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The positive impact of a four-week Cardiac Rehabilitation program on depression levels of cardiological patients

Floriana Caccamo[a], Simone Saltini[b], Cristina Marogna[a], Vito Sava[b], Roberto Carlon[b], Federico Vignaga[b]

[a] Department of Philosophy, Sociology, Pedagogy and Applied Psychology, University of Padova, Italy
[b] UOA of Cardiology, Cardiac Rehabilitation, ASSL 6 Euganea, Presidio Hospital of Cittadella, Padova, Italy

SOUHRN

Cíl: Posoudit pozitivní dopad programu srdeční rehabilitace na stupeň deprese u pacientů po akutní srdeční příhodě a ověřit, zda některé sociodemografické proměnné (např. diagnóza, pohlaví a věk) a proměnné v souvislosti se zaměstnáním a podporou ze strany okolí (povolání, rodinný stav, přítomnost/nepřítomnost dětí) lze považovat za prediktory deprese, a to jak na začátku, tak na konci programu srdeční rehabilitace.
Metody: K posouzení symptomů deprese vyplnilo před čtyřtýdenním programem a po čtyřtýdenním programu srdeční rehabilitace 122 pacientů dotazník BDI-II. Změny v hodnotách skóre se porovnávaly pomocí párového *t*-testu. K ověření prediktorů rozvoje deprese byla použita lineární regresní analýza.
Výsledky: Průměrné skóre BDI-II se od prvního do druhého hodnocení významně snížilo, jak u afektivního faktoru ($t = 2,66$; $p < 0,01$), u kognitivního faktoru ($t = 3,89$; $p < 0,01$), tak i v celkovém skóre BDI-II ($t = 3,68$; $p < 0,01$). Prediktory stupně deprese před hodnocením byly rovněž pohlaví ($\beta = 0,312$; $t = 2,55$; $p < 0,01$) a přítomnost dětí ($\beta = 0,426$; $t = 3,08$; $p < 0,01$).
Závěr: Snížené stupně deprese prokázaly pozitivní dopad programu srdeční rehabilitace, v němž mají strukturované aktivity řadu příznivých účinků na psychiku pacienta. Podle získaných výsledků je vhodné při rozhodování o dalších intervencích u pacientů se srdečním onemocněním vzít v úvahu jeho pohlaví a míru podpory ze strany okolí.

ABSTRACT

Purpose: To investigate the positive impact of a Cardiac Rehabilitation program on levels of depression in patients after an acute cardiac event and to verify if some socio-demographic variables, as diagnosis, gender and age, and variables related to work and social support (working occupation, marital status, presence/absence of children) could be considered as predictors of depression, both at the beginning and at the end of the Cardiac Rehabilitation.
Methods: One hundred and twenty-two patients completed the BDI-II questionnaire for evaluate depressive symptoms, before and after a four-week Cardiac Rehabilitation program. Changes in the scores were compared using paired *t*-test. Linear regression was used to verify predictors of depression.
Results: Mean BDI-II scores decreased significantly between PRE- and POST evaluation, both in the affective factor ($t = 2.66$, $p < 0.01$), in cognitive factor ($t = 3.89$, $p < 0.01$) and in total score of BDI-II ($t = 3.68$, $p < 0.01$). Also, at PRE-evaluation levels of depression were predicted by gender ($\beta = 0.312$, $t = 2.55$, $p < 0.01$) and presence of children ($\beta = 0.426$, $t = 3.08$, $p < 0.01$).
Conclusion: The decreased levels of depression showed the positive impact of Cardiac Rehabilitation program where structured activities have many beneficial effects on the psychological status of patients. The current findings suggested to consider gender difference and presence of social support to set up interventions for patients with heart disease.

Address: Floriana Caccamo, Ph.D., FISPPA, Dipartimento di Filosofia, Sociologia, Pedagogia e Psicologia Applicata Università degli Studi di Padova, Via Venezia, 8, 35131 Padova, Italy, e-mail: floriana.caccamo@unipd.it

Introduction

Many researches have described the short-term benefits of cardiac rehabilitation and exercise training upon depressive symptoms in coronary heart disease patients following major cardiac events, indicating a 40–50% reduction in depressive symptoms and significant improvements in overall quality of life [1–4].

Cardiac Rehabilitation (CR) is a clinically useful method of treatment that modifies cardiac risk factors and reduces psychological distress after an acute cardiac event [5]. The World Health Organization [6] and the European Society of Cardiology have defined the rehabilitation of patients with cardiovascular disease as the sum of the interventions required to ensure the best physical, psychological and social conditions so that patients with post-acute or chronic heart disease can preserve or regain their role in society [7,8].

Cardiac Rehabilitation has a primary role to encourage the development of strategies for the management of risk factors and self-management of care, promote the recovery of a satisfactory quality of life, help patients and family members to express emotions about the disease. They can be reached through different ways of action: educational interventions, individual counseling and group interventions, interventions for stress management (e.g. Relaxation techniques), individual and group psychotherapy [9].

CR combines the prescription of physical activity with the modification of risk factors and, in the perspective of secondary prevention, aims to limit symptoms related to the disease, disability and the risk of cardiovascular events and to improve exercise capacity, and re-employment [10,11]. Recent reviews show that the introduction of physical activity in a CR program reduces cardiovascular mortality and the rate of hospitalization, determining an overall improvement of the quality of life [1,12,13]. Physical exercise plays a very important role in the CR program, because, in addition to its physiological effect on the cardiovascular system, it prevents the onset of depressive symptomatology. Recent studies confirm that cardiac patients with several depressive symptoms benefit from physical exercise in terms of reduction of mortality and cardiovascular comorbidity rates in a 12 months' follow-up [14–16]. According to scientific literature the psychological distress, as depressive symptoms, represents a modifiable risk factor, which may ease the recurrence or accelerate the intensification of heart disease. Particularly, those patients who undergo to the greatest risk of coronary problems are people living in a constant state of emotional tension and anxiety, especially when linked to frustration and failure in their social and business activities [17]. Concurring to these premises, it becomes fundamental the CR program that, in addition to attention to diet and physical exercises, provides a psychological support. Recent studies show that group psychotherapy is helpful to patients with heart disease because it addresses their common problems, including interpersonal conflicts, life transitions, grief and loss [18]. It also addresses social isolation, a factor that has been linked to increased mortality and morbidity in some studies of patients with post-acute or chronic heart disease [5].

The prevalence of major depression after an acute cardiac event has been documented in 15–20% cases, and it exposes the patient to increased risk for future cardiac events [19,20]. It was observed that negative emotions, mainly depression and anxiety, have a negative influence on the heart primarily the autonomic nervous system, and indirectly the streets neuroendocrine [21–24]. There are many potential mechanisms linking depression to heart disease, including increased sympathetic and decreased vagal tone, decreased heart rate variability, impaired sleep, poor adherence to medical treatments and difficulties in quitting smoking [25–27].

Identification and treatment of depression are especially important in patients following recent cardiac events where its presence may be particularly pathogenic, conferring a greater than 4-fold increase in risk of death in the post-MI setting. Complicating this increased risk is the observation that major depression following MI runs a chronic course untreated, with more than 95% of patients remaining depressed at 6 months and up to 70% remaining depressed at 1 year [7].

It was observed that depression is associated with decreased compliance with medical treatment and this affects the chances of successful modifications of other cardiac risk factors [28] and the participation in cardiac rehabilitation, and not surprisingly, this is associated with reduced quality of life [29,30].

The main objective of this study is to determine if a short and intense 4-week Cardiac Rehabilitation program could produce a positive impact on levels of depression in patients who have had an acute cardiac event. Also, we want to investigate, both at the beginning and at the end of the cardiac rehabilitation, whether some socio-demographic variables, as gender and age, and variables related to work and social support (working occupation, marital status, presence/absence of children) could be considered as predictors of depression.

Method

Population

The patients were recruited among the ones hospitalized at the operating unit of Cardiology, in the Hospital of Cittadella (Italy). The protocol was proposed to all patients referred for an outpatient cardiac rehabilitation program after an acute event (ischemic heart disease with or without subsequent myocardial revascularization, chronic heart failure, chronic occlusive peripheral arterial disease, heart transplantation). All patients gave their written informed consent to participate in this protocol which was revised and approved by the Ethical Committee of the Hospital of Cittadella. The exclusion criteria concerned the inability to read or understand Italian, the visual or auditory impairments, the incomplete data collection, having life-threatening condition and having a neurological deficit.

Of the 127 patients enrolled, two patients dropped out the rehabilitation program for personal reasons and three patients were excluded from the analysis because they did not complete the questionnaire of the post--test evaluation. Therefore, a total of 122 patients were

included in the analysis. Patients were distributed as follows: 96 men (78%) and 26 women (22%) with a mean (standard deviation [SD]) age of 64.4 (10.4) years. Compared to diagnosis, patients were as follows: 78% acute myocardial infarction, 18% stable angina and 4% heart transplant.

Cardiac Rehabilitation program

After being discharged from the hospital, patients are encouraged to take part in the cardiac rehabilitation program, attending daily outpatient. The access to the program is consistent with the availability of place within the program and the compliance of the patient.

This program, which aims to optimize the medical treatment, is characterised by five fundamental activities: initial cardiological check-up, physical reconditioning, health education, dietary assessment and psychological support. In the first phase, patients undergo cardiac diagnostic tests aimed to control their specific symptoms and condition. Physical reconditioning consists of a period of personalised training using an exercise bike and some other floor exercises that involve specific muscle groups. Specifically, if there are no signs of ischemia or relevant arrhythmias, the heart rates to be achieved during the training sessions must correspond to 70–85% of the maximum heart rates reached at the exercise stress test. From a psychological point of view, physical reconditioning ensures that the patients reconnect to their body, which has changed from its preliminary condition. Physical reconditioning is done in groups, with two nurses who coordinate the physical exercises and calibrate the exercises on each individual patient.

Health education aims to change personal lifestyle to achieve long lasting changes, as well as to increase awareness of patient's condition by promoting cyclic monitoring even in case of subclinical forms of cardiovascular disease. Moreover, it allows to evaluate the level of adherence and the patient's self-management skills to prevent relapses and hospitalisation. Finally, it permits the correction of dysfunctional psychosocial factors with the goal of improving self-management and adherence to the prescriptions. Health education consists of group interactive classes, conducted by nurses, to which the family members of patients can also participate.

The fourth activity, called dietary assessment, consists of group meetings conducted by a nutritionist who prescribes the correct diet considering the inevitable changes involved with coronary heart disease. Furthermore, obese or overweight patients as well as patients with metabolic disorders (such as hypercholesterolemia, hypertriglyceridemia and diabetes mellitus) should attend specific individual meetings. Finally, it is provided a group of psychological support to help patients to cope with psychological suffering that commonly follows a cardiac event and that increases the risk of mortality and other cardiovascular events. The group of psychological support has the primary objective to support patients in becoming aware of their physical and psychological condition. It is led by a structured psychotherapist, there is also a psychologist and a nurse.

Each activity of cardiac rehabilitation program is provided twice a week.

Table 1 – Demographic characteristics of patients enrolled in the study.	
Variable	**Patients (n = 122)**
Age (years)	64.4 (10.4)
Male gender (n, %)	96 (78%)
Married (n, %)	81 (67%)
With children (n, %)	92 (72%)
Employed (n, %)	44 (33 %)
Acute myocardial infarction	99 (78%)
Stable angina	23 (18%)
Heart transplant	5 (4%)

Measures

To the patients was given the Beck Depression Inventory--II ([31]; Italian version [32]) which is a widely used self--administered questionnaire that evaluates the severity of depressive symptoms during the last two weeks preceding the assessment. It had to be compiled twice, the day after admission (PRE) and the day before hospital discharge (POST). The BDI-II is a self-rating questionnaire of 21 items. It includes a 13-item somatic-affective subscale, which concerns the somatic-emotional manifestations of depression such as loss of interest and energy, changes in sleep and appetite, shaking and weeping, etc., and an 8-item cognitive subscale, which mainly concerns the cognitive manifestations such pessimism, guilt, self-criticism, etc. Each item consists of four statements and the subject is instructed to choose the one that best describes his condition in the last two weeks. The statements are rated from 0 to 3, with 0 for normal or least depressed mood and 3 for the most depressed mood. Adding all the values together it was obtained a total score that range from 0 to 63. According to other Italian studies, patients with a score of 16 or above were defined as depressed [33,34]. The socio-demographic characteristics of patients included in the analysis, concerning gender, age, diagnosis, marital status, presence/absence of children, working occupation, are reported in Table 1.

Statistical analyses

For statistical and descriptive analysis was used the Statistical package SPSS 17.0. We calculated the t-student test for paired samples to evaluate changes between the PRE and the POST evaluation. Two-tailed $p < 0.005$ was considered statistically significant. Linear regression analysis was performed in order to determine independent predictors of depression, both at the PRE and at the POST evaluation. Our reliability analysis showed an adequate internal consistency for the questionnaire: α was .881 at pre-test and .864 at post-test.

Results

As for the phase concerning the PRE evaluation of depression, patients were distributed as follows: 61% (minimal depression), 18% (mild depression) and 21% (moderate-severe depression); at the moment of the POST eva-

luation phase, patients were distributed as follows: 89% (minimal depression), 9% (mild depression) and 2% (moderate-severe depression). No patient in the study was following a pharmacological treatment for depression. The results show that a reduction of depressive symptoms by 19% has occurred from the beginning to the end of CR program.

Results by *t*-student test for paired samples showed a significant difference in BDI-II scores between PRE and POST evaluation, both with regard to the affective and the cognitive factors and in total score of BDI-II (Table 2) as well, suggesting a significant decrease on depression levels at the end of the CR program.

To verify if gender, age, diagnosis, marital status, the presence of children and employment could predict the presence of depression and possibly its level, both in PRE and POST evaluation, linear regression analysis were conducted assuming the scores of affective factor, cognitive factor and total score of BDI as dependent variables and each of socio-demographic variables as predictors.

Results showed that in PRE evaluation phase, the affective factor is predicted by gender (β = .353, t = 2.88, $p < 0.01$) and presence of children (β = .383, t = 2.77, $p < 0.01$). Women (M = 9.73; SD = 5.37) have higher mean scores than men (M = 5.03; SD = 4.66) and patients without children (M = 8.90; SD = 4.88) have higher average scores than patients with children (M = 4.54; SD = 3.67). Cognitive factor in the PRE evaluation phase is predicted by the presence of children (β = .416, t = 2.89, $p < 0.01$), particularly patients with children have lower average scores (M = 1.42; SD = 1.88) than patients without children (M = 3.80; SD = 4.16). Finally, total score of BDI is predicted by gender (β = .312, t = 2.55, $p < 0.01$) and presence of children (β = .426, t = 3.08, $p < 0.01$). Also in this case women (M = 12.15; SD = 6.97) have higher mean scores than men (M = 6.44; SD = 6.61) and patients with children have lower average scores (M = 5.17; SD = 4.28) than patients without children (M = 11.80; SD = 8.49). No relationships were found between diagnosis, age, marital status, employment, and levels of depression during the PRE evaluation phase. Finally, changes observed in the different scores of depression after the cardiac rehabilitation program were not related to any variable.

Discussion

Decreased levels of depression showed the significant impact of Cardiac Rehabilitation program in improving the reduction of depressive symptoms observed in patients after an acute cardiac event [1]. This marked reduction in the prevalence of depressive symptoms represents a significant implication of the study that underlines, as shown in previous studies, the crucial role of the Cardiac Rehabilitation to the improvement in the global quality of life of the cardiac patients [4,5,11].

In the Cardiac Rehabilitation program, there is an entire team dedicated to patient's cardiac care which focus its attention on health of the body and psychological well-being. This care plays a very important role in helping the patients to understand their cardiac disease and treatment, to work together to increase awareness toward their healthcare, as well as to take charge of their own health and to preserve and improve their quality of life. Structured activities in the Cardiac Rehabilitation program have many beneficial effects on the psychological status of the patients, starting from the physical exercise that, in addition to preventing mortality and cardiovascular comorbidity, gives them a more positive image of themselves as people who can be able to carry out physical activity [12]. Recent studies suggest that exercise and physical activity are associated with better quality of life and several other health outcomes, as decreased depressive symptoms, because of the significant improvements in motor function and the benefits associated with physical activity [35,36]. Also, the psychological support group may represent an important form of care for cardiac patients and may contribute to reduce levels of depression because of the opportunity that patients should share their anxieties and emotional pains associated with coronary problems and heart disease. Evidences from literature suggest that sharing emotions linked with cardiac disease, especially frustration and failure in social and business activities, could improve perception, prognosis and course of illness, because the psychological support ensures the patient a better understanding of their emotions and, consequently, an appropriate use of coping strategies [17]. Furthermore, socialization and bonding with other patients who are at various stages of recovery and rehabilitation, is an important component of the intervention program and contributes to the favourable effects seen upon depression [7]. Specifically, there are many studies which confirm the effectiveness of homogenous group therapy for the care of physical pathology, as heart disease, because it becomes therapeutic for patients to experience understanding and reflection by other patients who have gone through the same experience and who can provide feedback, reassurance and infusion of hope [37].

Table 2 – Means and standard deviations of depression of patients before and after CR program.					
BDI-II		**M**	**SD**	*t*	*p* **value**
BDI – affective factor	T0	6.03	5.17	2.66	0.009
	T1	5.19	4.27		
BDI – cognitive factor	T0	1.62	2.48	3.89	0.001
	T1	0.99	1.74		
BDI – total score	T0	7.66	7.06	3.68	0.001
	T1	6.18	5.43		

In the present study, at the pre-test evaluation phase women resulted more depressed than men, confirming several studies in which women after an acute cardiac event had more severe depressive symptoms than men [38,39]. It may be that depression in male patients is underdiagnosed, because males tend to deny their depressive symptoms and compensate for them with attitudes and behaviour such as anger, hostility, cynicism, and externalizing coping styles (aggressiveness, antisocial behaviour, alcohol misuse) [40]. There are some evidences about the different way to experience emotions in men and women, so gender-related issues should be taken into account, not only in detecting depression after an acute cardiac event, but also in treatment and rehabilitation programs, to meet the specific needs of men and women [41].

In line with previous findings conducted in Cardiac Rehabilitation, our results showed that the presence of children could be considered as a predictor of depression, specifically patients without children were more depressed than patients with children [42,43]. This result underlines the role of children as crucial to social support, in predicting less emotional distress and contributing to emotional health, so to a greater support given by family members and children becomes lower levels of depression [44]. Studies support the practical and emotional burden that family members, as children, should endure and suggest that the presence of a family support can serve as a predictor of a favourable outcome [18]. People who live alone and lack of a social network, such as in absence of children, have a higher risk of ischaemic heart disease and death [45]. Besides, it was confirmed that social isolation is associated with reduced survival and worse health for patients with cardiovascular diseases [46].

In conclusion, this study reinforces the importance of the rehabilitation programs for stable cardiac patients to decrease their depressive symptomatology and improve their global quality of life. Also, the study highlights the role of children as promoters of greater psychological well--being, because patients with children keep the reassurance to count on the support of someone and this helps them to feel less depressive, as usually follows a cardiac event.

This work could be used as the basis for identifying patients who did not improve their depression during the Cardiac Rehabilitation program and thus providing them with a more focused psychological and cardiac monitoring and follow-up. These elements should be systematically assessed during the cardiac rehabilitation care of patients using quick questionnaires to provide relevant information on the status of psychological health. Further studies are necessary to better understand the complexity of mood and quality of life during cardiac rehabilitation and correlate it to a better compliance to physical exercise and lifestyle changes.

Some limitations met while conducting this study are as follows. First, the absence of a 1-year follow-up, as suggested by other studies [47,48], does not support the conclusion that the reduction of depressive symptoms will be maintained over time. The periodic and structured follow-up with a multidisciplinary approach is a tool that allows the continuity of care of cardiac patients. Another study limitation may be due to the selection bias, because the study group did not represent all the patients who have coronary events but rather those selected for referral and who attended and completed the formal cardiac rehabilitation program; the participation in cardiac rehabilitation program identifies them as active patients who desire to take care of themselves and to obtain an improvement in their quality of life. Third, symptomatology of depression was evaluated through the BDI-II questionnaire, but not with a complete clinical assessment. While BDI-II has shown good psychometric properties, it has been validated by a large community population and covers the most symptomatic elements of depression, it cannot replace a psychiatric evaluation using structured criteria as defined in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders-5 [49]. Finally, we did not collect objective physical performance measures to evaluate possible correlations with psychological symptomatology, and we did not collect data about erroneous and maladaptive beliefs that the patient has on the occurrence and consequences of his illness. It has been shown that erroneous beliefs are associated with adverse outcomes such as low quality of life [50], higher levels of depression [51], late resumption of work and less participation in Cardiac Rehabilitation programs [52]. The awareness of the patient's beliefs about their illness allows to start therapeutic interventions with the aim to change the false beliefs about the disease and to ensure a better outcome in terms of a positive change in lifestyle and a greater perception of psycho-physical well-being [53].

Conflict of interest
There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of this study.

Ethical statement
This study was approved by the Ethical Committee of the University of Padua (Padua, Italy). Written informed consent was obtained from all participants. Sensitive data have been handled with confidentiality and securely stored.

Informed consent
Written informed consent was obtained from all participants. Sensitive data have been handled with confidentiality and securely stored.

References
[1] P.D. Freitas, A. Haida, M. Bousquet, et al., Short-term impact of a 4-week intensive cardiac rehabilitation program on quality of life and anxiety-depression, Annals of Physical and Rehabilitation Medicine 54 (2011) 132–143.

[2] C.J. Lavie, R.V. Milani, Cardiac rehabilitation, exercise training, and psychosocial risk factors, Journal of the American College of Cardiology 47 (2006) 212.

[3] C.J. Lavie, R.V. Milani, Adverse psychological and coronary risk profiles in young patients with coronary artery disease and benefits of formal cardiac rehabilitation, Archives of Internal Medicine 166 (2006) 1878–1883.

[4] L. Pourafkari, S. Ghaffari, A. Tajlil, et al., The impact of cardiac rehabilitation program on anxiety and depression levels after coronary artery bypass graft surgery, Cor et Vasa (2016) e384–e390.

[5] C.J. Lavie, R.V. Milani, M.M. Cassidy, Y.E. Gilliland, Effects of cardiac rehabilitation and exercise training programs in women with depression, American Journal of Cardiology 83 (1999) 1480–1483.

[6] World Health Organization, Rehabilitation After Cardiovascular Diseases, with Special Emphasis on Developing Countries: Report of a WHO Expert Committee [Meeting Held in Geneva from 21 to 18 October 1991], 1993.

[7] R.V. Milani, C.J. Lavie, Impact of cardiac rehabilitation on depression and its associated mortality, American Journal of Medicine 120 (2007) 799–806.

[8] A. Mozafari, A. Baharvand, S. Mohebi, S.F. Hejazi, Impact of cardiac rehabilitation on depression after percutaneous coronary intervention, Journal of Health 7 (2016) 356–364.

[9] M. Sommaruga, R. Tramarin, E. Angelino, et al., Gruppo Italiano di Cardiologia Riabilitativa e Preventiva, Guidelines on psychological intervention in cardiac rehabilitation – methodological process, Monaldi Archives for Chest Diseases 60 (2003) 184–234.

[10] R. Klempfner, T. Kamerman, E. Schwammenthal, et al., Efficacy of exercise training in symptomatic patients with hypertrophic cardiomyopathy: results of a structured exercise training program in a cardiac rehabilitation center, European Journal of Preventive Cardiology 22 (2015) 13–19.

[11] T. Rutledge, L.S. Redwine, S.E. Linke, P.J. Mills, A meta- analysis of mental health treatments and cardiac rehabilitation for improving clinical outcomes and depression among patients with coronary heart disease, Psychosomatic Medicine 75 (2013) 335–349.

[12] L. Anderson, N. Oldridge, D.R. Thompson, et al., Exercise-based cardiac rehabilitation for coronary heart disease: Cochrane systematic review and meta-analysis, Journal of the American College of Cardiology 67 (2016) 1–12.

[13] M.J. Armstrong, R.J. Sigal, R. Arena, et al., Cardiac rehabilitation completion is associated with reduced mortality in patients with diabetes and coronary artery disease, Diabetologia 58 (2015) 691–698.

[14] L. Ernstsen, V. Rangul, J. Nauman, et al., Protective effect of regular physical activity on depression after myocardial infarction: the HUNT study, American Journal of Medicine 129 (2016) 82–88.

[15] R.V. Milani, C.J. Lavie, M.R. Mehra, H.O. Ventura, Impact of exercise training and depression on survival in heart failure due to coronary heart disease, American Journal of Cardiology 107 (2011) 64–68.

[16] J.P. Van Melle, P. De Jonge, T.A. Spijkerman, et al., Prognostic association of depression following myocardial infarction with mortality and cardiovascular events: a meta-analysis, Psychosomatic Medicine 66 (2004) 814–822.

[17] J.C. Peterson, M.E. Charlson, M.T. Wells, M. Altemus, Depression, coronary artery disease, and physical activity: how much exercise is enough? Clinical Therapeutics 36 (2014) 1518–1530.

[18] I. Locati, F. Caccamo, C. Marogna, Pazienti in cerca di gruppi: gruppi omogenei con coniugi e figli di pazienti con Grave Cerebrolesione Acquisita, in: (a cura di), F.N. Vasta, R. Girelli, S. Gullo (Eds.), Quale omogeneità nei gruppi? Elementi di teoria, clinica e ricerca, Gruppal-Mente, Alpes, Roma, Collana, 2013.

[19] D.E. Bush, R.C. Ziegelstein, U.V. Patel, et al., Post-myocardial infarction depression, in: AHRQ Evidence Report Summaries, 2005.

[20] D.M. Colquhoun, S.J. Bunker, D.M. Clarke, et al., Screening, referral and treatment for depression in patients with coronary heart disease, Medical Journal of Australia 198 (2013) 483–484.

[21] J. Barth, C.R. Martin, Factor structure of the Hospital Anxiety and Depression Scale (HADS) in German coronary heart disease patients, Health and Quality of Life Outcomes 3 (2005) 1.

[22] R.M. Carney, J.A. Blumenthal, K.E. Freedland, et al., Low heart rate variability and the effect of depression on post-myocardial infarction mortality, Archives of Internal Medicine 165 (2005) 1486–1491.

[23] L.V. Doering, K. Dracup, M.A. Caldwell, et al., Is coping style linked to emotional states in heart failure patients?, Journal of Cardiac Failure 10 (2004) 344–349.

[24] W. Jiang, M. Kuchibhatla, M.S. Cuffe, et al., Prognostic value of anxiety and depression in patients with chronic heart failure, Circulation 110 (2004) 3452–3456.

[25] J. Barth, M. Schumacher, C. Herrmann-Lingen, Depression as a risk factor for mortality in patients with coronary heart disease: a meta-analysis, Psychosomatic Medicine 66 (2004) 802–813.

[26] R.M. Carney, K.E. Freedland, G.E. Miller, A.S. Jaffe, Depression as a risk factor for cardiac mortality and morbidity: a review of potential mechanisms, Journal of Psychosomatic Research 53 (2002) 897–902.

[27] J.M. Gorman, R.P. Sloan, Heart rate variability in depressive and anxiety disorders, American Heart Journal 140 (2000) S77–S83.

[28] R.C. Ziegelstein, J.A. Fauerbach, S.S. Stevens, et al., Patients with depression are less likely to follow recommendations to reduce cardiac risk during recovery from a myocardial infarction, Archives of Internal Medicine 160 (2000) 1818–1823.

[29] N. Frasure-Smith, F. Lespérance, G. Gravel, et al., Social support, depression, and mortality during the first year after myocardial infarction, Circulation 101 (2000) 1919–1924.

[30] K.M. Glazer, C.F. Emery, D.J. Fred, R.E. Banyans, Psychological predictors of adherence and outcomes among patients in cardiac rehabilitation, Journal of Cardiopulmonary Rehabilitation and Prevention 22 (2002) 40–46.

[31] A.T. Beck, R.A. Steer, G.K. Brown, Beck Depression Inventory-II, 1996 San Antonio, TX, 78204-2498.

[32] M. Ghisi, G.B. Flubs, A. Montano, et al., Beck Depression Inventory-II. Manual Italian, Organization Special, Frieze, 2006.

[33] G. Blood, C. Nevada, M. Ghisi, D. Aplomb, Posttraumatic and depressive symptoms in victims of occupational accidents, Depression Research and Treatment 2012 (2012).

[34] C. Sic, M. Ghisi, G. Aloe, et al., The Italian version of the Obsessive Compulsive Inventory: its psychometric properties on community and clinical samples, Journal of Anxiety Disorders 23 (2009) 204–211.

[35] M.P. Herring, T.W. Poets, P.J. O'Connor, R.K. Dishpan, Effect of exercise training on depressive symptoms among patients with a chronic illness: a systematic review and meta-analysis of randomised controlled trials, Archives of Internal Medicine 172 (2012) 101–111.

[36] F.J. Penned, J.R. Dan, Exercise and well-being: a review of mental and physical health benefits associated with physical activity, Current Opinion in Psychiatry 18 (2005) 189–193.

[37] S. Corbelled, R. Girelli, S. Marginally, Gruppi omogenei, Bola, Milan, 2004.

[38] F. Bonnet, K. Irving, J.L. Terra, et al., Anxiety and depression are associated with unhealthy lifestyle in patients at risk of cardiovascular disease, Athéroscléreuses 178 (2005) 339–344.

[39] N. Frasure-Smith, F. Lespérance, M. Thalamic, Depression and 18-month prognosis after myocardial infarction, Circulation 91 (1995) 999–1005.

[40] Y. Dory, S. Cravats, G. Hirsch Berger, Israel Study Group on First Acute Myocardial Infarction, Long-term mental health of women after a first acute myocardial infarction, Archives of Physical Medicine and Rehabilitation 84 (2003) 1492–1498.

[41] A.M. Moller-Leimkuhler, Gender differences in cardiovascular disease and comorbide depression, Dialogues in Clinical Neuroscience 9 (2007) 71.

[42] A. Compare, C. Zero, G.M. Mansoni, et al., Social support, depression, and heart disease: a ten-year literature review, Frontiers in Psychology 4 (2013) 384.

[43] C. Zarbo, A. Compare, E. Baldassari, et al., In sickness and in health: a literature review about function of social support within anxiety and heart disease association, Clinical Practice & Epidemiologist in Mental Health 9 (2013) 255–262.

[44] U. Maeda, B.J. Sheen, E.R. Schwarz, et al., Self-efficacy mediates the associations of social support and depression with treatment adherence in heart failure patients, International Journal of Behavioural Medicine 20 (1) (2013) 88–96.

[45] R.B. Case, A.J. Moss, N. Case, et al., Living alone after myocardial infarction: impact on prognosis, Journal of the American Medical Association 267 (1992) 515–519.

[46] R.B. Williams, J.C. Barefoot, R.M. Cliff, et al., Prognostic importance of social and economic resources among medically treated patients with angiographically documented coronary artery disease, Journal of the American Medical Association 267 (1992) 520–524.

[47] K. Jolly, F. Bradley, S. Sharp, et al., Randomised controlled trial of follow up care in general practice of patients with myocardial infarction and angina: final results of the Southampton heart integrated care project (SHIP), British Medical Journal 318 (1999) 706–711.

[48] T. Cavanaugh, D.J. Martens, L.F. Hamm, et al., Prediction of long-term prognosis in 12 169 men referred for cardiac rehabilitation, Circulation 106 (2002) 666–671.

[49] American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders (DSM-5®), American Psychiatric Pub, 2013.

[50] D.P. French, R.J. Levin, N. Watson, D.R. Thompson, Do illness perceptions predict attendance at cardiac rehabilitation and quality of life following myocardial infarction?, Journal of Psychosomatic Research 59 (2005) 315–322.

[51] L. Stafford, M. Berk, H.J. Jackson, Validity of the Hospital Anxiety and Depression Scale and Patient Health Questionnaire-9 to screen for depression in patients with coronary artery disease, General Hospital Psychiatry 29 (5) (2007) 417–424.

[52] A. Whit marsh, M. Koutantji, K. Slidell, Illness perceptions, mood and coping in predicting attendance at cardiac rehabilitation, British Journal of Health Psychology 8 (2003) 209–221.

[53] E. Broadbent, C.J. Ellis, J. Thomas, et al., Further development of an illness perception intervention for myocardial infarction patients: a randomised controlled trial, Journal of Psychosomatic Research 67 (2009) 17–23.