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Motivational factors for exercise in cardiac patients? A literature review

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Abstract: Objective: To review factors related to regular exercise in patients diagnosed with myocardial ischemia, heart failure, and other heart diseases. Review methods: Literature review of studies published from 1969 to January 2013. Results: Of the studies included (n=27), 18 describe factors related to the performance of exercise. The other 9 articles describe barriers to exercise and/or propose options for overcoming the barriers posed by social and economic factors, the health care system, the patient's condition, the therapy and the patient related factors. The literature specifically describes different barriers and motives for men and women. Conclusions: To increase exercise among cardiac patients, the factors that influence participation need to be examined. Alternative formats for exercise programs are needed. Programs need to be better tailored to patients' needs so as to enhance participation among those who are not attracted by the choice of programs currently offered.

Keywords: Myocardial Ischemia, Heart Disease, Motivation, Barriers, Exercise, Literature Review

1. Introduction

In patients with coronary heart disease, a healthy lifestyle including exercise is important to reduce mortality and the risk of recurrent events[1, 2]. Meta-analyses based on exercise-based cardiac rehabilitation programs conclude that these programs achieve reductions in all-cause and cardiac mortality and also in the risk of non-fatal myocardial ischemia[1, 3].

Despite this evidence, adherence to cardiac rehabilitation programs is low, with drop-out rates of 50-90% in the first year[4-10]. A considerable proportion of heart failure patients (40-58%) do not follow the recommendations on activity[11-12]. According to the World Health Organization, several factors simultaneously influence adherence among patients. There is often more than one barrier to treatment adherence: for example, social and economic factors, the health care team/system, disease characteristics, therapies and patient-related factors. Patients' adherence to therapy can often be improved by resolving the problems related to these factors[12].

Gaining insights into the reasons for non-adherence to exercise-based cardiac rehabilitation programs and the reluctance to regular exercise may help us develop strategies to improve adherence[13] and increase exercise training. These insights can serve as the basis for proposing alternative formats for exercise programs that are more attractive to patients.

The aim of the current paper is to review factors related to the practice of regular exercise in patients diagnosed with myocardial ischemia, heart failure, and other heart diseases. Therefore, the research question is which factors influence cardiac patients to practice regular exercise?

2. Method

We conducted a literature review of studies published from 1969 to January 2013. The following databases were consulted: MEDLINE (PubMed), the Biblioteca Cochrane Plus (in Spanish), the Cochrane Library, CSIC-IME, Cuidatge, Cuiden, EnFisPo, ProQuest Health and Medical Complete, PsycInfo, Scopus, Web of Knowledge, Biblioteca Virtual en Salud and DialNet. We used the following keywords for the search: "motivation", "exercise", "exercise therapy", "heart diseases", "myocardial ischemia", "heart failure", "cardiovascular disorders", "rehabilitation",

"cardiac rehabilitation", "patient compliance", "motivación", "ejercicio", "ejercicio físico", "cardiopatías", "corazón", "enfermedades cardiovasculares", "rehabilitación", "motivacio$*", "motiva*", "ejercici$", "ejerci*", "rehabilitacio$", "rehabilita*", "cardiopat*" and "infart*". We combined them in different ways to obtain as many documents as possible on the topic of study: see Annex 1. Rather than perform a meta-analysis we aimed to cover a broad array of factors; therefore we chose not to exclude studies based on design. So both qualitative and quantitative studies were considered. Titles and abstracts were reviewed to assess whether the article met the inclusion criteria. If this could not be determined from the abstract, the judgment was made after review of the full article.

The inclusion criteria were: (1) English or Spanish language publications and (2) studies involving patients with myocardial ischemia, heart failure and other heart diseases presenting results on motivation and exercise. Our aim was to provide insight into possible factors related to exercise in cardiac patients. We did not focus on the minutes or on the limit of exercise time. We defined "exercise" as "physical activity which is usually regular and done with the intention of improving or maintaining physical fitness or health"[14]. Within the term "exercise" we included the practice of non-supervised exercise or attending an exercise-based cardiac rehabilitation program which it is with supervision. We described "motivation" as "those factors which cause an organism to behave or act in either a goal-seeking or satisfying manner. They may be influenced by physiological drives or by external stimuli"[14]. Authors assessed the methodological quality of the qualitative and quantitative articles prior to inclusion in the review. Standardized critical appraisal instrument was used[15].

To structure our data, we classified the factors and interventions that influence cardiac patients to follow their exercise recommendations according to the five dimensions proposed in the World Health Organization report[12]. These dimensions are the following: social and economic factors which are related to the socioeconomic status, factors related to the health care system as the health care team or the health services, factors related to the patient's condition which represent particular illness-related demands faced by the patient, therapy-related factors which are associated with the medical regimen, the treatment or the effects of the therapy and patient-related factors which represent the resources, knowledge, attitudes, beliefs, perceptions and expectations of the patient.

Annex 1. *Combination of the keywords.*

Databases	Combination of keywords
PubMed	Motivation"[Mesh] AND ("Exercise"[Mesh] OR "Exercise Therapy"[Mesh]) AND ("Heart Diseases"[Mesh] OR "Myocardial Ischemia"[Mesh] OR "Heart Failure"[Mesh])
	"Motivation"[Mesh] AND ("Exercise"[Mesh] OR "Exercise Therapy"[Mesh]) AND ("Heart Diseases"[Mesh] OR "Myocardial Ischemia"[Mesh] OR "Heart Failure"[Mesh])NOT "Rehabilitation"[Mesh]
	"Motivation"[Mesh] AND "Exercise"[Mesh] AND ("Heart Diseases"[Mesh] OR "Myocardial Ischemia"[Mesh] OR "Heart Failure"[Mesh])NOT "Rehabilitation"[Mesh]
	"Motivation"[Majr] AND ("Exercise"[Majr] OR "Exercise Therapy"[Majr]) AND ("Heart Diseases"[Majr] OR "Myocardial Ischemia"[Majr] OR "Heart Failure"[Majr])
	"Motivation"[Majr] AND ("Exercise"[Majr] OR "Exercise Therapy"[Majr]) AND ("Heart Diseases"[Majr] OR "Myocardial Ischemia"[Majr] OR "Heart Failure"[Majr]) NOT "Rehabilitation"[Majr]
	"Motivation"[Majr] AND "Exercise"[Majr] AND ("Heart Diseases"[Majr] OR "Myocardial Ischemia"[Majr] OR "Heart Failure"[Majr]) NOT "Rehabilitation"[Majr]
	"Motivation"[Majr] AND "Exercise"[Majr] AND "Patient Compliance"[Mesh]
	"Heart Diseases/rehabilitation"[Majr]AND "Motivation"[Majr] AND "Exercise"[Majr]
	"Heart Diseases/rehabilitation"[Majr] AND "Motivation"[Majr]
	"motivation" and "exercise" and ("heart diseases" or "myocardial ischemia" or "heart failure") not "rehabilitation".
BIBLIOTECA COCHRANE PLUS (in Spanish)	Motivación AND ejercicio
	motivación AND rehabilitación, motivación AND cardiopatías, motivación AND corazón
COCHRANE LIBRARY (in English)	(motivation AND exercise AND "cardiac rehabilitation")
	"motivation" and "exercise" and ("heart diseases" or "myocardial ischemia" or "heart failure") and "rehabilitation"
	"motivation" and "exercise" and ("heart diseases" or "myocardial ischemia" or "heart failure") not "rehabilitation"
CSIC-IME	'MOTIVACION", 'EJERCICIO","EJERCICIO FISICO"
	"MOTIVACION"
CUIDATGE	motivacio$ * (exercici$ + ejercici$)
	motivacio$ * rehabilitacio$
CUIDEN	(MOTIVA*)& (EJERCI*/REHABILITA*) & (CARDIOPAT* / INFART*)
	MOTIVA*
EnFisPo	motivación AND ejercicio
	motivación AND rehabilitación
	Motivación
ProQuest Health and medical complete	su(motivation*) AND su(exercise*) AND "cardiac rehabilitation"

PsycInfo	(DE "Motivation") AND (DE "Exercise") AND (DE "Cardiovascular Disorders")
Scopus	(motivation AND exercise AND "cardiac rehabilitation")
Web of Knowledge	(motivation AND exercise AND "cardiac rehabilitation")
	"motivation" and "exercise" and ("heart diseases" or "myocardial ischemia" or "heart failure") and "rehabilitation"
	"motivation" and "exercise" and ("heart diseases" or "myocardial ischemia" or "heart failure") not "rehabilitation"
Biblioteca Virtual en Salud	mh:("Motivación" AND "Ejercicio" AND "Enfermedades Cardiovasculares")
DialNet	motivación ejercicio
	motivación rehabilitación

3. Results

We obtained 865 articles from the search, of which 94 were duplicated (most of them were repeated more than once, making a total of 213 duplicates). We thus obtained 652 original articles. A hand search of the reference lists of eligible articles yielded nine additional articles, of which six were included. After review of the title and the abstract of each article, we rejected the articles which did not meet the inclusion criteria. Then, we read the non-rejected articles in their entirety and, of these, we included 27 and rejected 36 (figure 1). Table 1 presents the reasons for exclusion of all studies excluded after reading in the literature review.

The 27 articles included presented substantial diversity in terms of design (see table 2). There were three randomized clinical trials and twenty-four descriptive studies.

Based on the classification of study designs (see table 3)[15], the studies were ranked in different levels. Three of the quantitative studies were included in this review was ranked level II (good evidence)[16-18], nine studies were ranked level I [19-27], two were ranked level V (good to fair evidence)[28,29], and thirteen studies were ranked level VIII (poor evidence)[30-42]. The qualitative studies were not ranked as there is no widely accepted hierarchy of evidence for qualitative studies. The sample size also varied widely, from 17 to 5922. Three of the studies included practice non-supervised exercise[24, 30, 33] and all the rest had cardiac rehabilitation programs.

Table 4 presents the results for factors that act as barriers to exercise-based cardiac rehabilitation and non-supervised exercise. For both these categories we present the results in terms of the factors related to adherence as defined by the World Health Organization.

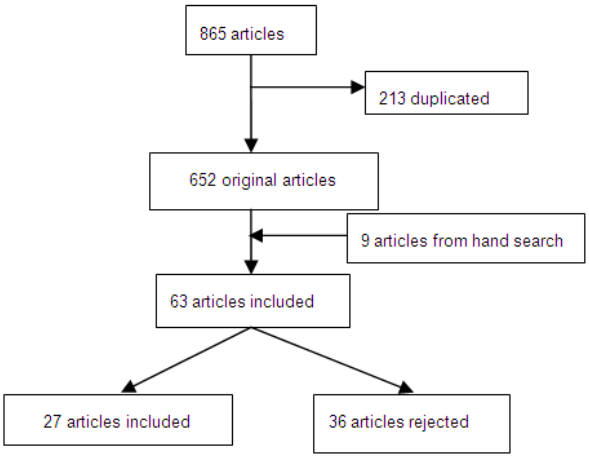

Figure 1. *Selection of the articles.*

With regard to barriers to exercise, we find the following results:

Table 1. *Overview of the authors and reason for exclusion of all studies excluded after reading in the literature review.*

Study (author, year)	Reason for exclusion
Oldridge N, 1984	Motivational and/or resistent factors to exercise are not measured.
Radtke KL, 1989	Assess compliance or non-compliance in the PRC, but motivational and/or resistent factors to exercise are not assessed.
Greif H, 1995	Assess psychological effects of exercise in the short term, but motivational and/or resistent factors to exercise are not assessed.
Mirotznik J, 1995	The study population was patients with AMI and other patients who do not have heart disease.
Bock B, 1997	Focus on the transtheoretical model. Motivational and/or resistent factors to exercise are not assessed.
Allison MJ, 1999	Examine strategies that can facilitate continuity of physical activity in the PRC learned. Motivational and/or resistent factors to exercise are not assessed.
Oldridge N, 1999	Motivational and/or resistent factors to exercise are not assessed.
Ruland CM, 2001	It is a pilot test (very small sample). It examines the applicability of a technique to cause preference (CHOICE).
Wyer S, 2001	A literature review.
Song R, 2001	Assess whether exercise produces effects on motivation. Motivational and/or resistent factors to exercise are not assessed.
Song R, 2001	Identify the effects of a program. Motivational and/or resistent factors to exercise are not assessed.
Daly J, 2002	Critical literature review.
Young DR, 2002	Not focus on cardiovascular diseases, but instead the study population consisted of patients with high CVRF.
Blanchard C, 2003	A theory is evaluated. Motivational and/or resistent factors to exercise are not assessed.
Johnston DW, 2004	Motivational and/or resistent factors to exercise are not assessed.
Brodie DA, 2005	Focus on the motivational interview. Motivational and/or resistent factors to exercise are not assessed.

Falko F, 2005	Focus on theorical models. Motivational and/or resistent factors to exercise are not assessed.
Sniehotta FF, 2005	Focus on action planning, coping and control the action. Motivational and/or resistent factors to exercise are not assessed.
Timmins F, 2005	Motivational and/or resistent factors to exercise are not assessed.
Luszczynska A, 2006	Motivational and/or resistent factors to exercise are not assessed.
Perry CK, 2006	Literature review which does not explain the method of selection of articles. It focuses on the motivational interview.
D'Angelo MS, 2007	Examine processes related with the regulation of the short and long term exercises. Motivational and/or resistent factors to exercise are not assessed.
Reid RD, 2007	Assess different theories. Motivational and/or resistent factors to exercise are not assessed.
Bjarnason-Wehrens B, 2007	A literature review
Brodie DA, 2008	Focus on mtivational interview. Motivational and/or resistent factors to exercise are not assessed.
Leung Y, 2008	Examine the mind-body therapy. Motivational and/or resistent factors to exercise are not assessed.
Mildestvedt T, 2008	Examine the effectiveness of an individualized intervention. Motivational and/or resistent factors to exercise are not assessed.
Parkosewich JA, 2008	Literature review (not specify the methodology of research information).
Blanchard C, 2009	Examine a theory of protection motivation. Do not focus on motivation to exercise.
Everett B, 2009	Discuss the use of ambivalence and decisional balance for behavior change. Motivational and/or resistent factors to exercise are not assessed.
Millen JA, 2009	Examine the effect of an intervention post-PRC. Motivational and/or resistent factors to exercise are not assessed.
Tulloch H, 2009	Examine the usefulness of a theory of motivation. Do not focus on motivation to exercise.
Davies P, 2010	Determine the effects of interventions Motivational and/or resistent factors to exercise are not assessed.
Guimarães GV, 2010	The study was conducted in Brazil. Really healthcare different from Spain
Russell KL, 2010	Evaluate the effect of self-determination theory. Motivational and/or resistent factors to exercise are not assessed.
Beckie TM, 2011	Not valued if depression reduces adherence or motivation in the exercise.

Table 2. *Overview of the authors and study characteristics of all studies included in the literature review.*

Study (author, year)	Design	Level of study design	Aim	Follow-up	Sample	Diagnosis	Intervention	Control
Andrew GM, 1979	Descriptive study. Longitudinal study (questionnaire).	IV	To determine reasons for subjects dropping out from the study. To identify differences in perceptions of the program, attitudes and other related factors between those who stay in or comply with the study and those who drop out.	No record.	631 patients completed the questionnaire (728 total possible respondents).	AMI.	CRP but no details specified.	Absence.
Godin G, 1991	Descriptive study. Transversal study (questionnaire).	VIII	To understand the intention to exercise of individuals who suffer from coronary heart disease (intentions, attitudes, subjective norms, perceived barriers, habits, perceived difficulties and personal normative beliefs with respect to exercising).	No record.	161 subjects (137 men; 24 women). Age < 70 years in 1988. Mean age= 52.8+-8.1 years.	Uncomplicated AMI.	No. Administration of questionnaire.	Absence.
Lieberman L, 1998	Descriptive study. Transversal study (questionnaire).	VIII	To investigate gender differences in the barriers and incentives that are most influential in the coronary patient's decision to participate in CRP; suggests strategies to counter these barriers.	Survey	129 attenders at CRP and 61 referred non-attenders at CRP (116 men and 74 women). Mean age of 65 years approx.	AMI and post-coronary artery bypass graft (CABG)	CRP but no details specified.	Absence.
Dorn J, 2001	Randomized clinical trial.	II	To examine factors associated with	3 years.	651 men assigned to 2	AMI (1 or more) between	CRP had 2 phases: 1- The	Not appear.

			exercise session compliance over 3 years in male AMI survivors. To investigate the association between demographic characteristics, coronary heart disease risk factors, maximal graded exercise test findings, depression, and overall compliance in terms of attendance at the scheduled sessions of the CRP and / or participation in an outside exercise program.		groups (323 men to CRP and 328 men control group). This study focused only on CRP group. 308 men in final sample. Mean age: 51..4 years (range 30 - 64 years).	8 weeks and 36 months.	first 8 weeks: monitored exercise. 4 min, on six different stationary devices, with a 2 min rest interval between stages. 2- Exercising at the gym or swimming pool without ECG monitoring (exercise HR was checked). 15 min of continuous jogging, cycling, or swimming + 25 min of recreational games (intensity: 85% HRmax). It was 3 days / week for 36 months.	
Farley RL, 2003	Descriptive study. Longitudinal study.	IV	To examine predictors of, and reasons for, non-attendance at CRP among coronary heart disease patients. To investigate the baseline demographic, clinical and psychological characteristics that predicted attendance at CRP after an acute cardiac event.	6 weeks.	Initially 85 patients, of whom 34 attended CRP (40%; 71% men. Mean age: 64.8+-11.35 years).	Coronary heart disease (unstable angina, AMI).	Hospital CRP for 6 weeks: 2h/week.45 min of supervised light exercise (walking or cycling). Second hour talking about different topic each week.	Absence.
Jones LW, 2003	Descriptive study (questionnaire and semi-structured interview)	VIII	To examine the factors that influence enrolment in exercise-based CRP in a northern urban centre servicing a large rural area. A patient-focused approach was used to explore reasons that encourage and inhibit patient enrolment.	Questionnaire and semi-structured interview.	20 enrollers and 9 non-enrollers. Mean age= 62.5 years (range 33 to 77).	AMI, unstable angina, coronary artery bypass grafts and angioplasty (in the previous 3 months).	CRP but no details specified.	Absence.
Kärner A, 2004	Descriptive study. Qualitative with an empirical and inductive approach (semi-structured interviews).	VIII	To explore spouses' conceptions concerning causes of coronary heart disease and drug treatment 1 year after the partner's cardiac event.	Interview one year after the episode.	25 spouses (17 women; mean age 52 years, range 36 to 67) and (8 men; mean age 61 years, range 46 to 68).	AMI or revascularization 1 year previously.	No groups, since it is a semi-structured interview with spouses.	Absence.
Clark AM, 2004	Descriptive study. Focus groups.	VIII	To compare decision-making in relation to CR attendance in users, non-users and patients	8 focus groups in 2 weeks. 55 to 90 min/focus group.	44 patients (33 men and 11 women). Mean age: 66 years (range	AMI, coronary artery bypass grafts or angina.	CRP consists of 12 weeks of exercise and health education on	Absence.

			with high attrition rates from a CRP		51 to 69).		diet, stress and smoking cessation. One-year follow up (4 visits in 1 year for patients with AMI). All patients do home walking exercise program: walk once a day, 5 days / week for 12 weeks. Progressive program from 40% to 65% HRmax. Initially 10 min at 40% HRmax and progressively increase up to 60 min at 65% HRmax in the last 6 weeks. Wore a pedometer and recorded the minutes and distance. 1 time / week received the visit of the nurse during the first 6 weeks and biweekly in the last 6 weeks.	
Corvera-Tindel, 2004	Descriptive study. Nonexperimental prospective study. Correlational design.	IV	To identify significant predictors of noncompliance to a home walking exercise program implemented in patients with advanced HF. To evaluate the clinical and emotional characteristics among 3 groups of patients: compliant patients who completed the exercise program, noncompliant patients who completed the program, and dropouts. To compare changes in functional status among these 3 groups.	12 weeks.	39 patients (99% men). Mean age: 63.2+- 10.1 years.	HF		Absence.
Hong TB, 2005	Descriptive study. Transversal study (interview).	VIII	To examine similarity of reported exercise behavior as a moderator of the association between social support for exercise provided and received by extending an actor-partner dyadic effects model.	No record. An interview of approximately 1 hour.	99 couples (1 patient/couple). Married and the partner must agree to participate in the study.	AMI, PTCA or coronary artery bypass grafts.	Patients finished phase II and some finished phase III.	Absence.
Kärner A, 2005	Descriptive study. Longitudinal study (semi-structured interviews).	IV	To explore how patients in the rehabilitation phase of coronary heart disease experience both facilitating and constraining factors related to lifestyle changes of importance for wellbeing and prognosis.	12 months.	113 participants (84 men and 29 women). Age < 70 years. Mean age: 58 years.	AMI, PCTA and/or coronary artery bypass grafts.	Interviews in the first 6 weeks and at 1 year post-AMI. All performed CRP and voluntarily accepted the interview.	Absence.
Dolansky MA, 2006	Descriptive study (focus groups) and individual interviews.	VIII	To examine older adults' expectations of and experiences with CRPs and factors associated with participation.	Interview at home 45 min and focus group 2 hours.	40 older adults (20 men and 20 women). Mean age: 71.7 years (age = or > 65 years.	AMI, coronary artery bypass grafts, or intracoronary intervention within the past 6 months.	Hospital CRP but not specified.	Absence.

Evenson KR, 2006	Descriptive study (survey by mail in 1999 and 2004).	IV	To describe CRP, barriers to participation, and reasons for dropout in North Carolina from a program director's perspective and to compare those results with those of a similar statewide survey conducted 5 years earlier.	Survey by mail in 1999 and 2004	61 CRP directors (from CRP participants: 65% men and 35% women)	AMI, coronary artery bypass grafts	CRP provided aerobic exercise, weight training, vocational counseling, stress management, smoking cessation, nutritional counseling, weight loss counseling, cardiopulmonary resuscitation classes, drug education, spouse support group, patient support group, water aerobics, symptom management class and other. Patients could choose hospital- or home-CRP. Home-CRP lasted 6 weeks and was chosen by 10 people. It used the Heart Manual (a book with two tapes or CDs to provide information and advice on aspects of CR such as exercise, diet, medication and psychological care). A trained facilitator supports its use through home visits and telephone contact. Hospital-CRP consists of the above information presented in weekly outpatient classes, with exercise as a core component facilitated by a team of CR professionals meeting national	Absence.
Wingham J, 2006	Descriptive study. Qualitative study (semi-structured interviews and interpretive phenomenological analysis).	VIII	To explore patients' experiences of AMI and to identify the factors which influence the choice patients make given the option of hospital or home-based CR after AMI.	Interview.	17 participants (14 men and 3 women). Mean age: 67 years.	First event of AMI or re-AMI.		Absence.

							guidelines. 7 people chose it.	
Caulin-Glaser T, 2007	Descriptive study (retrospective cohort analysis)	V	To determine the relationship of depressive symptoms and sex to completion rates in a CRP and, in those individuals completing the CRP, to clinical outcomes.	12 weeks.	348 participants (248 men and 100 women). Mean age: 63.9+-10.6 compliant; 55.5+-13.3% noncompliant.	AMI, coronary artery bypass grafts, PTCA, valve and others.	CRP 12 weeks: including exercise training, education, and behavior modification therapy. Education and behavior modification therapy included instructions and training in exercise; management of diet, cholesterol, blood pressure, stress, and glucose; smoking cessation; and weight-loss strategies.	Absence.
Jolly K, 2007/ Jones M, 2007	Randomized clinical trial.	II	To evaluate the relative effectiveness and cost-effectiveness of a home-based CRP using the Heart Manual, with centre-based CRP. To explore the reasons for non-adherence to CRP.	24 months.	525 patients (45.6% men and 38.3% women). 48.9% < 65 years and 37% > 65 years.	AMI, coronary artery bypass grafts or PTCA during previous 12 weeks.	All the CRP included exercise, relaxation, lifestyle counseling and education. All patients were seen by a cardiac nurse prior to hospital discharge and were provided with information about their condition and counseling about risk factor modification. The four centre-based CRP varied in length from 9 sessions (1 week) intervals of education + relaxation + circuit training to 24 individualized sessions over 12 weeks of mainly walking, fixed cycling and rowing with group-based education.	Not appear

							Hospital 1: risk factors advice, relaxation + 2 times / week supervised exercise for 12 weeks (walking, fixed cycling, rowing) 25-30 min at 60-75% HRmax. The information sessions and relaxation sessions were held once during each rehabilitation session and were optional. End after 24 sessions. Hospital 2: During 9 weeks performed education, advice and relaxation. 1 time / week exercised with 6 workout stations (1.5h total) for 9 weeks. Hospital 3: During 8 weeks performed education and exercise (2 times / week for 4 weeks (2.5h) + 1 time / week for 4 weeks (exercise 1h). Relaxation 1 time / week. 45 minutes of circuit training at 65-75% HRmax. Hospital 4: 2 sessions / week for 6 weeks. 30 min of education + warming + 40 min of exercise bike or treadmill and relaxation + 4 sessions of 1 exercise hour at 65-75% HRmax. Home-based CRP: Heart Manual for

							weeks (education, exercise at home, relaxation tape and stress management), the nurse visits at home 7-10 days after admission, telephone call at 3 weeks, visits after 6 and 12 weeks at home.	
Leung YW, 2007	Descriptive study. Longitudinal study.	IV	To examine exercise patterns (maintenance vs. Irregular vs. inactive) among cardiac patients. To identify sociodemographic, clinical, psychosocial and environmental correlates of these exercise patterns.	18 months post-discharge.	661 patients but 417 participate (76.5% men and 235% women). Mean age: 63.1+-10.2 years.	AMI, unstable angina, HF, PTCA and coronary artery bypass grafts.	Exercise in general no details specified.	Absence.
Marzolini S, 2008	Descriptive study. Retrospective analysis (interview)	V	To identify demographic (specifically age and sex), nonmedical and medical factors contributing to withdrawal in a large number of consecutively enrolled women and men in a long-term CRP.	12 months (retrospective analysis from 1999 to 2004).	5922 patients (4833 men and 1089 women). Mean age: 60.9+-10.6 years (men= 60.3 years and women =63.9 years).	AMI, bypass surgery, PTCA and documented ischemic cardiopathy.	Referred to the CRP a minimum of 4-8 weeks after cardiac event or surgical intervention by their physician. The CRP consisted of 1 session / week of rehabilitation for 9 months followed by 1 class / month for 3 months. Combined resistance and aerobic training, educational sessions, psychosocial and dietary counseling. Performed 5 aerobic and 2 resistance training workouts/week.	Absence.
Thow M, 2008	Descriptive study. Transversal study. (two-stage triangular approach was used where more than one	VIII	To identify the exercise motives of long-term phase IV CR participants. To determine if men and women phase III participants have similar exercise motivations.	Focus group of 1 hour.	55 participants (30 men and 25 women). Mean age: men 66+-7.4 years and women 69+-6.5 years.	AMI + angioplasty and coronary artery bypass grafts.	All the participants had attended phase III exercise sessions for at least 5 years in a community centre.	Absence.

	methodology is used)							
Rivett MJ, 2009	Descriptive study. Transversal study (telephone interview)	VIII	To determine the stage of physical activity readiness in patients who had previously withdrawn from a phase III community-based CRP, and to identify the reasons for withdrawal.	One phone call.	101 patients (72% men and 38% women) Mean age: 61 years.	Low risk cardiovascular disease.	Patients who had withdrawn from CRP (12-month follow-up). Transtheoretical model of change through a telephone interview to assess the patient's physical state. Four questions were asked to assess the level of motivation of the patient.	Absence.
Jones MI, 2009	Descriptive study (focus groups)	VIII	To compare the views of patients who had completed a home or hospital-based CRP. To explore the benefits and problems of each CRP.	Focus group of 1.5 hours.	16 patients hospital-CRP + 10 patients home-CRP (19 men and 7 women). Mean age: 62-65 years.	Low-moderate AMI and post-coronary artery bypass grafts.	Hospital-CRP: 3 hospitals exercised as a group and the exercise, education and relaxation components were combined in each session; in the other hospital individualized exercise and exercise and education components took place in separate sessions. Home-CRP: 6 weeks, nurse, exercise at home and focused on walking + Heart Manual+ relaxation and information tapes and received home visits and telephone follow-up for 12 weeks from the study nurse.	Absence.
Sharp J, 2009	Descriptive study. Longitudinal study.	IV	To describe rates and patterns of attendance and adherence to phase II CR and to determine factors that predict the uptake and adherence to the CRP. To investigate the patient intention to attend phase II CR, psychosociodemograp	12 weeks.	91 patients (70.3% men and 29.7% women). Mean age: 63.82+-12.23 years.	AMI or acute coronary syndrome, cardiac surgery, PTCA or elective angioplasty or attendance at an information session on angina.	For 8 weeks: 1 session / week of educational sessions + 10 weeks of exercise program: semiweekly hour-long exercise sessions	Absence.

			hic variables associated with the intention to attend phase II CR and psychosociodemographic variables associated with adherence to phase II CR.				(patients could choose to attend classes in either hospital-based or community-based settings and at different times to suit their needs).	
Beckie TM, 2010	Randomized clinical trial.	II	To compare attendance of women participating in a motivationally enhanced, gender-tailored CRP with that of women attending a traditional outpatient CRP. To determine the significant baseline predictors of attendance of the exercise and education components of interventions.	12 weeks	252 women = o > 21 years. Mean age = 63+-12 years.	Coronary heart disease (AMI, angina or coronary artery bypass graft or PTCA) within the last year.	CRP tailored: Like the traditional CRP but only women, adjusted for stage of change, improvement of individual behavior using motivational interview (1 hour to 1st and 6th week). They could not choose the time. Prior to the exercise performed 10 consecutive classes of practical guides for women, social support and relaxation exercises. (n = 141 women).	Traditional CRP: aerobic exercise and resistance training 3 days / week (5min warm-up, 30-45 min aerobic exercise (treadmill walking, cycling, or rowing) at 60-85% HRmax + 5 min cool-down) . Free hours to choose between 8am-4pm. + 8 consecutive sessions focus on risk factor modifications in 5 different times.
Dohnke B, 2010	Descriptive study. Longitudinal study.	IV	To examine the correlation of motivation and participation 6 months after inpatient phase II CR and the predictors of dropout 6 months later using the health action process approach.	12 months	456 patients (411 men and 45 women). Mean age = 57.69 years.	AMI, coronary artery bypass graft, PTCA, heart valve replacement surgery, or coronary heart disease.	Supervised exercise program and paid by social security. 90 min / session, 1 or 2 times / week.	Absence.
Marzolini S, 2010	Descriptive study. Retrospective analysis (questionnaire) .	VIII	To evaluate cardiac patients' self-reported long-term compliance to home-based resistance training. To evaluate the factors that affect compliance and the factors that should be considered in modifying a program to improve compliance in this population.	72 months. Median follow up = 38.7+- 25.9 months after the prescription of training resistance.	518 patients (447 men and 71 women). 69% returned the questionnaire = 358 patients (316 men and 42 women). Mean age: 58.2+´.6 years.	AMI, coronary artery bypass grafts, PCTA, angina and others.	All patients participated in CRP a minimum of 4-8 weeks after the event or surgical intervention (1 time/ week aerobic training and education session for 9 months	Absence.

							followed by 1 class / month for 3 months; they were required to complete 5 aerobic training sessions/week and could begin resistance training at any time during the first year enrolment. Training resistance = 3 additional visits for instruction and guidance, after which they can practice it at home or in the community but continue CRP).	
Sweet SN, 2011	Descriptive study. Longitudinal study (questionnaires).	IV	To explore differential patterns of exercise and motivation in CR patients over a 24-month period. To examine the relationship between these emerging patterns.	24 months.	251 patients (79% men and 21% women). 98% participated in CRP. Mean age: 61.40+-9.64 years.	AMI, coronary artery bypass grafts or PCTA.	All participants performed CRP (non-specified; part of the TEACHER study).	Absence.
Martin AM, 2012	Descriptive study (focus groups)	VIII	To investigate the motivations and supports deemed necessary to adhere to a community-based CRP.	Focus group of 1'5 hours.	24 patients (15 men and 9 women). Mean age: 67'7 +-16'7 years.	Established coronary heart disease.	Phase III CRP. Exercise-based and run.	Absence.

Table 3. *Classification of study design [15].*

Level	Strength of evidence	Type of study design
I	Good	Meta-analysis of randomized controlled trials
II		Large-sample randomized controlled trials
III	Good to fair	Small-sample randomized controlled trials
IV		Nonrandomized controlled prospective trials
V		Nonrandomized controlled retrospective trials
VI	Fair	Cohort studies
VII		Case-control studies
VIII	Poor	Noncontrolled clinical series, descriptive studies
IX		Anecdotes or case reports

Table 4. *Reasons for non-attendance at the exercise-based cardiac rehabilitation program and reasons for non-practice of regular non-supervised exercise reported by patients.*

Reasons for non-compliance	**Non-adherence to the exercise-based cardiac rehabilitation programs**	**Non-practice regular non-supervised exercise**
Social and economical factors:	younger and older age work commitments family demands lack of support be divorced or separated interferes with work housework	older age overprotection of the family lack of social support family commitments social commitments work commitments poor social integration

	patient race or ethnicity	lower socio-economic status
	economic problems	
	low educational level	
	no transport	
	too far to travel	
	not enough hours of CRP	
	expense and crowding	
	poor location of the center	lack of access to sporting facilities
Factors related to the health care system:	dislike public or mixed-gender exercise	transport problems
	problems in patients referral in exercise-based cardiac rehabilitation programs	not enough hours of CRP
	lack of exercise-based cardiac rehabilitation program information to the patient	dislike exercise with people
	lack of knowledge of exercise-based cardiac rehabilitation programs by doctors	
	to feel "I can deal with it by myself"	longer heart failure duration
	not feeling well enough	lower body mass index
	injury or illness	lower hostility scores
	low functional capacity	difficulties in psychological adaptation
Factors related to the condition of the patient:	female gender	higher comorbidity
	smoker	lower exercise capacity
	negation, stress	reduced functional capacity
	body fat	not exercise prior to event
	be tired from work, exercise and other activities	smoker
	noncardiac medical problems	urinary incontinence
		diabetes mellitus
	attending other programs	to be afraid of a new event due to practice exercise
Factors related to the therapy:	be afraid of the therapy	
	few training sessions	to have others priorities before practicing exercise
	repetition of the exercise sessions	
	lack of motivation	
	lack of enjoyment	
	lack of self-discipline	
	low level of intention and maintenance of self-efficacy	
	depression	lack of motivation
	anxiety	lack of enjoyment
	lack of time to exercise	laziness
	not comfortable being in groups	lack of time to exercise
	not wanting to dwell the problem	lack of experience with physical exercise and sports
Factors related to the patient:	no wanting to go back to the hospital	low level of self-efficacy
	don't want to listen to other's problems	low level of self-esteem
	to think "Doctor doesn't think I need it"	depression
	don't want to be reminded of heart attack	anxiety
	to perceive unmet emotional needs	
	joining other facilities	
	laziness	
	to find exercise tiring and painful	
	lack of interest	
	lack of belief in the benefits	

3.1. Social and Economic Factors

Twenty-three of the articles identified social and economic factors. Social factors may both positively and negatively affect the likelihood of exercise. For example, patients belonging to ethnic minorities report lower levels of physical activity than the rest of patients[17] and marital disruption has a negative impact on the capacity for social engagement, access to resources, and support received for positive lifestyle changes[18]. By contrast, women with a partner may have more social support and help with practical arrangements and may feel more committed to recovery in order to continue their care-giving role in the family[20]. However, the partner's negative attitudes towards exercise may also be a deterrent[33-35]. All kinds of social support are important, because they all influence the decision to exercise [31, 32, 36, 41-43]. In the case of women, the support of adult children is a very powerful factor for participation in exercise-based cardiac rehabilitation programs[31].

Eight studies reported that older or younger age, female gender, a low educational and socioeconomic level, patient ethnicity and minority status are related to poor adherence to exercise-based cardiac rehabilitation programs [16, 23, 28, 34]. Another study concluded that unmarried people under 55 have a high risk of premature withdrawal from these programs[29].

3.2. Factors Related to the Health Care System

Eighteen of the studies reported information related to the health care system. Transport problems[17, 20, 31, 32, 34,

36, 37], a lack of access to sporting facilities[30], a lack of hours of cardiac rehabilitation program[19, 20, 22, 29, 31, 36-38, 40, 41] and problems in patient referral to the exercise-based cardiac rehabilitation programs[23, 42] may all prevent patients from being physically active.

3.3. Factors Related to the Patient's Condition

Eighteen studies described factors related to the patient's condition (see table 4). They concluded that physical activity before myocardial ischemia predicts physical activity after the event[24, 30, 44]. In addition, concomitant diseases may limit participation in exercise-based cardiac rehabilitation programs. Smoking status was reported as a reason for lower adherence among smokers, maybe partly due to their perceptions of judgmental attitudes towards their habit among healthcare providers[16, 18]. Exercise was reported to be anxiety-provoking for sedentary women because many are unfamiliar with exercise equipment and voiced concern about their safety when using it[18, 45]. Additionally, sedentary lifestyle and obesity are associated with low adherence to exercise-based cardiac rehabilitation programs in some studies[13, 28, 29, 45] but not in others[18, 20, 41].

3.4. Therapy-Related Factors

Twenty-seven studies reported information related to therapy. The following aspects can trigger patient withdrawal from exercise: attending other programs, having priorities other than exercising, anxiety regarding a new event such as exercise, the low numbers of training sessions and the repetition of the exercise sessions[42]. Older heart failure patients, often presenting comorbidity, may find it difficult to adhere to advice regarding exercise[21, 46].

3.5. Patient-Related Factors.

Twenty studies reported information about the patient-related factors. Perceived control is an independent predictor of exercise[24][47] . Perceived self-efficacy – the individual's beliefs concerning his or her ability to perform exercise – was found to be strongly related to exercise behavior[26][37][42][48]. Higher and stable levels of barrier self-efficacy, outcome expectations and self-determined motivation are likely to increase and maintain exercise levels[27]. Motivation is relevant to exercise planning; and a lack of motivation can prevent people from continuing to exercise[49].

The reported factors for adherence and completion of exercise-based cardiac rehabilitation program differed for men and women[17]-[20][16, 28][29][31][36][37]. In women, they are more likely to dropout because of 'being very tired by work, exercise and other activities'[19][41], 'medical (non-cardiac) problems'[16][17][29][31][41], 'family obligations'[17] [29] [38][41][50] and 'having less leisure time due to their multiple roles'[45][51][52]. In contrast, men were more likely than women to report factors such as laziness, thinking that exercise is 'boring' and that exercise-based cardiac rehabilitation programs might 'interfere with work'[19][29][41]. Therefore, differences in withdrawal can be explained by the characteristics of the person rather than by sex alone[29].

Sixteen articles report motivating factors[17][22][42][45][53] with twelve studies reporting social interaction during exercise and social support from family, friends or physicians and/or cardiologist to be motivators. The aim of being fit, maintenance or weight loss, to feel good and preventing a new cardiac event or other injuries as osteoporosis increases adherence to exercise. The increase in autonomy and in self-confidence, the opportunity to choose the exercise program, and the possibility of enjoyment or to prepare for practice some sport are also described as motivational factors. Motivating factors related to the health care system as recruitment patient methods and the characteristics of the program are strategies to increase adherence[42].

Six studies focused on motivating factors for exercise specifically in men and women[39][41][52][54][55][56]. Motivational factors reported by men were related to getting physically fit and improving appearance; those reported by women were related to social interaction and preventing osteoporosis (table 5).

Table 5. *Men and women's motivations to increase exercise.*

MEN	WOMEN
health	social interaction during exercise
to get fit	social support
professional support	to tell her story and share her experiences with those
enjoyment	closest to them
improve appearance	enjoyment of exercise
accelerometer	prevent osteoporosis
lost weight	decrease anxiety and stress
social support	
stress control	

3.6. Intervention Suggested

Regarding social and economic barriers, reimbursement for exercise-based cardiac rehabilitation programs and non-supervised exercise should be considered[43][57]. In addition, support groups or telephone follow-up during long-term maintenance of new health behaviors are recommended[38][42][53][58] Adapting an exercise program to patients' preferences and eliciting support from others[17][25][29][31,36][38][41][42] is important to encourage patients to exercise[31][32] With regard to the health care system, transport facilities[20][38][43] , access to sporting facilities and equipment and to local community leisure[38][43][53] and allowing patients choose the best program for themselves[20][29][31][36][37][29, 40][59][60] can be helpful. As for the patient's condition, exercise programs can improve their health and, as a result, can improve their condition. To overcome therapy barriers it could be useful to identify the intentions to exercise, and to translate intentions into specific plans (how, where, and

when to perform an action by keeping a diary within the first weeks after discharge)[44][47][58][61][62]. In addition, instilling the idea that exercise provides health benefits, and offering realistic information about disease severity [17][41][42][62][63] as well as reviewing common and personal barriers with possible solutions is recommended. These strategies may help patients to avoid or control these obstacles in the future[45][58]. For older heart failure patients, meaningful, individualized health promotion plans are recommended, specifying exercise frequency, amount, intensity and persistence. Finally, to overcome patient-related barriers, exercise programs need to be tailored to each situation through strategies that increase self-efficacy and motivational self-determination and conform to expectations[25][27]. So the use of motivational interviewing might be a tool to overcoming these barriers[25][30][38][52][64]. It is important to give personalized information targeted at increasing self-concept and self-esteem[65]. Receiving tips from patients who have already completed the program can increase self-reflection on the negative perspectives[26][42]. Subscribing a written contract with information about the benefits of exercise can increase participation, and paying attention to patient preferences may help maintenance of exercise over time[37][66].

4. Discussion

Despite the knowledge that physical activity is beneficial for health, its practice in the population is becoming less common, especially in children. These low levels of physical activity lead a sedentary lifestyle of most people, which coupled with poor eating habits have led to the alarming increase in various diseases (obesity, cardiovascular disease, metabolic syndrome, etc), in some cases have become a real public health problem. Long-term adherence to a healthy lifestyle remains difficult for healthy persons and it is also difficult for cardiac patients. Although some of the risk factors for physical inactivity of non-adherence to exercise-based cardiac rehabilitation programs are described, there does not seem to be a general set of variables that can be used to identify people who are likely to attend exercise programs. We reviewed factors that influence cardiac patients to exercise, including qualitative and quantitative studies. Rather than a meta-analysis, we aimed to cover a broad array of factors, so we chose not to exclude studies on the grounds of their design, therefore, we got studies very different in aims and study methods. Secondly, we realize that cardiac rehabilitation program is very different from self initiated exercise but, because of the limited number of studies related to exercise and motivation, we considered “exercise” as practicing non-supervised exercise or attending exercise-based cardiac rehabilitation programs. Not all the studies specified the details of its cardiac rehabilitation program but of those that specified it, they had not the same characteristics, so they were heterogeneous. Our aim was to provide insight into possible factors related to exercise in cardiac patients. Third, our inclusion criteria were relatively broad to allow our search strategy to capture all relevant articles, and so the study designs and populations investigated were quite heterogeneous. Finally, most research we found focused on barriers and non-adherence to exercise, and only 16 studies focused on the actual motivation or benefits reported by patients. The research highlighted several barriers to exercise related to social and economic factors, or to factors related to the health care system, the patients' condition, therapy, or the patients themselves. Barriers and motivational factors differed according to gender.

With regard to social and economic factors, most studies report that social support is related to adjustment to lifestyle alterations and is correlated to exercise and exercise adherence[17][19][22][23][31][41][48][67], even in the long term[39][42]. Economic factors such as a lack of reimbursement for the cardiac sessions or transportation to go to the cardiac rehabilitation program centre is a barrier for patients with lower socio-economic status[23, 34]. The condition of the patient was related to adherence to exercise[16], but more studies are needed to confirm this finding[68]. Patients reported that adherence to exercise was reduced by inadequate social support, logistical problems in going to the rehabilitation centre, lack of motivation to exercise, lack of time to exercise, or laziness. Understanding the factors which influence people to exercise may help health professionals to guide patients towards the most appropriate exercise program method for their particular case.

This literature review shows that each patient should be given the choice of exercise to increase their feelings of control and thus their motivation to continue taking exercise. The findings emphasize the need for health care professionals to meet patients in a dialogue about how they think, feel and act in relation to major behavior changes. We believe that it is important to focus on the factors that motivate patients, although behavioral change needs to address issues of action implementation rather than motivational factors alone[47].

The reasons that deter patients from joining exercise-based cardiac rehabilitation programs are multifactorial and highly individual. It is important to consider social and individual needs in the design of programs, as well as other factors such as the location of the center in order to increase participation[17]; there are no universal variables that can be used to identify patients who will attend exercise programs[20].

5. Application to Practice

Understanding the factors that motivate people to exercise may help health professionals to guide patients towards the most appropriate exercise program method for their particular case.

Each patient should be given the choice of exercise to increase their feelings of control and thus their motivation to

continue taking exercise.

We stress the need for health care professionals to meet patients in a dialogue about how they think, feel and act in relation to important behavior changes.

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