions for older adults, highlighted briefly the issue of limited population reach and nonrepresentativeness of study participants: the majority of participants in the trials reviewed were Caucasian women, well-educated, and of average to high income; another review noted that most studies have targeted middle-aged, and more recently, older adults.

Over the past decade, concerns about the limited generalizability of findings from physical activity efficacy trials have led to an increased emphasis on effectiveness trials. Such trials aim to evaluate the impact of an intervention in ‘real-world’ settings and employ larger and more representative samples from groups known to be at higher risk of chronic diseases related to physical inactivity. There has been a further shift in focus toward disseminating and diffusing physical activity interventions (by combining policy and broader environmental approaches), so that they may have the widest possible population reach. With these shifts has come the need for a careful evaluation of the generalizability of findings. However, recent reviews are only partially helpful in this regard, as they have not provided a detailed
evaluation of the particular attributes of study participants; no review has considered how the characteristics of participants may vary according to different intervention settings and modalities.

The purpose of this review is to describe the characteristics of participants in a representative sample of physical activity intervention trials published in 5 major health-behavior journals between 1996 and 2006. The questions addressed are:

- What are the characteristics of participants, and do they differ by intervention setting?
- What are the response and retention rates, and participant representativeness of physical activity intervention trials, and do they differ by intervention setting?

## Methods

### Search Strategy and Data Sources

The timeframe for this review corresponds to a 10-year period following the issuance of public health recommendations for physical activity by the Centers for Disease Control and Prevention and the American College of Sports Medicine in 1995, and the expectation that more physical activity intervention studies would be published in the decade subsequent. The 5 journals from which physical activity intervention trials were selected were *American Journal of Preventive Medicine, Preventive Medicine, Annals of Behavioral Medicine, American Journal of Health Promotion*, and *Health Education and Research*. These journals were selected purposively following a search of 4 major databases. A combination of keywords and Medical Sub-Heading (MeSH) search terms were entered into PubMed, PSYCINFO, Medline, and CINAHL to determine the peer-reviewed journals that most frequently published the results of physical activity intervention studies. The search terms included “physical activity,” “exercise,” “motor activity,” and “intervention studies.” The terms “nutrition therapy” and “diet*” were used to exclude trials with a dietary component, and results were limited to studies published in English with adult samples. The results of the searches of each database were reviewed with the aim of identifying the 5 health-behavior journals that most frequently published the results of physical activity intervention trials. The intent was not to conduct a systematic review, as the total number of reports of physical activity interventions trials would be excessive. Rather, the intent was to capture a representative snapshot of reports of recent physical activity intervention trials.

Following the selection of journals, a structured search for reports of physical activity intervention trials published in these journals between 1996 and 2006 was conducted using Medline. This search used the same terms and limits that were used in the initial search for journal titles. To ensure the completeness of the search, individual journal websites and indexes were also searched.

### Selection of Studies

This review included randomized controlled trials and quasi-experimental studies of interventions that sought to increase the frequency or duration of participants’ physical activity in any domain (leisure, transport, etc). Studies that considered other related measures (such as change in stage of motivational readiness for physical activity) were included, provided that they also reported on change in physical activity behavior. No limits were placed on the population under investigation in terms of baseline physical activity or health status. Studies were excluded if recruitment was stratified by gender, age, ethnicity or socioeconomic status; if there was no control or comparison group; if participants were under 18 years of age; and, if the intervention included a dietary component.

### Data Extraction

Intervention characteristics were extracted and are summarized in Table 1. These include intervention setting, duration, recruitment strategy, target population, and study design. The intervention setting was determined primarily by the site in which recruitment was conducted, yielding 4 categories: workplace, primary healthcare, home-based, and community-based. Consistent with conventions of reporting on physical activity intervention trials, studies in which participants were recruited from the workplace or from primary health care settings were deemed to be workplace (or primary health care) interventions, regardless of whether the intervention was delivered in that setting or via mediated delivery methods (ie, telephone, tailored print, website), or both. For interventions where participants received no face-to-face contact, the intervention setting was categorized based on the site of the intervention activities (for example, mediated interventions where participants received mailed print were categorized as home-based). Interventions were categorized as community-based if they included strategies that relied on mass media approaches and/or participants engaging in community-based exercise groups, or the development of purpose-built environmental cues to exercise, such as walking trails. Community-based interventions may also have been supplemented by print media, mass media, telephone or individual counseling.

In addition, the number and the characteristics of participants were recorded, including the proportions of women involved, age range, mean age, ethnicity, educational attainment, and income.

Response rate was calculated as the number consenting or randomized, divided by the number of potential participants exposed to recruitment and determined to be eligible. Retention rate was calculated as the percentage of those recruited who completed the intervention. Where available, information comparing participants and nonparticipants (participant representativeness) was extracted, as was information on the characteristics of completers versus noncompleters (those lost to follow up).
### Table 1 Attributes of Physical Activity Intervention Trials and Participant Characteristics

<table>
<thead>
<tr>
<th>Author, year, location</th>
<th>Study design, intervention attributes, target population, and recruitment strategy</th>
<th>% women, mean age (range), % Caucasian</th>
<th>% tertiary educated, income $US (majority)</th>
<th>Response rate, representativeness, and retention</th>
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<td><strong>Workplace intervention trials</strong></td>
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<td>Blissmer et al, 53 2002, USA</td>
<td>RCT Intervention: 4 monthly tailored print mailings; or 4 ‘mismatched’ monthly print mailings; or 4 monthly AHA print mailings. Control: 4 mailings of generic print Target population were healthy (faculty &amp; staff) employees aged 20 to 73 years with any level of current physical activity. Participants were recruited at a large university via e-mail and newsletter.</td>
<td>74% women Mean age (range): 43 (20–73) years 90% Caucasian</td>
<td>71% tertiary educated Income: ≥$40,000</td>
<td>Response rate not reported (NR). Representativeness NR. Retention 68%. No significant differences at baseline between completers and noncompleters.</td>
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<tr>
<td>Calfas et al, 32 2000, USA</td>
<td>RCT Intervention: 1 50 minutes lecture per week for 15 weeks, 110min/week of group exercise, print information and assignments. A second phase of the intervention trial involved monthly mailed print with follow-up telephone counseling for 18 months. Control: general health course 2 hours per week for 15 weeks. Followed by bimonthly print newsletter. Target population were university seniors aged 18 to 29 years and intending to graduate in the next 2 semesters. Participants were recruited (actively with letter and phone call or passively with letter and response card) to participate in a health course with follow-up intervention. Courses offered 2 units of upper-division course credit.</td>
<td>54% women Mean age (range): 24 (20–29) years 61% Caucasian</td>
<td>100% tertiary educated Income: NR</td>
<td>Response rate NR. Participants were generally representative of the population from which they were drawn. Retention 94%.</td>
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| Coleman et al, 44 1999, USA | Randomized trial  
Intervention: 30 minutes continuous walking; or 3 sessions of 10 minute walks, or 30 minutes walking (choice). All participants attended an initial information session and group walk, and were provided with a training manual. Subsequently, participants walked independently 6 days per week but met with a counselor individually on a weekly basis. Participants were sedentary, nonsmoking university employees without physical or mental health problems. Participants were recruited via ads in university publications, mass mailings, and program posters. Eligible participants were determined through an initial telephone interview and subsequent laboratory screening process. | 84% women  
Mean age (range): 39 (NR) years  
97% Caucasian | | 84% women  
Mean age (range): 39 (NR) years  
97% Caucasian | Response rate NR.  
Participants were not entirely representative as there were some differences between sample and reported population data.  
Retention 89%. |
| Griffin-Blake et al, 52 2006, USA | Randomized trial  
Intervention: 1 mailing of stage-based, motivationally tailored print material; or 1 mailing of nonstaged Social Cognitive Theory print material. Participants were full time academic faculty and college staff aged 21 to 70 years. Participants were recruited through cold calling. | 64% women  
Mean age (range): NR (21–70) years  
92% Caucasian | 55% tertiary educated  
Income: NR | 64% women  
Mean age (range): NR (21–70) years  
92% Caucasian | Response rate 20%.  
Participants were representative in terms of the stage of change distribution reported in other studies.  
Retention 57%. More noncompleters than completers were in the contemplation stage of change at baseline. |
| Marcus et al, 41 1998 (b), USA | RCT  
Intervention: 2 distributions of tailored stage-matched print  
Control: 2 distributions of standard PA print. Participants were employees who were sedentary or lacking motivation from 11 manufacturing worksites that participated in the intervention arm of the Working Healthy Project. Participants were recruited as part of a larger intervention. | 43.3% women  
Mean age (range): 39.9 (NR) years  
94% Caucasian | 32% tertiary educated  
Income: NR | 43.3% women  
Mean age (range): 39.9 (NR) years  
94% Caucasian | Response rate NR.  
Participants were not entirely representative in that a higher proportion of participants were educated and Caucasian.  
Retention 58%. More completers than noncompleters were white-collar workers, not married and physically active. |
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<td>Workplace intervention trials (continued)</td>
<td>Marshall et al, 47 2003 (b), AUS Randomized trial Intervention: interactive tailored website and 4 biweekly tailored reinforcement emails containing hyperlinks; or single e-mailing of tailored letter and print booklets and 4 biweekly tailored reinforcement emails. Participants were healthy faculty and general staff from a regional university. Participants were recruited by internal e-mail.</td>
<td>58% women Mean age (range): 43 (NR) years % Caucasian: NR</td>
<td>71% tertiary educated Income: NR</td>
<td>Response rate 46%. Eligible participants were representative of original sample with respect to demographics and baseline levels of physical activity. Retention 78%.</td>
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<td>Napolitano et al, 35 2003, USA RCT Intervention: tailored website access and weekly e-mail tips for 3 months with a study helpline. Control: waiting list control group. Participants were sedentary, healthy adult employees (aged 18–65 years) working in several large hospitals. Participants were recruited at the worksite using in-person and electronic channels (e-mail ads, flyers, voicemails messages, newsletter, pay stub &amp; intranet ads, in-person information booths).</td>
<td>86% women Mean age (range): 43 (18–65) years 91% Caucasian</td>
<td>78% tertiary educated Income: ≥$50,000</td>
<td>Response rate NR. Representativeness NR. Retention 80%. There were non-significant differences between completers and noncompleters. Noncompleters had a lower BMI, less confidence in using e-mail, and were more likely to be men.</td>
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<td>Nichols et al, 72 2000, USA RCT Intervention: 12 weekly behavioral skills and physical activity sessions, plus12-week gym based exercise program, and 3 personal training sessions. Control: 12 week free gym membership. Participants were low-active or sedentary employees at 2 workplaces. A recruitment invitation was issued to all employees and PACE screening questionnaire was used to determine eligibility.</td>
<td>78% women Mean age (range): 66 (NR) years Most Caucasian</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 78%. Representativeness NR. Retention 91%.</td>
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<td>Peterson et al,19 1999, USA</td>
<td>RCT Intervention: 1 mailing of stage-based tailored print; or 1 mailing of generic (nontailored PA print). Control: No intervention. Participants were employees of a large company. Participants were recruited via a mailed invite, consent form, study description, and questionnaire. Interested employees asked to return questionnaire through office mail within a week.</td>
<td>60% women Mean age (range): NR (NR) 84% Caucasian</td>
<td>86% tertiary educated Income: NR</td>
<td>Response rate NR. Representativeness NR. Retention 67%.</td>
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<td>Proper et al,34 2003, NDL</td>
<td>RCT Intervention: 7 tailored 20-minute counseling sessions over 9 months plus general and tailored print materials. Control: general lifestyle-related printed information. Participants were office employees from 3 municipal services working at least 24 hours per week until the time of posttesting. Participants were recruited at an information session where consent to participate was solicited.</td>
<td>32% women Mean age (range): 44 (NR) years 92% Caucasian</td>
<td>66% tertiary educated Income: NR</td>
<td>Response rate 50%. Representativeness NR. Retention 80%. There were no significant differences between completers and noncompleters with respect to demographic factors, physical activity, fitness or health.</td>
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<td><strong>Home-based intervention trials</strong></td>
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<td>Green et al,40 2002, USA</td>
<td>RCT Intervention: 3 20 to30 minute phone calls over 3 months plus tailored and general print information. Control: No intervention. Participants were sedentary but healthy health cooperative members aged 20 to 64 years interested in increasing physical activity in next 6 months. Recruitment was via a mailed health risk assessment tool.</td>
<td>53% women Mean age (range): 45 (20–64) years 92% Caucasian</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 88%. Representativeness NR. Retention 81%. The Intervention group more likely to remain in the study.</td>
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<tr>
<td>Humpel et al,48 2004, AUS</td>
<td>Randomized trial Intervention: 3 brief telephone counseling calls over 3 weeks &amp; print material (3 mailings over 3 weeks); or print material mailings only. Participants were healthy clients of an insurance organization aged over 40 years. Recruitment was via a mailed invitation and questionnaire.</td>
<td>57% women Mean age (range): 60 (NR) % Caucasian: NR</td>
<td>58% tertiary educated Income: NR</td>
<td>Response rate 41%. Responding participants were more active at baseline than the general population and thus not a representative sample. Retention 65%. Completers were not different to the baseline sample with respect to age and gender.</td>
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| Levy et al,73 2004, USA | RCT  
Intervention: single mailing of tailored print materials; or single mailing of tailored print materials and print booster at 1 month.  
Control: single mailing of standard print material.  
Participants were sedentary but otherwise healthy adults aged 22 to 79 years and intending to start exercising regularly.  
Participants were recruited through newspaper ads, church newsletters, flyers, and by directly approaching people at local supermarkets. | 68% women Mean age (range): 47 (22–79) years  
% Caucasian: NR | % tertiary educated: NR  
Income: NR | Response rate NR.  
Representativeness NR.  
Retention 68%. No significant differences were found between completers and noncompleters with respect to demographic details. |
| Marcus et al,51 1998 (a), USA | Randomized trial  
Intervention: 4 mailings at baseline, 1, 3, and 6 months, of individually tailored print (reports) and motivationally matched manuals; or standard exercise promotion print materials.  
Participants were sedentary but healthy men and women aged over 18 years.  
Participants were recruited via newspaper advertisements and screened by telephone interviews. Mailed consent forms were sent to be signed and returned by mail. | 76% women Mean age (range): 44 (NR) years  
94% Caucasian | 78% tertiary educated  
Income: NR | Response rate NR.  
Representativeness NR.  
Retention 77%. A higher proportion of completers than noncompleters were not in employment. |
Intervention: single mailing of tailored print material.  
Control: no intervention.  
Participants were healthy but under-active adults aged 18 to 75 years.  
Recruitment was via cold calls made to a random selection of people living in a regional community and who had previously responded to a telephone interview. The person with the next birthday was recruited. | 64% women Mean age (range): 43 (18–75) years  
96% with English as first language | % tertiary educate: NR  
Income: NR | Response rate 89%.  
Participants were representative of the cohort from which they were selected, and comparable to the recent census data from the state’s general population.  
Retention 87%. |
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<tr>
<td>Marshall et al,38 2003 (a), AUS RCT</td>
<td>Intervention: single mailing of tailored letter and booklet(s). Control: no intervention. Participants were under-active adults aged 40-60 living in a regional city. Recruitment was via phone calls to households who consented to being recontacted at the time of a previous population survey (1995).</td>
<td>52% women Mean age (range): 49 (40–60) 94% English speaking</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 69%. Participants were representative of general population on all demographics characteristics although less physically active and with a higher BMI. Retention 77%. Participants who remained in the study but did not read the intervention materials were not different from those who did in terms of stage of change or sociodemographic characteristics.</td>
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<td>Smeets et al,36 2006, NDL</td>
<td>RCT Intervention: a personalized 3- to 5-page tailored letter. Control: no information. Participants were Dutch citizens aged 18 to 65 years with a telephone. Participants were recruited from a random sample of phone numbers obtained from a national telephone company. Selected addresses received an information letter and informed consent form.</td>
<td>46% women Mean age (range): 44 (18–65) years % Caucasian: NR</td>
<td>36% tertiary educated Income: NR</td>
<td>Response rate 55%. Representativeness NR. Retention 94%. Dropout rates were higher in the control group and for younger participants.</td>
</tr>
<tr>
<td>Aittasalo et al,60 2006, FIN RCT</td>
<td>RCT Intervention: physician counseling session; or Tailored print and 5-day self-monitoring with pedometer and physical activity log. Control: usual care. Participants were under-active primary-care patients. Participants were recruited from a pool of patients of participating physicians. Eligible participants were asked to complete the IPAQ before a scheduled visit. Responses were screened by the receptionist.</td>
<td>76% women Mean age (range): 47 (20–65) years % Caucasian: NR</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 50%. Nonconsenters were more sedentary with fewer chronic conditions. Recruitment by receptionists may have introduced bias as not every potential participant was screened. Retention 77%.</td>
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<td>Healthcare-based intervention trials (continued)</td>
<td>Nonrandomized controlled trial Intervention: brief (3 minute) physician counseling session at a one-off visit during a 3-week period, and tailored supporting print material (mailed within 2 days of recruitment); or brief physician counseling and standard print. Control: no advice or print. Participants were sedentary patients (with no contraindications for exercise) consulting a family practitioner on an intervention day. Potential participants were asked to complete a questionnaire to determine eligibility. Eligible participants were allocated to the intervention or control group depending on day of visit.</td>
<td>65% women Mean age (range): NR (≥18) years % Caucasian: NR</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 75%. Sample was not representative as participants more likely to be &gt;60y, working in semi- or unskilled work, a current smoker and overweight. Participants were also less likely to drink alcohol and speak English at home. Retention 55%. No difference between completers and noncompleters with respect to gender but completers were more likely to be &gt;60y. Smokers were less likely to complete the follow-up.</td>
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<tr>
<td>Bull et al, 1998, AUS</td>
<td>Nonrandomized controlled trial One-off brief (5-minute) physician counseling session (PACE protocol) and a 10-minute booster phone call. Control: Hepatitis B counseling. Participants were sedentary adults (aged over 18 years) without cardiovascular disease and scheduled for well- or follow-up visit for chronic disease care over a 6-week period. Eligible participants received info letter and consent form. Research staff also called patients, screened for activity level, informed of program and solicited verbal and written consent.</td>
<td>84% women Mean age (range): 39 (NR) 72% Caucasian</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 63%. Representativeness NR. Retention 83%. Noncompleters had fewer years of education.</td>
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<td>Calfas et al, 1996, USA</td>
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<tr>
<td>Goldstein et al,43 1999, USA</td>
<td>RCT Intervention: information manual, 2 brief counseling sessions, 2 written exercise prescriptions and 5 monthly mailings. Control: usual care. Participants were ambulatory, sedentary patients aged over 50 years and scheduled for a routine, nonacute GP appointment during the intervention window. Participating physicians were recruited from lists of primary care practices and personal contacts. Participants were recruited from target lists of eligible patients (provided by the GP). Consent was gained via telephone interview.</td>
<td>65% women Mean age (range): 66 (NR) years 97% Caucasian</td>
<td>% tertiary educated: NR Income: ≥$20,000</td>
<td>Response rate 80%. Sample was not representative in that there were some differences between participants and population data. Retention NR.</td>
</tr>
<tr>
<td>Kirk et al,37 2004, SCT</td>
<td>Randomized trial Intervention: 30-minute general and stage-based extended physician counseling, accelerometer, brief follow-up telephone counseling and standard print; or standard print &amp; follow-up phone calls only. Participants were sedentary adults with 'controlled' diabetes and over 75 years. Participants were recruited from an outpatient clinic population.</td>
<td>50% women Mean age (range): 57 (NR) years % Caucasian: NR</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate 31%. Sample was representative in that there were no significant differences in gender, age or BMI between those who participated and those who declined. Retention 84%.</td>
</tr>
<tr>
<td>Naylor et al,58 1999, ENG</td>
<td>Nonrandomized controlled trial Intervention: counseling only; or, stage-based information only; or, counseling and stage-based information Control: no intervention. Participants were adults attending participating general practices. Convenience sample of 4 general practices were nonrandomly assigned to conditions. Participants recruited via self-referral or referral by GP. Informed consent and baseline data collected by the clinic nurse before patients attending scheduled appointment.</td>
<td>77% women Mean age (range): 42 (NR) years % Caucasian: NR</td>
<td>% tertiary educated: NR Income: NR</td>
<td>Response rate NR. Representativeness NR. Retention 61%. Attrition rates were not associated with stage of change at baseline, self-efficacy, age, or gender.</td>
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<td>Norris et al, 19 2000, USA</td>
<td>RCT Intervention: physician-based assessment and counseling for exercise (PACE) at a one-off visit plus standard print followed by a counseling phone call at 4 weeks; or as above with booster calls and postcards at 2, 3, and 4 months. Control: usual care Participants were healthy members of Group Health Co-operative aged over 30 years. Consecutive participants who called a primary care physician to schedule a physical or gynecological examination were recruited. Consent solicited by a research assistant.</td>
<td>52% women Mean age (range): 55 (≥30) years 91% Caucasian</td>
<td>82% tertiary educated Income: NR</td>
<td>Response rate 53%. Participants were not representative of community residents in that they were more likely to be better educated and active; and less likely to have an income in the highest or lowest bracket. Retention 97%.</td>
</tr>
<tr>
<td>Pinto et al, 54 2005, USA</td>
<td>RCT Intervention: 3 to 45 minute physical activity clinician counseling sessions, a tailored physical activity prescription, 12 brief (10–15 minute) phone calls weekly or biweekly over 3 months, and 12 mailed tip sheets. Control: clinician advice only. Participants were sedentary adults aged over 60 years who were living without assistance. Patients were recruited when presenting for a non-urgent medical visit. Study staff in waiting room approached patients and consenting participants were screened for eligibility.</td>
<td>69% women Mean age (range): 69 (NR) years 85% Caucasian</td>
<td>58% tertiary educated Income: NR</td>
<td>Response rate 68%. Participants were not drawn from a broad sociodemographic population and were thus did not form a representative sample. Retention 90%. No significant differences between non-completers and completers with respect to demographic characteristics.</td>
</tr>
<tr>
<td>Bauman et al, 74 2001, AUS</td>
<td>Dissemination study Intervention: community support and telephone hotline, state-wide mass media campaign plus tailored print mail-outs and group-based physical activities. Participants were motivated but under-active adults aged 25 to 60 years. Participants were recruited through a cross-sectional random sample telephone survey.</td>
<td>56% women Mean age (range): NR (25–60) years 95% speak English at home</td>
<td>28% tertiary educated Income: NR</td>
<td>Response rate NA (survey). Sample data were representative of state and national population data. Retention 87%.</td>
</tr>
<tr>
<td>Author, year, location</td>
<td>Study design, intervention attributes, target population, and recruitment strategy</td>
<td>% women, mean age (range), % Caucasian</td>
<td>% tertiary educated, income $US (majority)</td>
<td>Response rate, representativeness, and retention</td>
</tr>
<tr>
<td>------------------------</td>
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<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Community-based intervention trials (continued)</td>
<td>Brownson et al, 2005, USA</td>
<td>Quasi-experimental design</td>
<td>77% women Mean age (range): NR (18–65) years 95% Caucasian</td>
<td>56% tertiary educated</td>
</tr>
<tr>
<td></td>
<td>Brownson et al, 2004, USA</td>
<td>Quasi-experimental design</td>
<td>75% women Mean age (range): NR (18 to &gt;65) years 67% Caucasian</td>
<td>40% tertiary educated</td>
</tr>
<tr>
<td></td>
<td>Hooker et al, 2005, USA</td>
<td>Quasi-experimental design</td>
<td>78% women Mean age (range): 68 (48–90) years 58% Caucasian</td>
<td>49% tertiary educated</td>
</tr>
</tbody>
</table>
### Table 1 (continued)

<table>
<thead>
<tr>
<th>Author, year, location</th>
<th>Study design, intervention attributes, target population, and recruitment strategy</th>
<th>% women, mean age (range), % Caucasian</th>
<th>% tertiary educated, income $US (majority)</th>
<th>Response rate, representativeness, and retention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Community-based intervention trials (continued)</strong></td>
<td></td>
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</tr>
</tbody>
</table>
| McAuley et al, 50 2000, USA | RCT  
Intervention: group-based regular walking 3 times per week.  
Control: group-based stretching and toning 3 times per week.  
Participants were sedentary adults aged 60 to 75 years.  
Participants were recruited through local media (newspaper and radio ads); flyers in grocery stores, churches, senior centers, etc. | 72% women  
Mean age (range): 67 (60–75) years  
94% Caucasian | 75% tertiary educated  
Income: >$30,000 | Response rate 75%.  
Representativeness NR.  
Retention 88%. No significant differences between those who did and did not return for post-test physiological testing with respect to self esteem. |
| Reger et al, 56 2002, USA | Quasi-experimental design  
Intervention: community exposed to paid media (network and cable television advertisements, radio ad broadcasts, and newspaper ads), significant local news coverage, a worksite program, multiple public health education seminars, walking prescriptions by physicians and a website.  
Control: community received no input.  
Participants were sedentary or irregularly active adults aged between 50 and 65 years.  
Participants were recruited via a telephone survey of a sample of houses selected by random digit dialing. | 68% women  
Mean age (range): 57 (NR) years  
% Caucasian: NR | 25% tertiary educated  
Income: >$30,000 | Response rate NA (survey)  
Participants were not representative of the general population of the USA because the community in which the intervention took place had lower average income and educational attainment, and higher levels of obesity and heart disease deaths than the rest of the USA.  
Retention 72%. |
| Stewart et al, 33 1997, USA | Quasi-experimental design  
Intervention: group based exercise, support meetings, print materials, and telephone counseling to encourage participation in physical activity of the participant’s choice.  
Control: waitlist comparison.  
Participants were community dwelling seniors aged over 65 years.  
Proactive strategies (flyers, letters, and ads) were used to recruit participants from 2 low-income housing facilities. All interested people attending a meeting were invited to enroll and consent was solicited and using the community senior center. | 83% women  
Mean age (range): 77 (62–91) years  
91% Caucasian | % tertiary educated: NR  
Income: “lower income area” | Response rate 20%.  
Participants were generally representative of the population, but slightly more likely to be younger, have English as their second language and be overweight.  
Retention 94%. |

Abbreviations: NR, not reported.
The methodological quality of the studies was also evaluated according to 4 criteria consistent with CONSORT and Cochrane Review guidelines. These criteria included study design (randomized controlled trial or quasi-experimental study), randomization procedures, blinding of data collection staff to participant allocation and use of validated measurement tools.

**Results**

**Study Selection**

The structured Medline search of the 5 selected journals yielded 256 publications. These articles were reviewed by 2 independent reviewers to determine whether they met the inclusion criteria. Where there was no consensus between reviewers, a third reviewer determined the eligibility of the article for inclusion. The review process identified a total of 32 suitable reports of physical activity intervention studies. Excluded studies fell into one of 10 categories: 64 did not report on physical activity as an outcome, or did not target changes in physical activity; 27 addressed change in diet/nutrition along with physical activity; and 6 did not include a control or comparison group. Fifty-two studies were descriptive rather than experimental; 18 were review articles; and 15 were other study types (including feasibility and cost-effectiveness). Thirty-three studies targeted only men (n = 4) or women (n = 25), or conducted recruitment stratified by gender or ethnicity (n = 3), and 8 targeted children or adolescents. One study appeared twice in the search list and thus the duplicate was excluded.

**Methodological Quality**

Of the 32 studies, 17 were randomized controlled trials and 6 were randomized trials with a comparison rather than a control group. Of these 23 studies, 7 reported using unbiased randomization procedures. Twenty-four of the 32 studies reported using validated measurement tools and 7 reported that data collection staff were blind to allocation (Table 1).

**Participant Characteristics**

As summarized in Table 1, of the 32 studies reviewed, 18 reported an age range, with participants’ ages extending from 18 to 91 years. The mean age of participants across the 26 studies reporting on this variable was 51 years. The minimum mean age was 24 years and the maximum was 77 years. The mean age was 77 years.33

All 32 studies reported on gender. The percentage of women participants ranged from 32% to 86%, with the mean percentage across all studies being 66%. Twenty-four of the 32 studies recruited more women than men (ie, at least 56% women). Six studies recruited a relatively equal proportion of men and women (45% to 55% men or women), and 2 studies recruited more men than women (at least 56% men).34

Of the 32 studies, 18 reported on ethnicity, with the majority of participants in these studies being Caucasian. The mean percentage of Caucasian participants was 86%. The minimum percentage of Caucasian participants was 58% and the maximum was 97%. Only 4 studies reported recruiting a sample of mixed ethnicity (<80% Caucasian).

**Participant Characteristics by Intervention Setting**

Participant characteristics varied across the 4 intervention settings (Table 2). Participants in community-based physical activity intervention trials tended to be older, with 4 of the 7 trials specifically targeting an older population (≥40 years). In contrast, no workplace intervention trials targeted older adults and 1 specifically targeted younger adults.32 Participants in the workplace trials had a mean age of 43 years, compared with 67 years in community-based intervention trials. The mean ages of participants in health care and home-based intervention trials (54 and 47 years respectively) were comparable to the mean age of participants across all studies (51 years).

Overall, trials in all 4 settings recruited higher proportions of women than men. The workplace was the only setting in which a trial recruited more men than women. Home-based intervention trials were most likely to target an equal number of men and women while community-based intervention trials were most likely to recruit more women than men. The workplace was also the setting in which intervention trials most often targeted a healthy...
population. In contrast, community-based intervention trials targeted sedentary populations more than any other setting. Healthcare-based intervention trials were the only trials to recruit participants with 1 or more preexisting chronic diseases.

Of the 4 studies reporting mixed ethnicity among participants, 2 were community-based intervention trials,42,45 1 was healthcare-based, 46 and 1 was a workplace intervention trial (in this case, the sample comprised university students).32

Finally, worksite intervention trials appeared to recruit more-educated participants, with all reporting that the majority of participants had postcollege education. However, 5 of these studies (45%)32,44,47,52,53 recruited participants from universities, which may have lead to a biased selection of participants with a higher level of educational attainment. A lack of consistent reporting of educational attainment and income across the studies makes it difficult to compare indicators of socioeconomic position across study settings.

Response Rate, Retention and Participant Representativeness

Of the 32 studies reviewed, 18 provided sufficient information to calculate response rate (Table 3), with the average response rate being 58% and ranging from 20%52 to 89%.59

Reporting on representativeness varied across the studies and included comparisons between consenters and nonconsenters, as well as comments on the representativeness of the sample compared with the broader sociodemographic attributes of the relevant populations at community, state or national levels (Table 1). Overall, 20 studies reported on the representativeness of their samples. In the 12 studies that reported differences between the sample and the population from which they were drawn, participants were more likely to be women, Caucasian, more educated and more overweight than were nonparticipants.33,39,41,43–45,48,49,54,56,60,61 Participants were also more likely to be in semi- or unskilled work and were less likely to fall into the highest or lowest income categories.

Table 2 Physical Activity Intervention Trial Participant Characteristics by Intervention Setting

<table>
<thead>
<tr>
<th></th>
<th>Workplace (n = 10)</th>
<th>Healthcare (n = 8)</th>
<th>Home-based (n = 7)</th>
<th>Community-based (n = 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age, years (range)</td>
<td>42.8 (18–73)</td>
<td>53.5 (18–65)</td>
<td>47.4 (18–79)</td>
<td>67.2 (18–91)</td>
</tr>
<tr>
<td>% Women (range)</td>
<td>63.4% (32–86%)</td>
<td>67.2% (50–84%)</td>
<td>59.3% (46–76%)</td>
<td>72.7% (56–83%)</td>
</tr>
<tr>
<td>% Caucasian (range)</td>
<td>86.8% (61–79%)</td>
<td>86.3% (72–97%)</td>
<td>92.7% (92–94%)</td>
<td>81.0% (58–95%)</td>
</tr>
<tr>
<td>% Tertiary educated (range)</td>
<td>72% (66–100%)</td>
<td>70% (58–82%)</td>
<td>57% (36–78%)</td>
<td>45% (28–75%)</td>
</tr>
<tr>
<td>Target population</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Well</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sedentary</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>Chronic illness</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Well</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sedentary</td>
<td>4</td>
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<td>8</td>
</tr>
<tr>
<td>Chronic illness</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Thirty studies provided sufficient information to calculate participant retention (Table 3). Retention rates ranged from 55%61 to 97%39 with an average of 78%. Seventeen studies reported on the characteristics of those retained compared with those who dropped out or were lost to follow-up. Across the 10 studies that reported a difference, certain characteristics appeared to be more typical of either completers or noncompleters.35,36,38,40,42,45,46,51,52,61 A higher proportion of noncompleters were employed full-time while more completers were not in employment.42,51 Completers who were employed were often in white-collar occupations, suggesting a higher level of educational attainment.41 Conversely, a high proportion of noncompleters reported lower levels of educational attainment.46 Completers tended to be older with more completers than noncompleters were over 60 years of age.36,61 Finally, higher proportions of completers than noncompleters were already physically active and were nonsmokers.41,61

Response Rate, Retention, and Participant Representativeness by Intervention Setting

Five out of 736,38,40,48,59 home-based intervention trials reported on with the mean response rate being 68% (41% to 89%; Table 3). For healthcare intervention trials, 7 out of 8 studies reported response rate,37,39,43,46,54,60,61 with a range from 31% to 80% and a mean of 60%. Only 4 of the 10 workplace intervention trials reported on this variable; and this setting recorded the lowest mean response rate (49%). It was not possible to determine population response rate for 4 of the 7 community-based intervention trials because data were collected from randomly selected samples of individuals exposed to an intervention.38,45,49,56

Reporting on representativeness was most complete for community-based and healthcare intervention trials, while less than half of the workplace and home-based intervention trials reported on the representativeness of the samples recruited. It is difficult to draw conclusions on which study setting was best able to recruit a representative sample of participants, due to the lack of consistency in reporting on this variable.
appeal more to men. Highlight the need for trials of interventions that might differential intervention effects based on gender, and in men. These findings demonstrate the potential for advice, was found to be more effective in women than and telephone counseling, above and beyond provider gender, such that the addition of health educator advice promotion interventions. Although our review excluded less likely than women to enroll and be engaged in health trials. The vast majority of participants across studies were Caucasian, and while difficult to quantify given the 4 intervention settings (Table 3). Mean retention was 81% in community-based intervention trials, 79% in home-based, 78% in healthcare-based, and 76% in workplace intervention trials.

### Conclusions

Through examining research reports on physical activity intervention trials published between 1996 and 2006 in 5 empirically-selected preventive medicine and health behavior journals, this review has determined the extent to which certain types of adults are recruited and retained as participants in particular types of physical activity intervention trials. It is clear that there is significant bias in the characteristics of participants in physical activity intervention trials. The vast majority of participants across studies were Caucasian, and while difficult to quantify given inconsistent reporting, the findings broadly suggest that most had postsecondary education and earned above the average income. This review also provides empirical evidence of the disproportionate participation by women in physical activity intervention trials. In 75% of the studies reviewed, the majority of participants were women.

Previous research has demonstrated that men are less likely than women to enroll and be engaged in health promotion interventions. Although our review excluded studies that targeted men or women specifically, the database search for relevant articles revealed just 4 interventions that recruited only men, while 25 recruited women only. In the trials reviewed, the workplace was the only setting in which more men were recruited than women. This is not surprising, given that more men than women tend to be in full-time employment. Interestingly, 3 of the 4 excluded men-only studies met the criteria for a workplace-based intervention. One of the few studies with adequate statistical power to compare intervention outcomes by gender was the Activity Counseling Trial (ACT), a multicenter trial of physical activity counseling in primary care. The ACT reported a significant effect of gender, such that the addition of health educator advice and telephone counseling, above and beyond provider advice, was found to be more effective in women than in men. These findings demonstrate the potential for differential intervention effects based on gender, and highlight the need for trials of interventions that might appeal more to men.

Overall, participation of non-Caucasian adults in physical activity intervention trials was limited, making it difficult to determine whether a particular intervention setting was associated with greater ethnic minority-group participation. Certain intervention settings may have advantages over others in recruiting participants of diverse ethnicity. It has been suggested that healthcare settings may have the potential to recruit more ethnically diverse participants by identifying potential participants using electronic medical records searches. Recent trials have also shown that it is possible to recruit more diverse samples when targeting blue-collar worksites. Recruitment of non-Caucasian participants may also be more successful in community-based settings, as these interventions have the potential to address environmental barriers to physical activity; this may be particularly important for ethnic minority-groups residing in low-SES areas. Of the 4 studies that recruited participants of mixed ethnicity (<80% Caucasian), 2 were community-based, 1 took place in a healthcare setting, and 1 was workplace-based. These studies used strategies that may favor recruitment of ethnically diverse participants, including targeting areas with a high ethnic minority population, employment of ethnically diverse physicians, face-to-face support, and buddy programs. Results suggest that home-based interventions (eg, those not recruiting in defined settings such as the workplace or healthcare settings) may be the least successful in recruiting participants from ethnic minority-groups. This may be because most home-based interventions used print media to recruit participants (eg, newspaper advertisements, mail-outs)—forms of recruitment that may attract fewer ethnic minority participants.

Participant response rate and representativeness were not reported systematically across the studies, despite their importance in determining the extent to which research can inform translation into practice. The average response rate of interventions was 58%, with participants more likely to be women, Caucasian, more educated, and more overweight than nonparticipants. Response rate was highest for home-based interventions, consistent with studies suggesting a strong preference for interventions that participants can do on their own. Comparisons of participant representativeness across study settings suggest that a higher proportion of participants in workplace and healthcare-based interventions are healthy, educated, middle-high income earners compared with participants in community- or home-based interventions. Thus, while these settings have the potential

### Table 3 Physical Activity Intervention Trial Response Rate and Retention by Intervention Setting

<table>
<thead>
<tr>
<th>Intervention Setting</th>
<th>Workplace (n = 10)</th>
<th>Healthcare (n = 8)</th>
<th>Home based (n = 7)</th>
<th>Community based (n = 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response rate (range)</td>
<td>48.7% (20.3–78%)</td>
<td>59.9% (31.4–79.9%)</td>
<td>68.3% (40.6–89.1%)</td>
<td>47% (20–75%)</td>
</tr>
<tr>
<td>Number reporting (%)</td>
<td>4 (40%)</td>
<td>7 (88%)</td>
<td>5 (71%)</td>
<td>2 (28%)</td>
</tr>
<tr>
<td>Retention (range)</td>
<td>76.2% (57–94%)</td>
<td>78.2% (55–97%)</td>
<td>78.5% (65–94%)</td>
<td>81% (62–94%)</td>
</tr>
<tr>
<td>Number reporting (%)</td>
<td>10 (100%)</td>
<td>7 (88%)</td>
<td>7 (100%)</td>
<td>6 (86%)</td>
</tr>
</tbody>
</table>
for greater recruitment of disadvantaged subgroups, our findings suggest that to achieve this, it will take targeted recruitment strategies in these settings.

Retention was above 75% across all intervention settings, and did not differ substantially by setting. However, participants lost to follow-up were disproportionately representative of the population groups bearing the greatest burden of disease related to physical inactivity, and who arguably are most in need of such interventions; this includes those who are less-educated, in semiskilled occupations, under 60 years of age, less active, and who smoke.

A challenge in evaluating whether particular types of interventions appeal more to certain subgroups, and a limitation of this review, is the difficulty of separating the influence of intervention settings from that of intervention delivery modalities (eg, provider advice, tailored print, telephone) and intervention characteristics (eg, intensity and duration). It is possible that some combinations of settings and intervention modalities may have a greater impact on response rate, representativeness, and retention than would the intervention setting alone. Complex trials would be required to address such potential interactions.

In this ‘snapshot’ of physical activity intervention trials conducted since 1996, we have found empirical evidence supporting earlier observations that the majority of participants are middle-aged, Caucasian women. In addition, this review provides an overview of broader biases that extend to ethnicity and socioeconomic status. Intervention setting appears to have some impact on who participates; a distinct finding to emerge was that participants in workplace interventions tended to be younger, more educated, and healthier, while those in community-based interventions were older and more ethnically diverse. Our overall pattern of findings further emphasizes the need for future research to develop and evaluate physical activity interventions that appeal to men and those ethnic-minority, low-income, and less-educated groups who bear the highest burden of chronic disease related to physical activity.

References


