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A systematic gender-based review of physical activity correlates in coronary heart disease patients

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Coronary heart disease is the leading cause of death for Canadian men and women due largely to insufficient cardiovascular fitness gained via physical activity. Thus, health promotion efforts should be directed at increasing physical activity levels in both men and women living with heart disease. These efforts should be informed by research identifying the key correlates of physical activity that influence the uptake and long-term maintenance of physical activity among men and women with heart disease. The objective of this article was to provide a review of physical activity correlates in men and women with heart disease by sourcing information from eligible gender-based studies on physical activity and heart disease. The social ecological model was used to organise the physical activity correlates at the intrapersonal, interpersonal, institutional, community and policy levels. Despite certain methodological challenges and inconsistencies across studies, findings indicated that physical activity in men and women with heart disease is largely influenced by intrapersonal correlates. Specifically, physical activity in women with heart disease is more influenced by physical barriers, while physical activity in men with heart disease is more influenced by psychological issues and social support.

Keywords: heart disease; physical activity; correlates; social ecological model; gender

Introduction

In Canada, coronary heart disease (CHD) is the leading cause of death and hospitalisations for both men and women (Heart and Stroke Foundation of Canada, 2011). According to 2009 statistics, CHD accounted for one in four female deaths (292,188 women) and one in four male deaths (307,225 men) in the US (Kochanek, Xu, Murphy, Miniño, & Kung, 2011). Although the incidence of CHD in men is greater than in women (van Oeffelen, Vaartjes, Stronks, Bots, & Agyemang, 2013), CHD in women is associated with a higher mortality rate (Vaccarino et al., 2005), poorer prognosis (Hassan, Smith, & Engel, 2006) and a greater number of comorbidities including hypertension, arthritis and diabetes (Frasure-Smith, Lesperance, Juneau, Talajic, & Bourassa, 1999; Grace, Fry, Cheung, & Stewart, 2004; Reibis et al., 2009).

Research shows that regular physical activity (PA) reduces the risk of mortality and improves the functional status and emotional wellbeing of people suffering from CHD

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(Haapanen, Miilunpalo, Vuori, Oja, & Pasanen, 1997; Lee, Sesso, & Paffenbarger, 2000; Rodriguez et al., 1994). Thus, health promotion efforts should be directed at promoting and supporting PA in people with heart disease. Despite public health guidelines and resources to promote PA in people living with CHD (American Association of Cardiovascular and Pulmonary Rehabilitation, 2005; Giannuzzi et al., 2003), studies indicate low PA adherence rates among CHD patients who attend structured hospital-based (31–81%) (Blanchard et al., 2007; Morrin, Black, & Reid, 2000; Reid et al., 2006) or home-based cardiac rehabilitation (CR) programmes (approximately 60%) (Blanchard et al., 2010; Jolly et al., 2003), and CHD patients not attending CR (45%) (Morrin et al., 2000). These low PA adherence rates suggest that a considerable number of people with CHD are not engaging in the recommended levels of PA (i.e., at least 30 minutes per day, five days per week of moderate-intensity aerobic activity) required for health benefits, managing heart disease and preventing life-threatening relapses. Of further concern is the reported gender differences in PA adherence rates across the various PA contexts, with male patients showing greater PA adherence (Blanchard et al., 2006, 2007; Held & Ritter, 2003; Herlitz et al., 2005; Jackson, Leclerc, Erskine, & Linden, 2005; Karoff, Held, & Bjarnason-Wehrens, 2007; McKee, Bannon, Kerins, & FitzGerald, 2007; Mildestvedt & Meland, 2007; Moore et al., 2006). For example, Leung, Ceccato, Stewart, and Grace (2007) showed that exercise maintainers (i.e., physically active people) among people with CHD were significantly more likely to be male. In addition, Treat-Jacobson and Lindquist (2004) showed that 60% of men with prior CHD and only 28% of women with prior CHD engaged in exercise more than two days per week.

Research evidence from various disciplines confirms that CHD-related risk factors, treatment and outcomes appear to differ according to one's sex (e.g., biology, physiology) and gender (e.g., psychosocial roles) (Ahmed, 2007; Ghali et al., 2002; Majahalme, 2006; Vaccarino, Krumholz, Yarzebski, Gore, & Goldberg, 2001). For example, women with CHD tend to experience greater psychosocial impairment and physical disability than men with CHD (Pilote et al., 2007; Roger et al., 2000), including higher rates of disability (46% in women vs. 22% in men), following a cardiac incident (AHA Statistics Update, 2006). Conversely, men with CHD tend to experience more work-related stresses and have fewer social supports for their recovery than women with CHD (Eller et al., 2009). Thus, it is important for CHD health care centres to structure and provide care that considers fundamental differences between men and women with heart disease.

In summary, the research evidence identifies regular PA as an important preventive measure in reducing the risk of CHD, as well as a means to improve the health of those affected by CHD (Haapanen et al., 1997). The research evidence also strongly suggests that interventions to increase PA in people living with CHD must consider gender (and sex) as an important contributing factor (Azad, Kathiravelu, Minoosepeher, Hebert, & Fergusson, 2011; Petter, Blanchard, Kemp, Mazoff, & Ferrier, 2009). Researchers state that such interventions should be grounded in research that seeks to identify and understand the gender-specific factors that may influence the uptake and long-term maintenance of PA in this population (Blanchard, 2012; O'Farrell, Murray, Huston, LeGrand, & Adamo, 2000). Research has identified correlates of PA that appear to differentially impact the PA of men and women living with heart disease (Grace et al., 2002a; Marcuccio, Loving, Bennett, & Hayes, 2003; Sanderson, Shewchuk, & Bittner, 2010; Scott, Ben-Or, & Allen, 2002). Because PA correlates are diverse and operate at multiple levels (Petter et al., 2009), gender-specific interventions should benefit from knowledge of how the multiple correlates independently and/or jointly influence PA in

people living with heart disease. This is important to consider given that not all PA correlates are modifiable through intervention (e.g., patient-level factors such as age); however, PA can be promoted via associations with other modifiable correlates (e.g., higher-level factors such as the availability of places to engage in PA).

Despite the potential gains from a comprehensive understanding of PA in men and women with heart disease, there has been little attempt to synthesise the available information in a systematic review. Such a review would benefit researchers and practitioners by providing a more integrated and clearer understanding of how the diverse and multi-level gender- and sex-based correlates of PA may operate to influence PA in people with heart disease. Thus, the objective of this systematic review was to examine published peer-reviewed empirical studies examining the correlates of PA from a sex and/or gender perspective. Specifically, we sought to address the following research questions: (1) What are the PA correlates in men and women with CHD? (2) Are PA correlates common to both men and women or do they differ by gender? Because the research literature on PA correlates in CHD patients has been criticised for emphasising intrapersonal and interpersonal correlates while largely ignoring the potential importance of broader correlates (Blanchard, 2012), a social ecological model (SEM) was used to organise the correlates into a multi-level explanatory framework. The SEM is systems-oriented in that it attempts to explain individual behaviour in terms of the dynamic interaction between individuals and their environment. In this way, individual behaviour shapes and is conversely shaped by behavioural determinants that operate at multiple levels of influence including the broader social, institutional, community and policy levels (Cochrane & Davey, 2008; Sallis et al., 2006; Spence & Lee, 2003). The SEM recognises the importance of higher-level correlates such as the physical environment as modifiable and more widespread population-based agents of PA change across clinical groups (Cochrane & Davey, 2008; Sallis et al., 2006). PA interventions based on the SEM should benefit from knowledge of how patient-level correlates such as gender operate within particular social and environmental contexts to influence PA rates.

Methods

A systematic and structured review of the literature was conducted. English-language peer-reviewed publications from January 1990 to January 2013 were obtained using the following online electronic databases: the EBSCO Host platform (Academic Search Premier, CINAHL with full text, the Gender Studies Database, and PsycINFO), PUBMED and PROQUEST. The date range facilitated a reasonable collection of more recent articles without sacrificing potentially useful older articles.

The literature search was conducted in January 2013 and involved systematic combinations of the primary keywords (‘gender’ or ‘sex’), secondary keywords (‘heart disease’ or ‘myocardial infarction’ [MI] or ‘coronary artery bypass graft’ [CABG] or ‘percutaneous coronary intervention’ [PCI] or ‘heart failure’ or ‘cardiovascular disease’ [CVD] or ’coronary heart disease’ [CHD]), tertiary keywords (‘physical activity’ or ‘cardiac rehabilitation’) and the following supplementary keywords: ‘determinants’, ‘correlates’ and ‘predictors’. These keywords were selected to facilitate the collection of a broad range of articles aligned with the objectives of the review. Key word search strings corresponded to text words appearing in abstracts, titles and/or subject headings.

Eligibility criteria for inclusion were empirical peer-reviewed articles that: include only adult participants (>18 years) with heart disease; include an explicit definition for

heart disease; provide a measure of PA; and document at least one gender-based correlate of PA. These eligibility criteria were used to ensure retrieval of scientific peer-reviewed studies reporting data based on rigorous methods and analyses. Reference lists of recent eligible articles and review articles were searched in order to identify additional suitable articles. The process of article selection is presented in Figure 1.

All publications meeting the inclusion criteria were retrieved and reviewed. Data were extracted regarding: (1) the study objective(s); (2) the methods used; (3) sample characteristics; (4) research setting; (5) key findings; and (6) correlates of PA by gender. Data were summarised and organised in a tabular format for clarity (Table 1). A valid PA correlate represented the report of a statistically significant association ($p < .05$) between a study correlate and PA levels separated by gender or a three-way statistically significant association ($p < .05$) among gender, the study correlate and PA.

Once the correlates were identified, they were placed within a social ecological framework (Figure 2). Intrapersonal-level factors include knowledge, attitudes, beliefs, perceived barriers, motivation, age, sex and socioeconomic status (SES). Correlates at the interpersonal level relate to one's social network (e.g., social support and obligations) in the context of the SEM. The institutional level includes health care organisations, institutions and associations with structures and rules that can influence PA (e.g., a CR exercise programme's facilities and hours of operation). At the community level, PA is

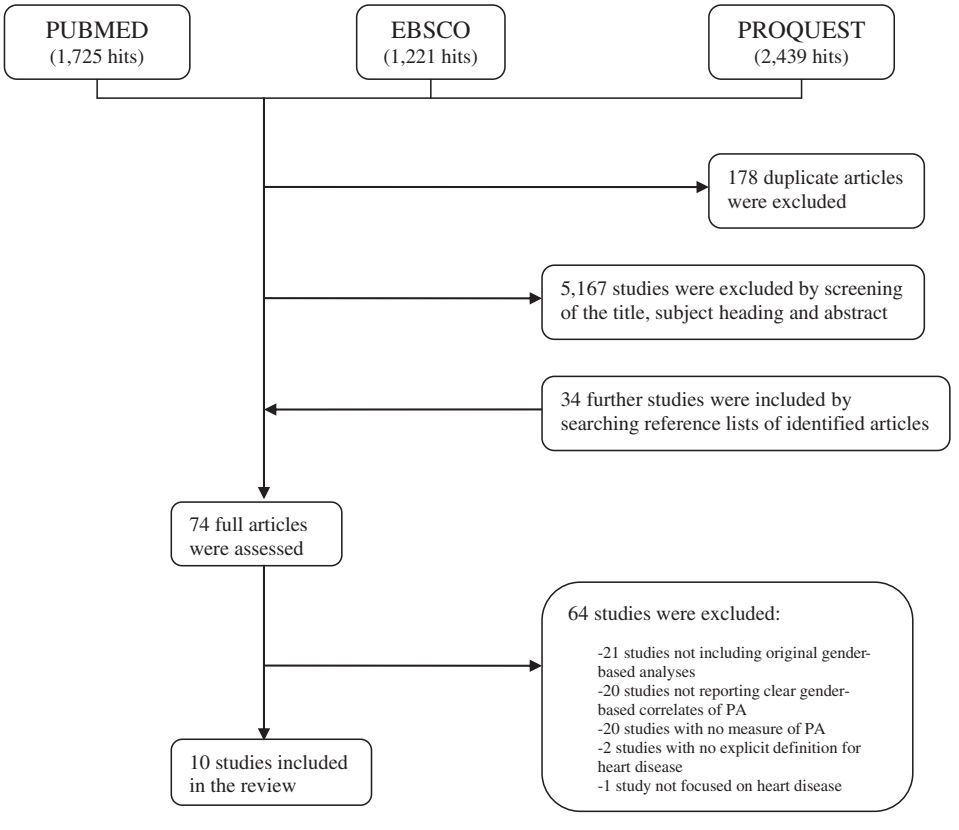

Figure 1. Results of the systematic literature search.

Table 1. Details of the reviewed studies including objectives, methods, participants, setting and summary of findings.

Study	Research Question(s)	Methods	Participants	Setting	Summary of Findings	Notes
Blanchard et al. (2007)	Does gender influence the PA/barrier self-efficacy relationship for CR/non CR patients?	Baseline (in hospital): internally modified self-report questionnaire Follow up (2, 6, 12 months): Same questionnaire plus PA recall interview Key variable(s): barrier efficacy PA measure: Godin exercise questionnaire & 7-day physical activity recall (PAR)	Eligibility criteria: 10–85 yrs, AMI, PCI or CABG, no contra-indications to PA Age: M = 61.95 yrs (±10 yrs) Gender: M = 410, F = 145 (no CR; follow up); M = 195, F = 52 (CR; follow up)	Tertiary care cardiac centres in Ottawa and Kingston, Ontario, Canada	PA levels in non-CR women decreased more than men over 12 months; barrier self-efficacy had stronger relationship with PA in CR and non-CR men over 12 months Correlates Barrier efficacy + (men & women)	Theory and hypothesis included
Blanchard et al. (2002a)	What is the relationship between task and barrier efficacy during and after CR and exercise adherence in men and women?	Baseline (pre CR): internally designed self-report questionnaire Follow up (beg., end and post CR): Same questionnaire Key variable(s): barrier efficacy, anxiety, depression, vigour PA measure: Godin & CR adherence (# attended/# prescribed)	Eligibility criteria: Enrolled in CR Age: M = 60.22 yrs Gender: M = 57, F = 24 (follow up)	Glenrose rehabilitation programme in Edmonton, Alberta, Canada	Self-efficacy lower in women at baseline; task and barrier efficacy increased over time (more in women); task and barrier efficacy related to PA during CR but only task efficacy related to PA post CR Correlates Self-efficacy for tasks + (men and women) Barrier efficacy + (men & women)	Theory and hypothesis included
Blanchard et al. (2002b)	Does barrier efficacy mediate the gender/ exercise adherence relationship during phase 2 CR?	Internally designed self-report questionnaire Key variable(s): barrier efficacy PA measure: CR adherence (# of CR	Eligibility criteria: Enrolled in CR Age: M = 60.55 yrs Gender: M = 50, F = 48	Glenrose rehabilitation programme, Edmonton, Alberta, Canafa	Men higher exercise adherence and barrier efficacy for (1) fear of having a cardiac incident, (2) back pain, (3) medication side effects, (4) feeling of having no time, (5) angina/chest pain	Theory and hypothesis included

Table 1 (*Continued*)

Study	Research Question(s)	Methods	Participants	Setting	Summary of Findings	Notes
		sessions attended/# of CR sessions prescribed)			earlier in the day and (6) feeling that it's too expensive to exercise Correlates Barrier efficacy + (men & women)	
Conn et al. (1991)	Do gender differences exist in psychosocial condition, health state, and therapeutic regimen adherence among MI patients?	Interviews in homes (health, psychosocial, and CR info) plus medical records Key variable(s): health state, anxiety/depression, perceived social support, self-esteem, quality of life PA measure: CR adherence (#attended/# of prescribed) and health behaviour scale (1–5, 5 = likely)	Eligibility criteria: >= 40 years, MI, mental competence Age: M = 63.24 yrs (±11.7 yrs) Gender: M = 117, F = 80	Two medium-sized teaching hospitals, one small private hospital and three medium-sized private hospitals in two midwestern states, USA	No gender differences in adherence to exercise; correlation between health variables and age stronger for women; correlation between social support and age for males stronger (social support lower among older men) Correlates Age – (men and women) Comorbidities – (women) Social support + (men)	Exploratory – no theory and no hypothesis
Dolansky et al. (2010)	Does age affect exercise adherence in men and women post CR?	Baseline (end of CR): interview Follow up (monthly for a year): assessments to determine adherence Key variable(s): age, gender, race, fitness, comorbidity, self-efficacy, depression, social support PA measure: adherence = >3 exercise sessions/week (heart rate monitor & exercise diary)	Eligibility criteria: MI, bypass or angioplasty, no contra-indications to PA, no cardiac-related medical issues (e.g., hypertension) Age: M = 62.4 yrs (±11.1 yrs) Gender: M = 153, F = 95 (follow up)	Three phase 3 CR programmes in Cleveland, Ohio, USA	PA levels decreased over time (more in women); youngest women had greatest decrease in PA over time (especially 9–12 months); oldest women had greater adherence to PA; self-efficacy decreased over time for both M & F Correlates Age -, Depression -, Self-efficacy + (men) Race (women)	Social Problem-solving model of health behaviour–no hypothesis

Table 1 (*Continued*)

Study	Research Question(s)	Methods	Participants	Setting	Summary of Findings	Notes
Holahan et al. (2008)	What is the relationship between purposiveness, perceived health and PA as a function of patient sex?	Self-report questionnaire Key variable(s): purposiveness & perceived health PA measure: self-report index of MVPA	Eligibility criteria: cardiac outpatientsAge: M = 60.22 yrs (±12.4 yrs) Gender: M = 64, F = 66	Hospital-based cardiac care clinics in a southwestern US city, USA	Purposiveness related to more PA and better perceived health; women rated as lower perceived health but high purposiveness and high PA; men rated as higher perceived health and high purposiveness and high PA Correlates Purposiveness + (men & women)	Hypothesis included
Jenkins & Gortner (1998)	Are there differences between men and women in self-efficacy expectation and walking various distances? What are the correlates of self-efficacy expectation and predictors of walking?	Baseline (post discharge): interview (medical & internally designed scales) Follow up (1, 2, 3, 6, 12 months): telephone interview (same info) Key variable(s): medical/clinical, perceived recovery, life satisfaction, life quality, self-efficacy expectations for walking PA measure: self-reported walking behaviour for various distances (Jenkins activity checklist)	Eligibility criteria: CABG, >70 years, English speaking, contactable, mentally competent Age: M = 75.8 yrs Gender: M = 151, F = 48 (baseline)	Six hospitals in the San Francisco Bay area, California, USA	Women had lower self-efficacy for walking and lower self-reported walking at all time periods; self-efficacy for walking and self-reported walking increased over time for men and women Correlates Self-efficacy + (men & women)	Exploratory – no theory and no hypothesis
King et al. (2001)	What is the relation between a patient's sex, psychosocial characteristics and attendance at CR	Baseline (post discharge): interview plus medical records Follow up (6 months): interview plus internally designed self-report	Eligibility criteria: MI or CABG, English speaking, contactable, mentally competent Mean age not reported	Alberta, Canada	Men more likely to attend CR; women greater improvement in self-efficacy over time; women less social support overall	Exploratory – no theory and no hypothesis

Table 1 (*Continued*)

Study	Research Question(s)	Methods	Participants	Setting	Summary of Findings	Notes
	two weeks and six months following a cardiac event?	questionnaire regarding participants' choices to (not) attend CR Key variable(s): self-efficacy (Jenkins self-efficacy expectation scale, self-motivation, social support PA measure: Jenkins activity checklist plus internally designed questionnaire	Gender: M = 231, F = 73 (baseline)		Correlates Social support + (men & women)	
Yates et al. (2003)	What are the self-reported facilitators of and barriers to PA six to twelve months after a cardiac event?	Self-report questionnaire Key variable(s): barriers (symptom distress and negative wellbeing), facilitators (positive wellbeing and self-efficacy) PA measure: self-report human activity profile	Eligibility criteria: cardiac outpatients Age: M = 67.3 yrs (±9.2 yrs) Gender: M = 50, F = 14	Midwestern regional health system	Women significantly lower levels of activity than men; women lower exercise capacity and more PA limitations Correlates Symptom distress -, negative wellbeing -, self-efficacy + (men & women)	Guided by Bandura's social cognitive theory and Pender's model of health promotion
Zimmerman et al. (2011)	What is the influence of gender on the impact of a symptom management intervention versus control among elderly CABG patients?	Random assignment to symptom management or usual care CR condition Baseline questionnaires 3 & 6 months post discharge telephone interview (same questions) plus PA measures Key variable(s): symptom presence & burden,	Eligibility criteria: competent, English, > = 65 years, CABG, have telephone with non-rotary system, discharged w/in 7 days after surgery, no physical limitations, not receiving home health care Age: M = 71.8 yrs (±4.8 yrs)	Four midwestern tertiary hospitals	Women greater presence and burden of symptoms and lower PA overall; women in SM less presence and burden of symptoms at 3 weeks, 6 weeks and 3 months Correlates Symptom management + (women)	Conceptual symptom management model

Table 1 (*Continued*)

Study	Research Question(s)	Methods	Participants	Setting	Summary of Findings	Notes
		physical function PA measure: 7-day activity recall, activity diary, accelerometers	Gender: M = 86, F = 23 (intervention); M = 106, F = 17 (control)			

Notes: The Godin exercise questionnaire measures the number of 15-minute bouts per week of light, moderate and moderate-to-vigorous physical activity. The PAR interview provides an estimate of an individual's time spent in moderate, vigorous and very vigorous physical activity for the seven days prior to the interview. The Jenkins activity checklist measures whether or not participants had engaged in various specific physical activities during the past 24 hours. The self-report index of moderate-to-vigorous physical activity measures the frequency of moderate and vigorous physical activity for a combined total of 30 minutes or more per day. The self-report human activity profile measures whether or not participants are currently engaging in, have discontinued or have never engaged in various specific physical activities. The health behaviour scale measures current adherence to exercise regimens within a cardiac rehabilitation programme.

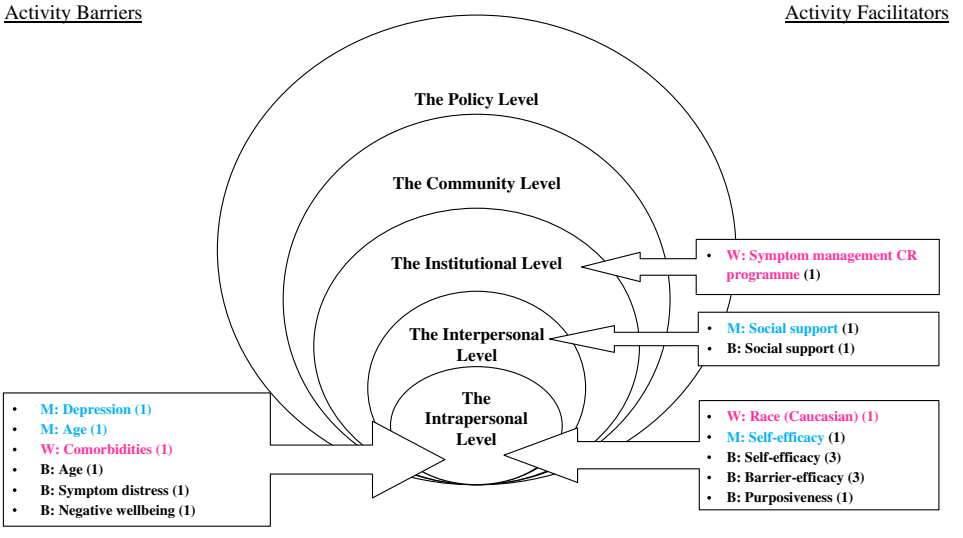

Figure 2. Social ecological model showing the multiple and dynamic influences on physical activity in people with heart disease. Correlates common to both are identified by the letter "B"; correlates in women only are in identified by the letter "W"; correlates in men only are identified by the letter "M".

influenced by broader structural settings such as whether or not neighbourhoods are designed to promote PA. Finally, policy-level correlates refer to the political factors that govern a society. Policies exist in multiple contexts and at multiple levels of society, and can influence the social environment by changing social norms (Cohen, Scribner, & Farley, 2000). For example, policies within the workplace may encourage group exercise among staff. It is important to note that PA correlates at any level of the SEM can influence PA either directly or indirectly via their association with correlates situated at other levels of the SEM. For example, self-efficacy is a commonly reported intrapersonal correlate of PA (Marks, Allegrante, & Lorig, 2005; Sallis, Prochaska, & Taylor, 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002) that may be less effective in the context of deprived environments (i.e., a community-level correlate).

Table 2 shows the checklist (Morris, Oliver, Kroll, & MacGillivray, 2012) used to assess the methodological quality of the reviewed studies. The quantitative studies were assessed for methodological quality according to individual components rather than a summary scale approach (Higgins & Altman, 2011). The methodological components included sampling strategy, response rate, use of validated instruments and appropriate statistical testing. Using these criteria, a study with acceptable methodological quality would show evidence of generalisability, a good survey response rate, validated survey instruments and appropriate statistical analyses.

Results

Study selection

In total, 5385 published articles were obtained from the initial literature search. Ten eligible articles were retained following screening of titles, subject headings and abstracts.

Table 2. Assessment of methodological quality.

	Methodological Element			
Quantitative studies	Sampling strategy indicates likelihood of generalisability	Reported good response rate (60%+)	Use of validated instruments	Appropriate statistical testing
Blanchard et al. (2007)	×	×	✓	✓
Blanchard et al. (2002a)	✓ (nb. low sample size)	×	✓	✓
Dolansky et al. (2010)	✓	×	✓	✓
Jenkins & Gortner (1998)	×	unclear	✓	✓
King et al. (2001)	×	✓	✓	✓
Blanchard et al. (2002b)	×	✓	✓	✓
Holahan et al. (2008)	✓	unreported	✓	✓
Yates et al. (2003)	×	×	✓	✓
Conn et al. (1991)	×	unreported	✓	×
Zimmerman et al. (2011)	×	✓	✓	✓

Each article reported the findings of one gender-based empirical study. Table 1 presents an overview of the studies in this review.

Risk of bias within studies

In general, survey quality was reasonable (Table 2); however, only three out of ten articles (Blanchard, Rodgers, Courneya, Daub, & Black, 2002a; Dolansky, Stepanczuk, Charvat, & Moore, 2010; Holahan, Holahan, & Suzuki, 2008) demonstrated sampling strategies that would suggest good representativeness. Furthermore, only three out of ten articles (Blanchard, Rodgers, Courneya, Daub, & Knapik, 2002b; King, Humen, Smith, Phan, & Teo, 2001; Zimmerman et al., 2011) reported a good response rate (i.e., over 60%). All studies used validated instruments (e.g., Godin exercise questionnaire, Jenkins activity checklist), and all but one study (Conn, Taylor, & Abele, 1991) used appropriate statistical testing.

Correlates of physical activity

All reported correlates of PA in men and women with heart disease were organised according to the levels of the SEM (Figure 2). In total, 11 correlates of PA were identified, the majority at the intrapersonal level (82%). Examples of significant correlations or mean differences are reported when possible in this review.

Intrapersonal level

In total, nine correlates of PA were identified at the intrapersonal level. All correlates were examined in both men and women. In terms of research question #1, six PA correlates common to both men and women were identified. Self-efficacy (i.e., task efficacy or the confidence that one can complete tasks and reach goals) was positively associated with PA in men and women in three studies (Blanchard et al., 2002a; Jenkins & Gortner, 1998; Yates, Price-Fowlkes, & Agrawal, 2003). For example, Yates et al. (2003) evidenced a positive correlation between self-efficacy and activity levels across gender (r = .44,

$p < .01$). In addition, barrier efficacy (i.e., the belief in one's ability to overcome common barriers to PA) was positively associated with PA in men and women in three studies (Blanchard et al., 2002a, 2002b, 2007). In one study (Blanchard et al., 2002b), men reported greater confidence than women to overcome: fears of having a cardiac incident ($r = .39$, $p < .001$); back pain ($r = -.38$, $p < .001$); medication side effects ($r = -.28$, $p < .01$); lack of time ($r = .28$, $p < .01$); and angina/chest pain ($r = -.29$, $p < .01$). Purposiveness (i.e., having a purpose in one's life) was positively associated with PA in one study (Holahan et al., 2008). Purposiveness was measured using two subscales: purpose in life (moderate PA: $r = .22$, $p < .05$; vigorous PA: $r = .15$, $p < .05$) and personal growth (moderate PA: $r = .19$, $p < .05$; vigorous PA: $r = .35$, $p < .05$). Age (Conn et al., 1991), negative wellbeing ($r = -.41$, $p < .05$) (Yates et al., 2003) and symptom distress ($r = -.41$, $p < .05$) (Yates et al., 2003) were each negatively associated with PA in men and women. In terms of research question #2, three gender-specific PA correlates were identified. Depression (Dolansky et al., 2010) was identified as a negative correlate of PA in men only, while comorbidities (Conn et al., 1991) was identified as a negative correlate of PA in women only. 'Being Caucasian' was positively associated with PA in women only (Dolansky et al., 2010). One study (Dolansky et al., 2010) showed evidence of a positive association between self-efficacy and men's PA only and a negative association between age and men's PA only.

Interpersonal level

One correlate of PA was identified at the interpersonal level. Social support from a spouse or partner was positively associated with PA in men and women in one study (King et al., 2001) and men's PA only in another study (Conn et al., 1991).

Institutional level

In terms of research question #1, no PA correlates common to both men and women were identified. In terms of research question #2, one gender-specific PA correlate was identified. CR programmes that target cardiac symptoms enhanced PA adherence rates in women only (Zimmerman et al., 2011).

Community level

No correlates of PA were identified at the community level.

Policy level

No correlates of PA were identified at the policy level.

Discussion

Summary of evidence

The objective of this review was to identify common and gender-specific correlates of PA in CHD patients. A total of 10 articles were deemed eligible for this review. Attempts to compare findings across the reviewed studies were challenged by the heterogeneity in criteria for patient selection, data collection methods and PA measures. Nevertheless, 11 correlates were identified and are reported in this review. Six of the 11 correlates were uniquely

associated with PA in men or women with CHD. Findings indicate that PA in women with CHD is more influenced by physical barriers (e.g., comorbidities), while PA in men with CHD is more influenced by psychological issues (e.g., depression) and social support.

Correlates at the intrapersonal level

Task self-efficacy

Task self-efficacy was identified as a correlate of PA for both men and women in three studies (Blanchard et al., 2002a; Jenkins & Gortner, 1998; Yates et al., 2003) and men only in one study (Dolansky et al., 2010). These findings correspond with studies of healthy populations (Sallis et al., 2000; Trost et al., 2002) and clinical populations (Marks et al., 2005). In the reviewed studies, women had less task self-efficacy than men and correspondingly lower PA levels at discharge from a primary care facility, which may relate to women's limited exercise capacity and lack of experience with PA compared to men (Ades et al., 2006). In time and with experience, women's self-efficacy and PA levels increased at higher rates than those of men such that they eventually coincided with men's self-efficacy and PA levels. These higher rates of increase in self-efficacy among women may reflect their positive responses to effective secondary prevention (e.g., CR programmes) and further suggest that women may have more to gain than men in terms of interventions that target self-efficacy for exercise behaviour, especially earlier in recovery.

The positive relationship between self-efficacy and PA identified in this review does not imply that all cardiac patients' levels of self-efficacy should be maximised in order to enhance PA and realise stronger health benefits from PA. Schuster and Waldron (1991) reported that highly self-efficacious men with CHD failed to adhere to their CR exercise programme. Highly self-efficacious men may view certain exercise programmes as too easy and/or not aligned with their perceptions of PA and exercise needs. Conversely, gendered notions of help-seeking for health whereby men are expected to engage in more strenuous PA and endure pain (Addis & Cohane, 2005; Courtenay, 2000) may lead highly self-efficacious men to over-exert themselves during PA and risk injury. Cardiac patients should be encouraged to develop realistic assessments of their self-efficacy, activity tolerance and expectations/goals for their PA in order to promote better alignment to exercise regimens and prevent over- or under-exertion during exercise.

Barrier efficacy

Barrier efficacy was identified as a positive correlate of PA for both men and women in three studies (Blanchard et al., 2002a, 2002b, 2007). Men and women experience different barriers to PA such as social role obligations in the case of women (e.g., primary care givers within the family and/or primary responsibilities for domestic/household chores) and work obligations in the case of men (Ades et al., 2006). In the reviewed studies, men with CHD were younger, more educated and employed with higher incomes, intrapersonal correlates of which are associated with increased PA (Cerin & Leslie, 2008; Mirowsky & Ross, 2003). In contrast, women with CHD were older, homemakers and retired with lower incomes. These gender differences in baseline cardiac profiles have also been noted in several studies of CHD patients (Pilote et al., 2007; Reibis et al., 2009), and imply that women have fewer opportunities to maintain an active lifestyle. Thus, strengthening barrier efficacy in people with CHD may entail identifying the gender-based (and individual) differences in barriers that may interact with other factors

within the social-ecological model and then targeting those barriers in psychosocial interventions.

Age

Age was identified as a negative correlate of PA in one study for both men and women (Conn et al., 1991) and one study for men only (Dolansky et al., 2010). Older cardiac patients have reduced exercise capacity, more limitations in mobility, higher rates of disability (Cooper, Lloyd, Weinman, & Jackson, 1999; Sjoland et al., 1999) and perceptions that they are too old to exercise (Nied & Franklin, 2002), all of which impact their ability to engage in PA. The relationship between age and PA is unclear and may depend on other factors such as self-efficacy, barrier efficacy and social support, all of which covary with gender. For example, research has evidenced lower self-efficacy in older patients (Dolansky et al., 2010; Mirowsky, 1995) perhaps because older CHD patients experience a greater number of barriers to PA such as feelings of isolation, concerns about neighbourhood safety, limited access to PA facilities and reduced opportunities for PA (Humpel, Owen, & Leslie, 2002). However, it is important to note that women are typically older than men at first cardiac incident and diagnosis of CHD (Garavalia et al., 2007; Josephson, Casey, Waechter, Rosneck, & Hughes, 2006). Thus, interventions for older cardiac patients must also consider gender. PA can be increased in older people (especially women) by establishing PA as a normal activity for this population – in a sense, normalising PA among older people. Public health campaigns, which depict older people engaged in a number of activities (e.g., PA role models and champions) may be one way to effectively communicate these messages. Community churches, retirement homes and senior centres are frequented by older people and thus may represent highly relevant and accessible places for health promotion efforts.

Comorbidities

The presence of comorbidities was identified as a correlate affecting women's PA in one study (Conn et al., 1991). Female cardiac patients typically present with multiple comorbidities (e.g., osteoporosis, diabetes, urinary incontinence) that can restrict their PA due to discomfort, pain and fear of injury (Reibis et al., 2009). It is unclear, however, whether PA is more influenced by the actual symptoms of prevailing comorbidities or by women's perceptions of and emotional responses to their comorbidities. Kaplan, Anderson, and Wingard (1991) indicated that gender-based expectations may encourage women to express discomfort and seek treatment, yet prevent such behaviours in men (e.g., men are expected to tolerate discomfort). Future research should attempt to explore these issues qualitatively. Based on the evidence in this review and other studies (e.g., Reibis et al., 2009), CR programmes and exercise prescriptions should be modified so that exercise, as well as intensity level and pace, is customised to meet the needs and physical limitations of CHD patients.

Depression

Depression was identified as a negative correlate affecting men's PA in one study (Dolansky et al., 2010). These results are counterintuitive as women generally experience depression to a greater degree than men, which in turn relates to their lower PA levels

(Ai et al., 1997; Halm & Penque, 2000; Lavie, Milani, Cassidy, & Gilliland, 1999). Interestingly, women in this study had higher levels of depressed mood according to the depressed mood-Profile of Mood States (POMS) scale (Dolansky et al., 2010). It is possible that the low number of female participants compared to male participants, as well as sampling method, biased the results. In any case, this finding must be interpreted with caution.

Despite the questionable finding in this review, depression has been linked to poor adherence to exercise programmes in male and female stroke patients (Damush, Plue, Bakas, Schmid, & Williams, 2007) and the general population (Cerin, Leslie, Sugiyama, & Owen, 2010; Crombie et al., 2004). It is important to note that depression is a social construct and feminised condition (Emslie, Ridge, Ziebland, & Hunt, 2006; Parker & Brotchie, 2010). Although experiencing symptoms of depression, men may not recognise these symptoms as depression and furthermore may not disclose their depression as it would conflict with gendered notions of masculinity (Emslie et al., 2006). Based on the evidence (Cerin et al., 2010; Crombie et al., 2004; Damush et al., 2007; Whooley et al., 2008), CHD patients should be carefully screened for symptoms of depression upon discharge from primary care and provided with combined cognitive therapy and motivational support in order to increase their adherence to PA.

Correlates at the interpersonal level

Social support

Social support was identified as a positive correlate of PA for both men and women in one study (King et al., 2001) and men only in one study (Conn et al., 1991). Access to exercise partners (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Eyler & Vest, 2002; Stoddard, Palombo, Troped, Sorenson, & Will, 2004) and exercise groups (Booth, Bauman, Owen, & Gore, 1997; Nies, Vollman, & Cook, 1999) can facilitate and foster PA in men and women. Social support can include informational (e.g., providing advice, guidance and suggestions), emotional (e.g., providing empathy, concern and affection) and instrumental (e.g., providing financial assistance, material goods and services) support. Interventions should include these multiple forms of support. For example, home-based CR visits could include personalised PA instruction in conjunction with counselling support. Men typically receive support from a spouse whereas women receive support from their children (Lieberman, Meana, & Stewart, 1998), which may relate to the fact that women are more likely to outlive their spouse and be dependent on other family members (Reibis et al., 2009). Still, little is known regarding the sources and types of support that are most effective in promoting PA in men versus women with heart disease. Future studies should attempt to delineate the importance of the source (i.e., family members, friends, co-workers, medical staff, etc.) and type (informational, emotional, instrumental) of social support to particular patients.

Correlates at the institutional level

Symptom management cardiac rehabilitation programmes

Access to a specialised CR programme was identified as a correlate for women in one study (Zimmerman et al., 2011). The researchers suggested that female CHD patients may have been more motivated to seek symptom relief as they typically experience a greater range of comorbidities than their male counterparts. It should be noted that this

study was limited by a low sample size of women and high dropout rate, which may have skewed the study results. A randomised controlled trial with a larger sample of women would increase the generalisability of the results and confidence in statistically significant findings.

Specialised CR programmes (e.g., women-only centres) have been established with the aim to provide customised health care services to particular subsets of patients. In the case of women-only programmes, studies have shown greater exercise uptake among women attending women-only versus regular CR programmes (Beckie & Beckstead, 2010; Price et al., 2005). This increase in uptake likely reflects the fact that women's health care needs are better addressed within these programmes (Leung, Grewal, Stewart, & Grace, 2008). Future research should continue to evaluate the effect of specialised CR programmes on men's and women's PA.

Correlates at the community level

No correlates of PA were identified at the community level. Nevertheless, the community represents a commonly cited contributor and barrier to PA (Frumkin, Frank, & Jackson, 2004). For example, neighbourhood safety is often recognised as a key barrier to PA, especially among older people and those living in low-income neighbourhoods (Sallis, Bauman, & Pratt, 1998; Seefeldt, Malina, & Clark, 2002). Perceptions (an individual-level correlate within the SEM) of unsafe neighbourhoods not only impact PA but can also lead to an increase in social isolation (an interpersonal correlate within the SEM), thus impacting psychosocial health and future PA participation (Heesch, Brown, & Blauton, 2000). Humpel et al. (2002) identified access to exercise facilities and walkability (i.e., opportunities for walking) as key contributing factors in the initiation and maintenance of PA participation. It is important to note that issues of access and availability may influence women's PA to a greater degree than men's PA (Brownson et al., 2001). Krenichyn (2004) evaluated the impact of an urban park on women's PA, and discovered that the park enhanced women's PA by facilitating social capital due to its openness, availability and accessibility to people. According to the evidence (Williams, 2007), PA interventions should be extended to environmental settings where PA behaviours often occur. For example, CR exercise classes that are held in more accessible parks and community centres would create more opportunities for PA and a culture that values PA.

Correlates at the policy level

No correlates of PA were identified at the policy level. Nevertheless, the policy environment has the potential to influence multiple levels of the SEM. As such, PA interventions and research should focus on other levels of the SEM that hold promise (e.g., community level) to further encourage and facilitate policy change. For example, recreational facilities and local municipalities could offer incentives for patients with CHD to engage in PA through reductions in membership rates, tax credits and fee subsidies for those who enrol in a fitness programme. Car pooling could also be encouraged among CHD patients as a means to facilitate transport to exercise facilities and build an exercise community of CHD patients. Community centres and churches could also implement policies that incorporate exercise sessions within existing programmes. Sustainable change at the policy level must be supported by drawing

upon multiple levels (e.g., community) and efforts (e.g., social) to prioritise PA and health from community members, leaders and government representatives.

Limitations

Due to the limited number of studies available for this review, most correlates were either linked to only one study or common to only a few studies. It is difficult to determine the importance or strength of a correlate if presented in only one study. More research is needed to corroborate and further explain the somewhat isolated correlates of PA reported in this review.

Study participants were selected largely based on their enrolment in a CR programme or recent discharge from a primary care facility. Thus, participants in many of the reviewed studies may not be truly representative of the population of CHD patients. In addition, all studies were conducted in larger urban regions in North America. This limits the generalisability of the reported study findings to rural populations, smaller cities and lower SES communities. Future research should include a more representative sample of participants within a broader range of cardiac prevention programmes.

CHD is the leading cause of death for women (Grace, Racco, Chessex, Rivera, & Oh, 2010; Wickholm & Fridlund, 2003). Nevertheless, most studies of PA in CHD patients fail to include a representative number of women and conduct gender-based analyses. When combined with low sample sizes, the use of unequal groups by gender or sex limits the ability to conduct valid statistical comparisons and generalise findings to the female population. Future research should attempt to recruit more balanced numbers of men and women, as well as conduct gender-based analyses, in order to provide much needed information on the relationship between CHD and PA in men and women.

Inconsistencies were observed in study periods and durations, as well as data collection contexts and periods. These inconsistencies limit the possibility to compare and generalise correlates of PA across studies. Longer study periods may introduce several intervening and possibly time-dependant factors that affect both the correlates of PA and PA itself (e.g., physical conditions associated with increasing age). Several of the reviewed studies noted baseline characteristics that were treated as fixed factors and compared to PA levels across time. However, cardiac recovery is a fluid process that can be influenced by a stream of correlates with effects on PA that vary across a cardiac patient's recovery (McAuley, 1992, 1993). Future gender-based research should attempt to track PA and related correlates in longitudinal designs.

Conclusions

In conclusion, six out of 11 correlates were uniquely associated with PA in men or women with CHD. This may suggest that few correlates are uniquely associated with gender and as such interventions may not need to be gender specific. This may also reflect a lack of knowledge and the paucity of research devoted to understanding the gender-related differences in PA among CHD patients. The lack of research is symbolic of prevailing and deeply rooted gendered norms, such as the implicit association of CHD and CR programmes with men. Why consider gender when CHD is already known as a male disease? Continued gender-based research can challenge these gendered notions about heart disease. The methodological concerns in this review indicate that this area of

research is still in its infancy and needs to be further developed with strong theory-based research that focuses on broader societal factors (e.g., community/institutional levels).

The design and development of PA interventions from a gender-based social ecological perspective recognises the multiple and dynamic influences on a person's behaviour and thus may provide a foundation from which to increase and sustain PA in male and female CHD patients. As indicated in this review, no single correlate in isolation can explain the gender differences in PA rates. Instead, PA represents the outcome of interaction among diverse correlates at the five levels of the SEM – intrapersonal, interpersonal, institutional, community and policy. The SEM can help to identify and cluster intervention strategies based on the ecological level in which they operate. Intervention strategies targeting several correlates at multiple levels should produce greater combined benefit than initiatives that target only one correlate or level. As such, multisectoral and collaborative gender-based health promotion strategies that are more inclusive and supportive of male and female CHD patients are needed. To better serve the needs of CHD patients, the health care environment (including CR centres) should be evaluated to ensure that it is equally welcoming to both males and females. Since PA in women with CHD is influenced more by social and physical barriers (e.g., comorbidities), CR centres should attempt to address those barriers in their female cardiac patients. Similarly, CR centres can establish an environment that encourages social support and the sharing of feelings among male cardiac patients. Creating a supportive environment for both male and female CHD patients and normalising PA are necessary steps to addressing the lack of PA in this population.

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References

Addis, M. E., & Cohane, G. H. (2005). Social scientific paradigms of masculinity and their implications for research and practice in men's mental health. *Journal of Clinical Psychiatry*, *61*, 633–647. doi:10.1002/jclp.20099

Ades, P. A., Savage, P. D., Brawner, C. A., Lyon, C. E., Ehrman, J. K., Bunn, J. Y., & Keteyian, S. J. (2006). Aerobic capacity in patients entering cardiac rehabilitation. *Circulation*, *113*, 2706–2712. doi:10.1161/CIRCULATIONAHA.105.606624

AHA Statistics Update. (2006). Heart disease and stroke statistics–2006 update: A report from the American heart association statistics committee and stroke statistics subcommittee. *Circulation*, *113*, e85–e151. doi:10.1161/CIRCULATIONAHA.105.171600

Ahmed, A. (2007). Clinical manifestations, diagnostic assessment, and etiology of heart failure in older adults. *Clinics in Geriatric Medicine*, *23*, 11–30. doi:10.1016/j.cger.2006.08.002

Ai, A. L., Peterson, C., Dunkle, R. E., Saunders, D. G., Boiling, S. F., & Buchtel, H. A. (1997). How gender affects psychological adjustment one year after coronary artery bypass graft surgery. *Women & Health*, *26*, 45–65. doi:10.1300/J013v26n04_04

American Association of Cardiovascular and Pulmonary Rehabilitation. (2005). *Guidelines for cardiac rehabilitation and secondary prevention programs*. Champaign: Human Kinetics.

Azad, N., Kathiravelu, A., Minoosepeher, S., Hebert, P., & Fergusson, D. (2011). Gender differences in the etiology of heart failure: A systematic review. *Journal of Geriatric Cardiology*, *8*, 15. doi:10.3724/SP.J.1263.2011.00015

Beckie, T. M., & Beckstead, J. W. (2010). Predicting cardiac rehabilitation attendance in a gender-tailored randomized clinical trial. *Journal of Cardiopulmonary Rehabilitation & Prevention*, *30*, 147–56. doi:10.1097/HCR.0b013e3181d0c2ce

Blanchard, C. M. (2012). Heart disease and physical activity: Looking beyond patient characteristics. *Exercise and Sport Sciences Reviews*, *40*, 30–36. doi:10.1097/JES.0b013e318234c206

Blanchard, C. M., Reid, R. D., Morrin, L. I., Beaton, L. J., Pipe, A., Courneya, K. S., & Plotnikoff, R. C. (2006). Correlates of physical activity change in patients not attending cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation*, *26*, 377–383. doi:10.1097/00008483-200611000-00007

Blanchard, C. M., Reid, R. D., Morrin, L. I., Beaton, L. J., Pipe, A., Courneya, K. S., & Plotnikoff, R. C. (2007). Barrier self-efficacy and physical activity over a 12-month period in men and women who do and do not attend cardiac rehabilitation. *Rehabilitation Psychology*, *52*, 65–73. doi:10.1037/0090-5550.52.1.65

Blanchard, C. M., Reid, R. D., Morrin, L. I., McDonnell, L., McGannon, K., Rhodes, R. E., … Edwards, N. (2010). Demographic and clinical determinants of moderate to vigorous physical activity during home-based cardiac rehabilitation: The home-based determinants of exercise (HOME) study. *Journal of Cardiopulmonary Rehabilitation and Prevention*, *30*, 240–245. doi:10.1097/HCR.0b013e3181d0c4ae

Blanchard, C. M., Rodgers, W. M., Courneya, K. S., Daub, B., & Black, B. (2002a). Self-efficacy and mood in cardiac rehabilitation: Should gender be considered? *Behavioural Medicine*, *7*, 149–60. doi:10.1080/08964280209596040

Blanchard, C. M., Rodgers, W. M., Courneya, K. S., Daub, B., & Knapik, G. (2002b). Does barrier efficacy mediate the gender-exercise adherence relationship during phase II cardiac rehabilitation? *Rehabilitation Psychology*, *47*, 106–120. doi:10.1037/0090-5550.47.1.106

Booth, M. L., Bauman, A., Owen, N., & Gore C. (1997). Physical activity preferences, preferred sources of assistance, and perceived barriers to increased activity among physically inactive Australians. *Preventive Medicine*, *26*, 131–137. doi:10.1006/pmed.1996.9982

Brownson, R., Baker, E., Housemann, R., Brennan, L., & Bacak, S. (2001). Environmental and policy determinants of physical activity in the United States. *American Journal of Public Health*, *91*, 1995–2003. doi:10.2105/AJPH.91.12.1995

Cerin, E., & Leslie, E. (2008). How socio-economic status contributes to participation in leisure-time physical activity. *Social Science & Medicine*, *66*, 2596–609. doi:10.1016/j.socscimed.2008.02.012

Cerin, E., Leslie, E., Sugiyama, T., & Owen, N. (2010). Perceived barriers to leisure-time physical activity in adults: An ecological perspective. *Journal of Physical Activity & Health*, *7*, 451–459.

Cochrane, T., & Davey, R. C. (2008). Increasing uptake of physical activity: A social ecological approach. *Journal of the Royal Society for the Promotion of Health*, *128*, 31–40. doi:10.1177/1466424007085223

Cohen, D., Scribner, R., & Farley, T. (2000). A structural model of health behaviors: A pragmatic approach to explain and influence health behaviors at the population level. *Preventive Medicine*, *30*, 146–154. doi:10.1006/pmed.1999.0609

Conn, V. S., Taylor, S. G., & Abele, P. B. (1991). Myocardial infarction survivors: Age and gender differences in physical health, psychosocial state and regimen adherence. *Journal of Advanced Nursing*, *16*, 1026–1034. doi:10.1111/j.1365-2648.1991.tb03362.x

Cooper, A., Lloyd, G., Weinman, J., & Jackson, G. (1999). Why patients do not attend cardiac rehabilitation: Role of intentions and illness beliefs. *Heart*, *82*, 234–236. doi:10.1136/hrt.82.2.234

Courtenay, W. H. (2000). Engendering health: A social constructionist examination of men's health beliefs and behaviors. *Psychology of Men & Masculinity*, *1*, 4–15. doi:10.1037/1524-9220.1.1.4

Crombie, I. K., Irvine, L., Williams, B., McGinnis, A. R., Slane, P. W., Alder, E. M., & McMurdo, M. E. (2004). Why older people do not participate in leisure time physical activity: A survey of activity levels, beliefs and deterrents. *Age & Ageing*, *33*, 287–292. doi:10.1093/ageing/afh089

Damush, T. M., Plue, L., Bakas, T., Schmid, A., & Williams, L. S. (2007). Barriers and facilitators to exercise among stroke survivors. *Rehabilitation Nursing*, *32*, 253–262. doi:10.1002/j.2048-7940.2007.tb00183.x

Dolansky, M. A., Stepanczuk, B., Charvat, J. M., & Moore, S. M. (2010). Women's and men's exercise adherence after a cardiac event: Does age make a difference? *Research in Gerontological Nursing*, *3*, 30–8. doi:10.3928/19404921-20090706-03

Eller, N. H., Netterstrøm, B., Gyntelberg, F., Kristensen, T. S., Nielsen, F., Steptoe, A., & Theorell, T. (2009). Work-related psychosocial factors and the development of ischemic heart disease: A systematic review. *Cardiology in review*, *17*(2), 83–97. doi:10.1097/CRD.0b013e318198c8e9

Emslie, C., Ridge, D., Ziebland, S., & Hunt, K. (2006). Men's accounts of depression: Reconstructing or resisting hegemonic masculinity? *Social Science & Medicine*, *62*(9), 2246–2257. doi:10.1016/j.socscimed.2005.10.017

Eyler, A., & Vest, J. (2002). Environmental, policy, and cultural factors related to physical activity among in White women. *Women & Health*, *36*, 111–112.doi:10.1300/J013v36n02_01

Frasure-Smith, N., Lesperance, F., Juneau, M., Talajic, M., & Bourassa, M. G. (1999). Gender, depression, and one-year prognosis after myocardial infarction. *Psychosomatic Medicine*, *61*(1), 26–37. doi:10.1097/00006842-199901000-00006

Frumkin, H., Frank, L., & Jackson, R. (2004). *Urban sprawl and public health: Designing, planning and building for healthy communities*. Washington DC: Island Press.

Garavalia, L. S., Decker, C., Reid, K. J., Lichtman, J. H., Parashar, S., Vaccarino, V., … Spertus, J. A. (2007). Does health status differ between men and women in early recovery after myocardial infarction? *Journal of Women's Health*, *16*, 93–101. doi:10.1089/jwh.2006.M073

Ghali, W. A., Faris, P. D., Galbraith, P. D., Norris, C. M., Curtis, M. J., Saunders, L. D., … Knudtson, M. L. (2002). Sex differences in access to coronary revascularization after cardiac catheterization: Importance of detailed clinical data. *Annals of Internal Medicine*, *136*, 723–32. doi:10.7326/0003-4819-136-10-200205210-00007

Giannuzzi, P., Saner, H., Bjornstad, H., Fioretti, P., Mendes, M., Cohen-Solal, A., … Veress, G. (2003). Secondary prevention through cardiac rehabilitation: Position paper of the Working Group on Cardiac Rehabilitation and Exercise Physiology of the European Society of Cardiology. *European Heart Journal*, *24*, 1273–1278. doi:10.1016/S0195-668X(03)00198-2

Grace, S. L., Abbey, S. E., Shnek, Z. M., Irvine, J., Franche, R. L., & Stewart, D. E. (2002a). Cardiac rehabilitation I: Review of psychosocial factors. *General Hospital Psychiatry*, *24*, 121–126. doi:10.1016/S0163-8343(02)00178-0

Grace, S. L., Fry, R., Cheung, A., & Stewart, D. E. (2004). Cardiovascular disease. *BMC Women's Health*, *4*, S15. doi:10.1186/1472-6874-4-S1-S15

Grace, S. L., Racco, C., Chessex, C., Rivera, T., & Oh, P. (2010). A narrative review on women and cardiac rehabilitation: Program adherence and preferences for alternative models of care. *Maturitas*, *67*, 203–208. doi:10.1016/j.maturitas.2010.07.001

Haapanen, N., Miilunpalo, S., Vuori, I., Oja, P., & Pasanen, M. (1997). Association of leisure time physical activity with the risk of coronary heart disease, hypertension and diabetes in middle-aged men and women. *International Journal of Epidemiology*, *26*, 739–47. doi:10.1093/ije/26.4.739

Halm, M. A., & Penque, S. (2000). Heart failure in women. *Prognostic Cardiovascular Nursing*, *15*, 121–33. doi:10.1111/j.0889-7204.2000.080399.x

Hassan, M., Smith, J. M., & Engel, A. M. (2006). Predictors and outcomes of sternal wound complications in patients after coronary artery bypass graft surgery. *The American Surgeon*, *72*, 515–520.

Heart and Stroke Foundation of Canada. (2011). *Incidence of cardiovascular disease*. Retrieved from http://ww1.heartandstroke.ca

Heesch, K. C., Brown, D. R., & Blauton, C. J. (2000). Perceived barriers to exercise and stage of exercise adoption in older women of different racial/ethnic groups. *Women's Health*, *30*, 62–76. doi:10.1300/J013v30n04_05

Held, K., & Ritter, P. (2003). Age distribution in cardiac rehabilitation. *Herzmedizin*, *20*, 160–163.

Herlitz, J., Brandrup-Wognsen, G., Caidahl, K., Hartford, M., Haglid, M., Karlson, B. W., … & Sjöland, H. (2005). Determinants for an impaired quality of life 10 years after coronary artery bypass surgery. *International Journal of Cardiology*, *98*, 447–452. doi:10.1016/j.ijcard.2003.11.022

Higgins, J. P. T., & Altman, D. G. (2011). Assessing risk of bias in included studies. Chapter 8 in J. Higgins & S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions. Version 5.1.0. The Cochrane Collaboration*. Chichester: John Wiley & Sons, Ltd. doi:10.1002/9780470712184.ch8

Holahan, C. K., Holahan, C. J., & Suzuki, R. (2008). Purposiveness, physical activity, and perceived health in cardiac patients. *Disability and Rehabilitation*, *30*, 1772–1778. doi:10.1080/10428190701661508

Humpel, N., Owen, N., & Leslie, E. (2002). Environmental factors associated with adults' participation in physical activity: A review. *American Journal of Preventive Medicine*, *22*, 188–99. doi:10.1016/S0749-3797(01)00426-3

Jackson, L., Leclerc, J., Erskine, Y., & Linden, W. (2005). Getting the most out of cardiac rehabilitation: A review of referral and adherence predictors. *Heart*, *91*, 10–14. doi:10.1136/hrt.2004.045559

Jenkins, L. S., & Gortner, S. R. (1998). Correlates of self-efficacy expectation and prediction of walking behavior in cardiac surgery elders. *Annals of Behavioural Medicine*, *20*, 99–103. doi:10.1007/BF02884455

Jolly, K., Lip, G. Y., Sandercock, J., Greenfield, S. M., Raftery, J. P., Mant, J., … Stevens, A. J. (2003). Home-based versus hospital-based cardiac rehabilitation after myocardial infarction or revascularisation: Design and rationale of the Birmingham Rehabilitation Uptake Maximisation Study (BRUM): A randomized controlled trial. *BMC Cardiovascular Disorders*, *3*, 10. doi:10.1186/1471-2261-3-10

Josephson, E. A., Casey, E. C., Waechter, D., Rosneck, J., & Hughes, J. W. (2006). Gender and depression symptoms in cardiac rehabilitation. *Journal of Cardiopulmonary Rehabilitation*, *26*, 160–163. doi:10.1097/00008483-200605000-00008

Kaplan, R. M., Anderson, J. P., & Wingard, D. L. (1991). Gender differences in health-related quality of life. *Health Psychology*, *10*, 86–93. doi:10.1037/0278-6133.10.2.86

Karoff, M., Held, K., & Bjarnason-Wehrens, B. (2007). Cardiac rehabilitation in Germany. *European Journal of Cardiovascular Prevention & Rehabilitation*, *14*, 18–27. doi:10.1097/HJR.0b013e3280128bde

King, K. M., Humen, D. P., Smith, H. L., Phan, C. L., & Teo, K. K. (2001). Psychosocial components of cardiac recovery and rehabilitation attendance. *Heart*, *85*, 290–294. doi:10.1136/heart.85.3.290

Kochanek, K. D., Xu, J. Q., Murphy, S. L., Miniño, A. M., & Kung, H. C. (2011). *Deaths: Final data for 2009* (National Vital Statistics Reports, 60). Hyattsville, MD: National Center for Health Statistics.

Krenichyn, K. (2004). Women and physical activity in an urban park: Enrichment and support through an ethic of care. *Journal of Environmental Psychology*, *24*, 117–130. doi:10.1016/S0272-4944(03)00053-7

Lavie, C., Milani, R., Cassidy, M., & Gilliland, Y. (1999). Effects of cardiac rehabilitation and exercise training programs in women with depression. *American Journal of Cardiology*, *83*, 1480–3. doi:10.1016/S0002-9149(99)00127-7

Lee, I.-M., Sesso, H. D., & Paffenbarger, Jr, R. S. (2000). Physical activity and coronary heart disease risk in men: Does the duration of exercise episodes predict risk? *Circulation*, *102*, 981–986. doi:10.1161/01.CIR.102.9.981

Leung, Y. W., Ceccato, N., Stewart, D. E., & Grace, S. L. (2007). A prospective examination of patterns and correlates of exercise maintenance in coronary artery disease patients. *Journal of Behavioral Medicine*, *30*, 411–421. doi:10.1007/s10865-007-9117-4

Leung, Y. W., Grewal, K., Stewart, D. E., & Grace, S. L. (2008). Gender differences in motivations and perceived effects of Mind-Body Therapy (MBT) practice and views on integrative cardiac rehabilitation among acute coronary syndrome patients: Why do women use MBT? *Complementary Therapies in Medicine*, *16*, 311–317. doi:10.1016/j.ctim.2008.04.009

Lieberman, L., Meana, M., & Stewart, D. (1998). Cardiac rehabilitation: Gender differences in factors influencing participation. *Journal of Women's Health*, *7*, 717. doi:10.1089/jwh.1998.7.717

Majahalme, S. (2006). Gender and congestive heart failure. *Geriatrics & Aging*, *9*, 551–554.

Marcuccio, E., Loving, N., Bennett, S. K., & Hayes, S. N. (2003). A survey of attitudes and experiences of women with heart disease. *Women's Health Issues*, *13*, 23–31. doi:10.1016/S1049-3867(02)00193-7

Marks, R., Allegrante, J. P., & Lorig, K. (2005). A review and synthesis of research evidence for self-efficacy-enhancing interventions for reducing chronic disability: Implications for health education practice (part I). *Health Promotion Practice*, *6*, 37–43. doi:10.1177/1524839904266790

McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of Behavioural Medicine*, *15*, 65–88. doi:10.1007/BF00848378

McAuley, E. (1993). Self-efficacy and the maintenance of exercise participation in older adults. *Journal of Behavioural Medicine*, *16*, 103–113. doi:10.1007/BF00844757

McKee, G., Bannon, J., Kerins, M., & F itzGerald, G. (2007). Changes in diet, exercise and stress behaviours using the stages of change model in cardiac rehabilitation patients. *European Journal of Cardiovascular Nursing*, *6*, 233–240. doi:10.1016/j.ejcnurse.2006.10.002

Mildestvedt, T., & Meland, E. (2007). Examining the ''Matthew Effect''on the motivation and ability to make lifestyle changes in 217 heart rehabilitation patients. *Scandinavian Journal of Public Health*, *35*, 140–147. doi:10.1080/14034940600881930

Mirowsky, J. (1995). Age and the sense of control. *Social Psychology Quarterly*, *58*, 31–43. doi:10.2307/2787141

Mirowsky, J., & Ross, C. (2003). *Social causes of psychological distress*. Hawthorne, NY: Aldine de Gruyter.

Moore, S. M., Charvat, J. M., Gordon, N. H., Roberts, B. L., Pashkow, F., Ribisl, P., & Rocco, M. (2006). Effects of a CHANGE intervention to increase exercise maintenance following cardiac events. *Annals of Behavioral Medicine*, *31*, 53–62. doi:10.1207/s15324796abm3101_9

Morrin, L., Black, S., & Reid, R. (2000). Impact of duration in a cardiac rehabilitation program on coronary risk profile and health-related quality of life outcomes. *Journal of Cardiopulmonary Rehabilitation*, *20*, 115–121. doi:10.1097/00008483-200003000-00005

Morris, J., Oliver, T., Kroll, T., MacGillivray, S. (2012). The importance of psychological and social factors in influencing the uptake and maintenance of physical activity after stroke: A structured review of the empirical literature. *Stroke Research and Treatment*, *2012*, 1–20. doi:10.1155/2012/195249

Nied, R. J., & Franklin, B. (2002). Promoting and prescribing exercise for the elderly. *American Family Physician*, *65*, 419–26.

Nies, M., Vollman, M., & Cook, T. (1999). African-American women's experiences with physical activity in their daily lives. *Public Health Nursing*, *16*, 23–31. doi:10.1046/j.1525-1446.1999.00023.x

O'Farrell, P., Murray, J., Huston, P., LeGrand, C., & Adamo, K. (2000). Sex differences in cardiac rehabilitation. *Canadian Journal of Cardiology*, *16*, 319–25.

Parker, G., & Brotchie, H. (2010). Gender differences in depression. *International Review of Psychiatry*, *22*(5), 429–436. doi:10.3109/09540261.2010.492391

Petter, M., Blanchard, C., Kemp, K. A., Mazoff, A. S., & Ferrier, S. N. (2009). Correlates of exercise among coronary heart disease patients: Review, implications and future directions. *European Journal of Cardiovascular Prevention and Rehabilitation*, *16*, 515–526. doi:10.1097/HJR.0b013e3283299585

Pilote, L., Dasgupta, K., Guru, V., Humphries, K. H., McGrath, J., Norris, C., … Paradis, G. (2007). A comprehensive view of sex-specific issues related to cardiovascular disease. *Canadian Medical Association Journal*, *176*, S1–44. doi:10.1503/cmaj.051455

Price, J., Landry, M., Rolfe, D., Delos-Reyes, F., Groff, L., & Sternberg, L. (2005). Women's cardiac rehabilitation: Improving access using principles of women's health. *Canadian Journal of Cardiovascular Nursing*, *15*, 32–41.

Reibis, R. K., Bestehorn, K., Pittrow, D., Jannowitz, C., Wegscheider, K., & Voller, H. (2009). Elevated risk profile of women in secondary prevention of coronary artery disease: A 6-year survey of 117,913 patients. *Journal of Women's Health*, *18*, 1123–31. doi:10.1089/jwh.2008.1082

Reid, R. D., Morrin, L. I., Pipe, A. L., Dafoe, W. A., Higginson, L. A., Wielgosz, A. T., … & Blanchard, C. M. (2006). Determinants of physical activity after hospitalization for coronary artery disease: The Tracking Exercise After Cardiac Hospitalization (TEACH) Study. *European Journal of Cardiovascular Prevention & Rehabilitation*, *13*, 529–537. doi:10.1097/01.hjr.0000201513.13343.97

Rodriguez, B. L., Curb, J. D., Burchfiel, C. M., Abbott, R. D., Petrovitch, H., Masaki, K., & Chiu, D. (1994). Physical activity and 23-year incidence of coronary heart disease morbidity and mortality among middle-aged men. The Honolulu Heart Program. *Circulation*, *89*, 2540–2544. doi:10.1161/01.CIR.89.6.2540

Roger, V. L., Farkouh, M. E., Weston, S. A., Reeder, G. S., Jacobsen, S. J., Zinsmeister, A. R., … Gabriel, S. E. (2000). Sex differences in evaluation and outcome of unstable angina. *Journal of the American Medical Association*, *283*, 646–52. doi:10.1001/jama.283.5.646

Sallis, J. F., Bauman, A., & Pratt, M. (1998). Environmental and policy interventions to promote physical activity. *America Journal of Preventive Medicine*, *15*, 379–397. doi:10.1016/S0749-3797(98)00076-2

Sallis, J. F., Cervero, R. B., Ascher, W., Henderson, K. A., Kraft, M. K., & Kerr, J. (2006). An ecological approach to creating active living communities. *Annual Review of Public Health*, *27*, 297–322. doi:10.1146/annurev.publhealth.27.021405.102100

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine & Science in Sports & Exercise*, *32*, 963–975. doi:10.1097/00005768-200005000-00014

Sanderson, B. K., Shewchuk, R. M., & Bittner, V. (2010). Cardiac rehabilitation and women: What keeps them away? *Journal of Cardiopulmonary Rehabilitation & Prevention*, *30*, 12–21. doi:10.1097/HCR.0b013e3181c85859

Schuster, P., & Waldron, J. (1991). Gender differences in cardiac rehabilitation patients. *Rehabilitation Nursing*, *16*, 248–53. doi:10.1002/j.2048-7940.1991.tb01229.x

Scott, L. A., Ben-Or, K., & Allen, J. K. (2002). Why are women missing from outpatient cardiac rehabilitation programs? A review of multilevel factors affecting referral, enrollment, and completion. *Journal of Women's Health*, *11*, 773–791. doi:10.1089/15409990260430927

Seefeldt, V., Malina, R. M., & Clark, M. A. (2002). Factors affecting levels of physical activity in adults. *Sports Medicine*, *32*, 143–168. doi:10.2165/00007256-200232030-00001

Sjoland, H., Wiklund, I., Caidahl, K., Hartford, M., Karlsson, T., & Herlitz, J. (1999). Improvement in quality of life differs between men and women after coronary artery bypass surgery. *Journal of Internal Medicine*, *245*, 445–454. doi:10.1046/j.1365-2796.1999.00500.x

Spence, J., & Lee, R. (2003). Toward a comprehensive model of physical activity. *Psychology of Sport and Exercise*, *4*, 7–24. doi:10.1016/S1469-0292(02)00014-6

Stoddard, A., Palombo, R., Troped, P., Sorenson, G., Will, J. (2004). Cardiovascular disease risk reduction: The Massachusetts WISEWOMEN Project. *Journal of Women's Health*, *13*, 539–546. doi:10.1089/1540999041281106

Treat-Jacobson, D., & Lindquist, R. A. (2004). Functional recovery and exercise behavior in men and women 5 to 6 years following coronary artery bypass graft (CABG) surgery. *Western Journal of Nursing Research*, *26*, 479–498. doi:10.1177/0193945904265400

Trost, S. G., Owen, N., Bauman, A. E., Sallis, J. F., Brown, W. (2002). Correlates of adult participation in physical activity: Review and update. *Medicine & Science in Sports & Exercise*, *34*, 1996–2001. doi:10.1097/00005768-200212000-00020

Vaccarino, V., Krumholz, H. M., Yarzebski, J., Gore, J. M., & Goldberg, R. J. (2001). Sex differences in 2-year mortality after hospital discharge for myocardial infarction. *Annals of Internal Medicine*, *134*, 173–81. doi:10.7326/0003-4819-134-3-200102060-00007

Vaccarino, V., Rathore, S. S., Wenger, N. K., Frederick, P. D., Abramson, J. L., Barron, H. V., … Krumholz, H. M. (2005). Sex and racial differences in the management of acute myocardial Infarction, 1994 through 2002. *New England Journal of Medicine*, *353*, 671–682. doi:10.1056/NEJMsa032214

van Oeffelen, A. A., Vaartjes, I., Stronks, K., Bots, M. L., & Agyemang, C. (2013). Sex disparities in acute myocardial infarction incidence: Do ethnic minority groups differ from the majority population? *European Journal of Preventive Cardiology*. doi:10.1177/2047487313503618

Whooley, M. A., de Jonge, P., Vittinghoff, E., Otte, C., Moos, R., Carney, R. M.,… Browner, & W. S. (2008). Depressive symptoms, health behaviors, and risk of cardiovascular events in patients with coronary heart disease. *Journal of the American Medical Association*, *300*, 2379–2388. doi:10.1001/jama.2008.711

Wickholm, M., & Fridlund, B. (2003). Women's health after a first myocardial infarction: A comprehensive perspective on recovery over a 4-year period. *European Journal of Cardiovascular Nursing*, *2*(1), 19–25. doi:10.1016/S1474-5151(02)00088-9

Williams, C. H. (2007). *The built environment and physical activity: What is the relationship?* (Research Synthesis Report, 11). Princeton, NJ: Robert Wood Johnson Foundation.

Yates, B. C., Price-Fowlkes, T., & Agrawal, S. (2003). Barriers and facilitators of self reported physical activity in cardiac patients. *Research in Nursing and Health*, *26*, 459–469. doi:10.1002/nur.10108

Zimmerman, L., Barnason, S., Hertzog, M., Young, L., Nieveen, J., Schulz, P., & Tu, C. (2011). Gender differences in recovery outcomes after an early recovery symptom management intervention. *Heart Lung*, *40*, 429. doi:10.1016/j.hrtlng.2010.07.018