Community Fitness Center-Based Physical Activity Interventions: A Brief Review

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Abstract
Sedentary lifestyle is associated with cardiovascular and metabolic diseases. A compelling body of evidence demonstrates the amelioration and prevention of such conditions with increased levels of physical activity (PA). Despite this evidence, many public health initiatives aimed at increasing PA have failed to demonstrate clinically relevant effects on public health. It has been hypothesized that the highly controlled environments in which PA and health research is conducted limits its replicability in real-world community settings. This review aimed to evaluate the effectiveness of community fitness center-based interventions on inactivity-related diseases in adults. Data from 11 investigations highlighted 3 factors: 1) a lack of community-based PA studies, 2) a lack of clinically relevant data, and 3) further reliance on self-report and rudimentary measurements. It is concluded that the current laboratory-based evidence for PA and health is to be replicated yet in real-world settings and that rigorous and clinically relevant naturalistic research is required.

Introduction

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Type 2 diabetes, cardiovascular diseases, colon cancer, breast cancer, dementia, and depression have been associated with an inactive lifestyle (31,34). Such disorders place a substantial burden on the resources and finances of health agencies (36). Increases in physical activity (PA) can contribute substantially and significantly to the prevention and management of such conditions (32) while reducing health care costs. Schemes designed to promote PA have been established in many countries, for example, Exercise is Medicine® in the United States (4), Change4Life in the United Kingdom (14), and Getting Australia Active (3). Rates of inactivity-related disease, however, continue to rise in the United Kingdom (36) and in the whole world (23), suggesting that PA levels remain insufficient.

Recent reports (*e.g.*, European Health and Fitness Association, 2010) have called on fitness centers to become "community hubs for PA promotion and exercise." Exercise referral schemes, whereby patients are referred by their general practitioner (GP) to programs within local fitness centers, have been proposed as an effective way of promoting PA and managing chronic conditions (42). There is, however, uncertainty regarding the effectiveness of such schemes (30), specifically whether they are an efficient use of resources for sedentary people with or without a medical diagnosis (30). GP referral schemes have not led yet to significant improvements in health conditions or long-term behavior changes (27) or to increases in PA levels (26).

Given the evidence presented in major reviews (32,42,46) and in position stands issued by professional bodies (8,11), there is little doubt among researchers, policy makers, and practitioners that PA leads to improvements in health and a reduction in risk factors. However on the basis of the mentioned evidence, there appears to be a problem in converting the findings of research into large-scale interventions that make real impacts on public health.

The translation of evidence-based research findings into practice that is implemented effectively, appropriately, and widely has been described as one of the greatest challenges facing health promotion and disease prevention (19,38). It has been hypothesized that the controlled environments in which much research into PA and health is conducted reduce its transferability into community settings (12) and that if more research was conducted in real-world environments, the resultant data would have more relevance to, and application in, public health. Hohmann and Shear (15) suggest that the setting of research should be applicable to its delivery setting in the real world and that participants must be representative of those who need the "treatment" being proposed most. Community-based intervention trials test a treatment intervention (such as those

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Table 1.
Article selection criteria.

Selection Criteria
• Article published between January 1, 1975, and January 22, 2013
• Physical activity/exercise intervention located or delivered from a community fitness center
• Measurement before and after intervention
• Clinically relevant measures of health

exercise interventions described previously) but in the context of community-based delivery, *i.e.*, the way in which such interventions would be accessed in the real world. These trials, in order to provide meaningful information for community clinical practice, must take into account many factors that are controlled, or are not considered, in traditional clinical trials. The real-world delivery of PA interventions in the community is often from within fitness centers.

The aim of this review, therefore, was to assess the evidence for the impact of community fitness center interventions on inactivity-related diseases in adults. This is not an evaluation of exercise referral schemes but of peer-reviewed and published research conducted in the community setting.

How Much Research Has Been Conducted in Community Fitness Center Centers?

PubMed searches (article selection criteria are presented in Table 1) were conducted for search terms detailed in Tables 2 and 3. Articles were screened by title, then by abstract, and finally by a full reading of the article, if required. Articles were included only if the PA intervention was delivered in or from a community fitness center. Examples of articles excluded are those in which the intervention was administered from locations such as clinical research units (7), human performance laboratories (9), clinical centers (13), outpatient clinics (2), university medical centers (16,37), biomedical research centers (21), university research centers (24), or the applied physiology section of a university exercise facility (45). Articles also were excluded if they were not in English (22,33) or if the target cohort was children (35). The inclusion of the study of Dunn *et al.* (10), conducted within the Cooper Fitness Center and linked with the Cooper Institute and Clinic and hosts of many large and widely cited studies in PA (41,48), was considered borderline. However the facility is run as a community fitness facility, in a way similar to the Ohio State University Center for Wellness and Prevention (16), also a "borderline" inclusion.

Searches for only titles and abstracts (Table 2) located only three articles (5,17,40). The study of Suchánek *et al.* (40) focused on gene polymorphism and falls outside the public health spectrum in this case. Both Jolly *et al.* (17) and Boyce *et al.* (5), however, reported relevant findings. Searches were widened to include all fields, and 1,225 articles were located. The number of articles about implementing community-based PA/exercise interventions from fitness centers still was limited — only 11 met the inclusion criteria (Table 3). This evidence is presented in a later section and detailed in Table 4.

Research Into the Real World Delivery of Exercise

It is evident that few articles report research conducted in community fitness facilities. Of the 1,225 articles identified, only 22 were relevant or required reading to identify the setting of the intervention. However the 11 articles to be described later provide an insight into the evidence base for community-based interventions.

Jolly *et al.* (17) compared several commercial and primary care weight loss programs on a sample of 740 overweight men and women in the United Kingdom. Each was 12 wk in duration. Programs included the commercially available products Weight Watchers, Slimming World, and Rosemary Conley and GP- and pharmacy-led counseling sessions. A comparison group was provided with vouchers for 12-wk access to a local fitness facility. The primary outcome variables were weight loss at 12 wk and at 12-month follow-up. All interventions resulted in significant weight reduction at 12 wk, and all barring the GP- and pharmacy-led counseling maintained this reduction at 12 months. Only "Weight Watchers" was associated with significant increases in PA and decreases in body mass relative to the comparison group.

PA and body mass were the outcome variables in the study of Boyce *et al.* (5). The authors monitored call center staff during their first 8 months of work. Questionnaire data relating to weight, height, PA, and body part discomfort were collected from 393 employees. The study reported substantial weight gains — 68% gained an average of 0.9 kg·month^{-1} (which may have been an underestimate, given unreliable self-reporting of body mass especially among the obese (47)). Perhaps counterintuitively, it was reported that fitness center members experienced significantly greater body mass index (BMI) and weight gains over the period than those experienced by nonmembers

Table 2.
Articles located during initial searches — title and abstract.

Search Terms	Articles Located	Relevant Articles
Fitness center and insulin sensitivity	0	0
Fitness center and blood pressure	0	0
Fitness center and cholesterol	0	0
Fitness center and obesity	3	2

Table 3.
Articles located during secondary searches — all fields.

Search Terms	Articles Located	Relevant Articles	Final Articles
Fitness center and insulin sensitivity	171	1	1
Fitness center and blood pressure	373	8	3
Fitness center and cholesterol	208	4	2
Fitness center and obesity	473	9	3

Table 4.
Details of interventions reviewed.

Lead Author (Year)	Sample Size	Sample Characteristics	Study Type	Delivery Location	Intervention	Outcome Measure	Effect
Jolly (2011) (17)	740	Overweight men and women	RCT	Primary care/ community groups, inc. fitness center, Birmingham, United Kingdom	Commercially available weight loss programs, fitness center access, and primary care	Body weight	Commercial, 2.3-kg greater loss than that in primary care ($P = 0.004$); all groups stat sig.* decrease ranging from Weight Watchers (4.4 kg) to general practice (1.4 kg). FC use, 2.01 kg.
Boyce (2008) (5)	393	Call center employees	Pre-post	Call center — South Eastern United States	Questionnaires repeated after 8 months — no direct intervention	Body weight, PA levels, fitness center membership and injuries	Weight gain over 8 months, 5.1 kg*; PA associated with no weight gain; fitness center members (6.3 kg) increased weight more than nonmembers (4.3 kg)*
Mathieu (2008) (25)	39	With type 2 diabetes or insulin resistant or family history of type 2 diabetes	Pre-post	Sports Center — Montreal, Canada	10-wk individualized home-based program including one supervised PA session per week that included a lecture	PA levels, aerobic capacity, strength, dynamic balance, anthropometry, and CV risk factors	Increase in PA (effect size, 0.55), strength (0.31), aerobic capacity (0.28), and dynamic balance (0.28); reduction in body fat (0.58) and resting heart rate (0.48)
Kreuzfeld (2013) (20)	119	Unemployed workers	Pre-post	Lectures — training center; PA — fitness center, Rostock, Germany	3-month intervention; lectures to enhance individual health competence; two weekly group exercise sessions combining endurance and resistance training	Physical fitness, blood pressure, body composition, depression, and back pain	Reduction in blood pressure (systolic, $P = 0.016$; diastolic, $P < 0.01$), % body fat ($P = 0.017$), and depression ($P = 0.028$); increase in $\dot{V}O_{2max}$ ($P = 0.002$); back ache reduced by 50%*.
Dunn (1997) (10)	235	Sedentary adults	Quasi-experimental	Cooper fitness center, Texas	6 months — structured gymnasium-based exercise program in comparison with lifestyle physical activity counseling	Lipid profile, blood pressure, body composition, and maximal METs	Mean change — STRUC vs LIFE: total cholesterol, −0.3* vs −0.2* mM; LDL cholesterol, −0.2* vs −0.1* mM; SBP, −1.8* vs −3.2* mm Hg; DBP, −2.2* vs −2.2* mm Hg; % body fat, −1.7%* vs 1.4%*; maximum METs, 1.1* vs 0.4* $kcal \cdot kg^{-1} \cdot hr^{-1}$

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Table 4 *(Continued).*

Lead Author (Year)	Sample Size	Sample Characteristics	Study Type	Delivery Location	Intervention	Outcome Measure	Effect
Van Roie (2010) (44)	186	Sedentary older adults	RCT	Specific location not reported — Leuven, Belgium	11 months — structured gymnasium-based exercise in comparison with home-based PA program and control	Functional performance, cardiorespiratory and muscular fitness, and CV risk	Mean change — STRUC vs LIFE: $\dot{V}O_2$, 4.5* vs 3 mL•kg^{-1}•min^{-1}; time to exhaustion, 68.7* vs 33.8 s; static strength, 17.1* vs 7.1 N•m; dynamic strength, 6.2* vs 1.6 N•m; SBP, −4.9 vs −9.3* mm Hg; DBP, −5.5* vs −6.4* mm Hg; TOT, −15.6 vs −4.1 mg•dL^{-1}; LDL, −2.8 vs −12 mg•dL^{-1}
Brehm (2005) (6)	157	Sedentary adults	RCT	Sports club — Erlangen, Bavaria, Germany	12 months — seven-sequence exercise following FITT recommendations in comparison with active and nonactive controls; intervention group was divided into high, low, and no risk	Blood pressure, blood glucose, cholesterol, and BMI	Intervention, high risk: mean reductions — SBP, −19.83* mm Hg; DBP, −19.50* mm Hg; GLU, −17.25* mg•dL^{-1}; total cholesterol, −37.88* mg•dL^{-1}; LDL, −26.12* mg•dL^{-1}; TRI, −114* mg•dL^{-1}; BMI, −0.45* kg•m^{-2}
Graffagnino (2006) (12)	418	Overweight or obese adults	Pre-post	Medical wellness facility, Columbus, OH	6 months — access to exercise physiologists and dieticians — ability to exercise at home or at a center	Body weight, cholesterol, and blood glucose	Mean change: total cholesterol, −12.1 mg•dL^{-1}*; LDL, −9.6 mg•dL^{-1}*; HDL, −1.7 mg•dL^{-1}*; TRI, −21.7 mg•dL^{-1}*; GLU, −3.6 mg•dL^{-1}*
Tworoger (2003) (43)	173	Postmenopausal overweight or obese women not receiving hormone replacement therapy	Quasi-experimental	Exercise training facility, Seattle, WA	1 yr — moderate-intensity (60% to 75% HR_{max}); aim five times per week; first 3 months — three supervised exercise sessions and two at home; second 9 months — one to three sessions in facility, the remainder at home	Sleep quality or amount, $\dot{V}O_{2max}$, and BMI	Exercising for 225 min•wk^{-1} is associated with less trouble sleeping when compared with less than 180 min; 12% increase in $\dot{V}O_{2max}$*; BMI was reduced by 0.3 kg•m^{-2}*

Kaats (1998) (18)	200	Healthy (no underlying chronic conditions); male and female participants	RCT	Bally's Total Fitness — Huntington Beach/Long Beach, CA	EX, micro and macro dietary supplements were provided; exercise three times per week; 5-min warm-up, 30-min AE and two sets of RT — supervised	Body composition and lipid profile	Mean change, EX vs CON: body weight, −1.7 vs 0.1 lb; body fat, 6.1 vs 0.9 lb; fat-free mass, 4.5 vs 0.8 lb. % decrease, EX vs CON: TOT, 6.5 vs no change; LDL, 11.1 vs 0.7.
Nishijima (2007) (28)	561	40 to 89 yr old; two of three conditions — hypertension, hyperlipidemia, glucose intolerance	RCT	Sapporo Fitness Center, Sapporo, Japan	EX, 6 months — eight individualized training sessions with an exercise professional; two to four unsupervised fitness center sessions (mean, 2.6)	Primary outcomes — LDL, SBP, and HbA1c; secondary outcomes included hsCRP and $\dot{V}O_{2max}$.	Mean change, EX vs CON: SBP, −8.3 vs 6.17 mm Hg; LDL, −3.99 vs −1.65 mg•dL^{-1}; HbA1c, −0.023% vs −0.035%; hsCRP, (log-transformed), −0.111 vs −0.039; $\dot{V}O_{2max}$, 2.42 vs 0.35 mL•kg^{-1}•min^{-1} (no pre or post *P* value reported)

*$P < 0.05$, all comparisons before and after intervention.

CON, control condition; EX, exercise condition; DBP, diastolic blood pressure; LIFE, lifestyle intervention; MET, metabolic equivalent of task; RCT, randomized controlled trial; SBP, systolic blood pressure; STRUC, structured exercise intervention; TOT, total cholesterol; TRI, triglycerides.

(the authors make no reference to rates of fitness center attendance or usage).

Mathieu *et al.* (25) designed and piloted a 10-wk exercise program for health and exercise professionals working in Type 2 diabetes (T2D). The program involved one weekly supervised exercise session and an individual home-based training session. It was conducted among 39 participants with T2D — 29 completed — and no controls participated. Supervised sessions included a 15-min lecture on health improvement before 60-min PA and a 15-min review of the previous week. Aerobic, resistance, and flexibility trainings all were covered in both the supervised and home-based sessions. PA levels were self-reported through telephone. Significant increases in PA were reported at 10 wk and maintained at 6-month follow-up. Aerobic capacity, grip strength, high-density lipoprotein (HDL) cholesterol, body weight, waist circumference, and systolic blood pressure all improved between baseline and at 10 wk (but were not measured at 6 months). Data highlight the benefits to health of only one session a week with an exercise professional who is able to initiate and monitor behavior change.

A similar process was implemented by Kreuzfeld *et al.* (20) with long-term unemployed workers (n = 119). Participants were referred to the program by a job training center, and they attended a lecture on the benefits of a healthy lifestyle as well as training in a fitness studio. A combined endurance and strength training protocol was conducted in groups of 12 twice a week for 8 wk. Following the structured training period, participants were able to continue exercising free of charge but on a self-guided basis. Significant improvements in physical fitness, blood pressure, and body composition were reported following the initial intervention. Significant reductions in depression and chronic backache were reported by over 50% of participants (two factors that are linked often with long-term unemployment). All improvements were maintained at 6 months, although no further improvements were made.

Dunn *et al.* (10) compared PA counseling (PAC), aimed at increasing PA levels and improving dietary and lifestyle choices, with a supervised structured exercise program. All participants (n = 235) lived within 10 miles of the Cooper Fitness Center (Texas) and were recruited via posters, newspaper advertisements, and others. It was reported that PAC and the structured exercise program were equally effective at improving cardiorespiratory fitness, total cholesterol levels, and blood pressure after 6 months.

Van Roie *et al.* (44) reported that both lifestyle counseling and structured exercise interventions improved cardiovascular risk factors to similar extents in elderly participants (n = 186) over an 11-month period. Cardiorespiratory and muscular fitness, however, improved to greater levels with structured exercise. The structured exercise not only was supervised, but the fitness center also was open only to study participants (arguably decreasing its ecological validity). It was hypothesized that observed improvements would subside in the 12 months following the intervention in participants who completed the exercise program but would be maintained in the lifestyle counseling group. This was found to be the case at 12-month follow-up (29). At 23 months, however, both groups still showed improvements from baseline.

Brehm *et al.* (6) implemented a 12-month structured exercise intervention with a 12-month follow up in a German sports club (n = 157). The structured program involved one class for 90 min•wk^{-1}, incorporating exercise, games, relaxation techniques, and general health and fitness information. Adherence was 84% (n = 117) over the first 12 months, and at the 12-month follow-up, 80% of these were still active within the club. Participants had been offered a continuation of the program or other similar activities upon completion of the first year and consequently had the opportunity to maintain their activity levels in a familiar environment (previous exercise referral schemes had been criticized for not providing participants with a clear exit pathway (30)). While there is a strong chance that the positive effects of the initial 12 months were maintained in those still engaged, this was not examined.

Graffagnino *et al.* (12) reported a study in which a hospital community medical wellness facility hosted an intervention aimed at reducing body weight and cardiovascular risk factors. Participants paid an enrollment fee of $350 and $130 per month for the duration of the intervention (6 months). They had access to exercise physiologists and dietitians for 10 min•wk^{-1} of sessions for counseling and dietary advice. At 6 months, mean body mass was reduced by 7.3% in men and 4.7% in women. Significant reductions in fasting blood lipids and glucose levels were observed, as well as significant correlations between percentage of weight loss, number of sessions attended with experts, and the number of times the exercise facility was used. Although this investigation was conducted in a community facility, it was very expensive, and even with the availability of expert advice, the dropout rate was very high — 53% of the 418 participants — suggesting a lack of sustained behavior change.

Tworoger *et al.* (43) reported an intervention aimed at helping postmenopausal women (n = 173) achieve 5 sessions of moderate-intensity exercise (60% to 75% HR_{max}) per week for 1 year. For the first 3 months, participants attended 3 supervised sessions a week and completed a further 2 at home. For the final 9 months, this was reduced to between 1 and 3 supervised sessions per week, with the remainder completed at home. PA levels increased throughout the intervention, with those reporting at least 225 min•wk^{-1} of exercise reporting greater improvements in sleep quality (primary outcome) than those completing less than 180 min. PA data were collected via daily activity logs. A mean improvement of 12% in cardiorespiratory fitness suggests a large training effect. Therefore there was undoubtedly a positive impact on health, suggesting that initial high supervision and gradual handing over may be an effective method to initiate behavior change.

Nishijima *et al.* (28) approached supervision slightly differently in the Sapporo Fitness Club Trial. Participants (n = 561) attended 8 individually supervised exercise sessions spread throughout the 6-month intervention period. Other than these sessions, participants were asked to attend the fitness center 2 to 4 times each week on their own. Participants attended an average of 2.6 sessions per week. Supervised sessions consisted of bicycle exercise at 40% predicted $\dot{V}O_{2max}$ combined with resistance training (2 sets of 20 repetitions). Each exercise session lasted 60 to 90 min. Reductions in key outcome variables of systolic blood pressure, low-density lipoprotein (LDL) cholesterol, and glycated hemoglobin were reported in relation to those in controls, although only systolic blood pressure reached significance. Significant between-group differences also were observed in body weight, waist circumference, diastolic blood pressure, and triglycerides. Dropout rate was only 11%, *i.e.*, 249 of 281 participants completed the exercise intervention, an impressive percentage considering the limited supervision.

A commercial fitness program (Bally Total Fitness) was compared with a control condition (unstructured fitness center use) in a study by Kaats *et al.* (18). Body composition was the primary outcome variable. While only small between-group differences were observed in body mass, a significant difference in fat mass was reported, the fitness program resulting in a 6.1-lb fat loss compared with 0.9 lb in controls, while fat-free mass increased significantly in experimentals.

Limitations and Implications of Current Literature

The articles mentioned provide insights into the effectiveness of community PA interventions. Interventions generally are reported as successful, and several common themes emerge. For example, it is evident that supervised PA is associated with desirable outcomes. However while many of the studies report interventions that begin with supervised sessions, moving to a less supervised and more client-autonomous model, the data of Nishijima *et al.* (28) suggest that spreading the same level of supervision throughout the process as opposed to "front-loading" it may maintain engagement. Additionally the presence of postprogram follow-up sessions may increase retention and maintain PA levels. Lifestyle and home-based interventions such as those by Van Roie *et al.* (44) and Tworoger *et al.* (40) also increased PA over extended periods, reduced cardiovascular risk, and increased cardiorespiratory fitness.

There are, however, issues with the reliability of several of the studies. Self-report data might be influenced by a number of sources of bias/error, for example, participants' perceptions of what the researchers want to hear. In fact, the unreliable nature of self-reported PA was emphasized in the British Heart Foundation 2012 report (1), suggesting that while 39% and 29% of male and female participants, respectively, self-reported achieving recommended levels of PA, accelerometer data indicated that only 6% and 4%, respectively, actually did so. Related to this, the false reporting of other data, for example, body weight, is common (47). Body weight data, of course, are subject to short-term fluctuations, driven by the knowledge that weight assessment is imminent.

Issues relating to the unreliability of measurement in intervention groups of course can be controlled in studies on PA. However the lack of a control group in many of the studies mentioned is notable and in several cases renders it problematic to attribute reliably the observed effects to interventions.

Participants who volunteer for PA interventions often are motivated to change, arguably aiding in the success of interventions (10). This might impact positively upon engagement with any intervention, at the same time limiting the applicability of the findings to less motivated cohorts. Likewise the reliability of questionnaire-based analysis is a function of the sample that respond, a sample often characterized by certain psychosocial traits (for example, people motivated to exercise also might be more motivated to respond to the survey). An example of typical response rates was provided by Boyce *et al.* (5), who distributed over 1,100 surveys and met with a response rate of 33%.

Body mass is a measurement reported widely in the studies mentioned. It is, however, a crude measure that may mask clinically significant changes in lean or fat mass associated with, for example, strength training (39). Body composition analysis might have provided more clinically relevant information. Additionally and in relation to this, there are examples of questionable logic or *ad hoc* hypotheses regarding body mass gains; for example, Boyce *et al.* (5) suggested that the observed weight gain in their study might have resulted from resistance training despite the fact that the level of muscle gain in question — almost 1 kg•month^{-1} — would be challenging to achieve and require high levels of resistance training, which appeared unlikely in the population in question.

Conclusions

The studies mentioned highlight several factors: the paucity of published research in this area, the lack of clinically relevant data, and reliance upon self-report that provides little categorical insights into the effectiveness of public health interventions.

Kaats *et al.* (18) noted in 1998 that although almost every fitness or athletic club offers weight loss and fitness programs, very few provide information relating to their effectiveness. This is arguably still the case today. Of course, such information might exist, but it remains unpublished as the result of commercial factors or publication bias. However it is likely that in the majority of cases, the tools of measurement and the controls required for rigorous program evaluation are simply not common in fitness centers. Worst still, such rigorous evaluation often is not seen as worthwhile.

From a public health perspective, however, reliable information regarding the effectiveness of PA programs is crucial. The programs described previously are often the first port of call for individuals wishing to begin exercising. It is essential, therefore, that interventions are associated unambiguously with clinically relevant benefits. This is, perhaps, especially true, given the marketing of such products, which often suggests that it is effective despite the lack of empirical evidence supporting this claim.

The previous discussion demonstrates that relatively little research has examined the delivery of public health interventions from community fitness centers. This might hamper the administration of public health and exercise referral interventions aimed at increasing PA and managing or preventing the onset of inactivity-related disorders. It is not feasible to expect the same results found within highly controlled laboratory environments in programs delivered by community centers; in fact, the previously mentioned data suggest that attempts to replicate such controlled environments in the community might limit the effectiveness of interventions. It is imperative that there be an improvement in the measurement and evaluation of real-world PA initiatives. Such measurement or evaluation must be clinically relevant, rigorously evaluated, and peer-reviewed.

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References

1. British Heart Foundation Physical Activity Statistics 2012. British Heart Foundation Health Promotion Research Group. Department of Public Health, University of Oxford.
2. Balducci S, Zanuso S, Nicolucci A, *et al.* Effect of an intensive exercise intervention strategy on modifiable cardiovascular risk factors in subjects with type 2 diabetes mellitus: a randomized controlled trial: the Italian Diabetes and Exercise Study (IDES). *Arch. Intern. Med.* 2010; 170: 1794–803.
3. Bauman A, Bellew B, Vita P, *et al. Getting Australia Active: Towards Better Practice for the Promotion of Physical Activity.* Melbourne (Australia): National Public Health Partnership; 2002.
4. Blair S, Diehl P, Massarini M, Sarto P, Sallis R, Searle J. *Exercise is Medicine.* A quick guide to exercise prescription. Technogym Medical Scientific Department 2010.
5. Boyce RW, Boone EL, Cioci BW, Lee AH. Physical activity, weight gain and occupational health among call centre employees. *Occup. Med. (Lond).* 2008; 58:238–44.
6. Brehm W, Wagner P, Sygusch R, *et al.* Health promotion by means of health sport — a framework and a controlled intervention study with sedentary adults. *Scand. J. Med. Sci. Sports.* 2005; 15:13–20.
7. Dobrosielski DA, Gibbs BB, Ouyang P, *et al.* Effect of exercise on blood pressure in type 2 diabetes: a randomized controlled trial. *J. Gen. Intern. Med.* 2012; 27:1453–9.
8. Donnelly JE, Blair SN, Jakicic JM, *et al.*; American College of Sports Medicine. Position Stand: appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Med. Sci. Sports Exerc.* 2009; 41:459–71.
9. Donnelly JE, Jacobsen DJ, Heelan KS, *et al.* The effects of 18 months of intermittent vs. continuous exercise on aerobic capacity, body weight and composition, and metabolic fitness in previously sedentary, moderately obese females. *Int. J. Obes. Relat. Metab. Disord.* 2000; 24:566–72.
10. Dunn A, Marcus BH, Kampert JB, *et al.* Reduction in cardiovascular disease risk factors: 6-month results from Project Active. *Prev. Med.* 1997; 26:883–92.
11. Garber CE, Blissmer B, Deschenes MR, *et al.*; American College of Sports Medicine. Position Stand: quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. *Med. Sci. Sports Exerc.* 2011; 43:1334–59.
12. Graffagnino CL, Falko JM, La Londe M, *et al.* Effect of a community-based weight management program on weight loss and cardiovascular disease risk factors. *Obesity (Silver Spring).* 2006; 14:280–8.
13. Green JS, Stanforth PR, Rankinen T, *et al.* The effects of exercise training on abdominal visceral fat, body composition, and indicators of the metabolic syndrome in postmenopausal women with and without estrogen replacement therapy: the HERITAGE family study. *Metabolism.* 2004; 53:1192–6.
14. Hancock C. Change4life campaign. *Lancet.* 2009; 373:721.
15. Hohmann AA, Shear MK. Community-based intervention research: coping with the "noise" of real life in study design. *Am. J. Psychiatr.* 2002; 159:201–7.
16. Jakicic JM, Tate DF, Lang W, *et al.* Effect of a stepped-care intervention approach on weight loss in adults: a randomized clinical trial. *JAMA.* 2012; 307:2617–26.
17. Jolly K, Lewis A, Beach J, *et al.* Comparison of range of commercial or primary care led weight reduction programmes with minimal intervention control for weight loss in obesity: lighten Up randomised controlled trial. *BMJ.* 2011; 343:d6500.
18. Kaats GR, Keith SC, Pullin D, *et al.* Safety and efficacy evaluation of a fitness club weight-loss program. *Adv. Ther.* 1998; 15:345–61.
19. Kerner J, Rimer B, Emmons K. Introduction to the special section on dissemination: dissemination research and research dissemination: how can we close the gap? *Health Psychol.* 2005; 24:443–6.

20. Kreuzfeld S, Preuss M, Weippert M, Stoll R. Health effects and acceptance of a physical activity program for older long-term unemployed workers. *Int. Arch. Occup. Environ. Health*. 2013; 86:99–105.

21. Larson-Meyer DE, Redman L, Heilbronn LK, *et al*. Caloric restriction with or without exercise: the fitness versus fatness debate. *Med. Sci. Sports Exerc*. 2010; 42:152–9.

22. Lee KJ. Effects of an exercise program on body composition, physical fitness and lipid metabolism for middle-aged obese women [in Korean]. *Taehan. Kanho. Hakhoe. Chi*. 2005; 35:1248–57.

23. Lozano R, Naghavi M, Foreman K, *et al*. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012; 380:2095–128.

24. Martins C, Kulseng B, King NA, *et al*. The effects of exercise-induced weight loss on appetite-related peptides and motivation to eat. *J. Clin. Endocrinol. Metab*. 2010; 95:1609–16.

25. Mathieu ME, Brochu M, Béliveau L. DiabetAction: changes in physical activity practice, fitness, and metabolic syndrome in type 2 diabetic and at-risk individuals. *Clin. J. Sport Med*. 2008; 18:70–5.

26. Murphy SM, Edwards RT, Williams N, *et al*. An evaluation of the effectiveness and cost effectiveness of the National Exercise Referral Scheme in Wales, UK: a randomised controlled trial of a public health policy initiative. *J. Epidemiol. Community Health*. 2012; 66:745–53.

27. NICE. A rapid review of the effectiveness of exercise referral schemes to promote physical activity in adults. In. National Institute for Health and Clinical Excellence. Public Health Collaborating Centre for Physical Activity. London, 2006.

28. Nishijima H, Satake K, Igarashi K, *et al*. Effects of exercise in overweight Japanese with multiple cardiovascular risk factors. *Med. Sci. Sports Exerc*. 2007; 39:926–33.

29. Opdenacker J, Boen F, Coorevits N, Delecluse C. Effectiveness of a lifestyle intervention and a structured exercise intervention in older adults. *Prev. Med*. 2008; 46:518–24.

30. Pavey TG, Taylor AH, Fox KR, *et al*. Effect of exercise referral schemes in primary care on physical activity and improving health outcomes: systematic review and meta-analysis. *BMJ*. 2011; 343:d6462.

31. Pedersen BK. Exercise-induced myokines and their role in chronic diseases. *Brain Behav. Immun*. 2011; 25(5):811–816.

32. Pedersen BK, Saltin B. Evidence for prescribing exercise as therapy in chronic disease. *Scand. J. Med. Sci. Sports*. 2006; 16:3–63.

33. Pedersen J, Zimmermann E, Stallknecht BM, *et al*. [Lifestyle intervention in the treatment of severe obesity]. *Ugeskr. Laeger*. 2006; 168:167–72.

34. Poirier P. Targeting abdominal obesity in cardiology: can we be effective? *Can. J. Cardiol*. 2008; 24:13D–7D.

35. Sacher PM, Kolotourou M, Chadwick PM, *et al*. Randomized controlled trial of the MEND program: a family-based community intervention for childhood obesity. *Obesity (Silver Spring)*. 2010; 18:S62–8.

36. Scarborough P, Bhatnagar P, Wickramasinghe KK, *et al*. The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: an update to 2006-07 NHS costs. *J. Public Health (Oxf)*. 2011; 33:527–35.

37. Schrauwen-Hinderling VB, Hesselink MK, Meex R, *et al*. Improved ejection fraction after exercise training in obesity is accompanied by reduced cardiac lipid content. *J. Clin. Endocrinol. Metab*. 2010; 95:1932–8.

38. Sly JR, Jandorf L, Dhulkifl R, *et al*. Challenges to replicating evidence-based research in real-world settings: training African-American peers as patient navigators for colon cancer screening. *J. Cancer Educ*. 2012; 27:680–6.

39. Stensvold D, Tjønna AE, Skaug EA, *et al*. Strength training versus aerobic interval training to modify risk factors of metabolic syndrome. *J. Appl. Physiol. (1985)*. 2010; 108:804–10.

40. Suchánek P, Hubácek JA, Králová Lesná I, *et al*. Actigenetic of ACE gene polymorphism in Czech obese sedentary females. *Physiol. Res*. 2009; 58:S47–52.

41. Sui X, LaMonte MJ, Laditka JN, *et al*. Cardiorespiratory fitness and adiposity as mortality predictors in older adults. *JAMA*. 2007; 298:2507–16.

42. Swift DL, Lavie CJ, Johannsen NM, *et al*. Physical activity, cardiorespiratory fitness, and exercise training in primary and secondary coronary prevention. *Circ. J*. 2013; 77:281–92.

43. Tworoger SS, Yasui Y, Vitiello MV, *et al*. Effects of a yearlong moderate-intensity exercise and a stretching intervention on sleep quality in postmenopausal women. *Sleep*. 2003; 26:830–6.

44. Van Roie E, Delecluse C, Opdenacker J, *et al*. Effectiveness of a lifestyle physical activity versus a structured exercise intervention in older adults. *J. Aging. Phys. Act*. 2010; 18:335–52.

45. Villareal DT, Smith GI, Sinacore DR, *et al*. Regular multicomponent exercise increases physical fitness and muscle protein anabolism in frail, obese, older adults. *Obesity (Silver Spring)*. 2011; 19:312–8.

46. Warburton DE, Nicol CW, Bredin SS. Prescribing exercise as preventive therapy. *CMAJ*. 2006; 174:961–74.

47. Williams LT, Young AF, Brown WJ. Weight gained in two years by a population of mid-aged women: how much is too much? *Int. J. Obes. (Lond)*. 2006; 30:1229–33.

48. Willis BL, Morrow JR, Jackson AW, *et al*. Secular change in cardiorespiratory fitness of men: Cooper Center Longitudinal Study. *Med. Sci. Sports Exerc*. 2011; 43:2134–9.