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COGNITIVE FUNCTIONING AND DEPRESSIVE SYMPTOMS IN PATIENTS WITH ISCHEMIC HEART DISEASE UNDERGOING COMPREHENSIVE CARDIOLOGICAL REHABILITATION

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SUMMARY

Background

Current opinion holds that psychological factors may be as important as medical factors in recovery from ischemic heart disease (IHD). The aim of our research was to analyze selected parameters of cognitive functioning and the level of depressive symptoms in patients with IHD undergoing comprehensive cardiological rehabilitation (CCR).

Material/ Methods:

We studied a group of 57 people, including 29 IHD patients participating in comprehensive in-patient cardiological rehabilitation, and 28 healthy, socially and professionally active controls. The methods used included the Trail Making Test (TMT A & B), the Wisconsin Card Sorting Test (WCST), the Beck Depression Inventory (BDI), and a self-designed questionnaire covering demographic and medical parameters.

Results:

The experimental group demonstrated a normal level of cognitive functioning in respect to psychomotor speed, operational memory and executive functions, and the global depression score was also within the norms. A clinical analysis of partial indicators of depressive symptomatology revealed a prevalence of non-specific somatic symptoms over cognitive-affective symptoms in the case of IHD patients. At the same time, these patients demonstrated a reversely proportional relation between the depressive symptoms and psychomotor efficiency.

Conclusions:

What is important in the recovery of IHD patients is not only the strategy of recognizing and updating cognitive functions, but also a quantitatively and qualitatively appropriate strategy for recognizing and balancing non-specific somatic symptoms, which are frequently complications during the treatment of IHD.

Key words: recovery, executive functions, coping resources, non-specific somatic symptoms

INTRODUCTION

Recovery after ischemic heart disease (IHD) requires constant, dynamic balancing of, on the one hand, the needs of the patient, and, on the other hand, the requirements of his environment. This means that the state of health/illness is determined by the coping resources/deficiencies of a person, and by the requirements, which act as stressors. From this perspective health is understood as a disposition that makes adaptive functioning in a given environmental context possible, together with the process of moving along a continuum defined by the accessibility of genetic and psycho-social coping resources (Heszen & Sęk, 2007). Coping resources, also referred to as health resources, are defined as properties - physical and biochemical; objective and material; cognitive and emotional; assessments and attitudes; interpersonal and relational; macrosociocultural – belonging to the individual, the group and the environment. Special significance in the category of interpersonal resources is ascribed to cognitive and emotional qualities (Pasiowski, 2000; Antonovsky, 1995).

Health potential understood in this way enables the individual to avoid stressors, or, when this is not possible, to make more efficient the process of coping with the tension they generate. At the same time, this directly influences health, ensuring a feeling of balance and harmony. Illness is regarded as a consequence of the inefficiency of the regulative and adaptive health process. In other words, health deteriorates when there is a lack of energy and/or skills to face the requirements and burdens of everyday life (Heszen & Sęk, 2007; Ogińska-Bulik, Juczyński, 2008).

Ischemic heart disease

Ischemic heart disease (IHD) is currently considered to be a chronic civilization-related disease, closely connected with the lifestyle of the person. In medical terms it is defined as a set of clinical symptoms, which emerge as a result of an imbalance between the volume of coronary blood flow and the demand of the heart muscle for oxygen and energy compounds (Giec, 1999). The most frequent causes of IHD are sclerosis of the coronary artery and hypertension (Cieśliński, 2000; Tymińska-Sędek, 2004). Myocardial infarction, or full/partial cardiac necrosis, with resultant hypoxia, occurs when blood flow to the heart is completely blocked by plaques and blood clots. The most popular methods of IHD treatment are coronography, percutaneous transluminal coronary angioplasty (PTCA), and coronary artery bypass grafting (CABG) (Tymińska-Sędek, 2004).

Cognitive functions in IHD

Chronic IHD may have a direct negative impact on the functioning of the nervous system, and thus on the cognitive functions it performs. These cognitive functions include perception, speech functions, mentation, visuo-spatial

functions, executive functions, and memory (Bidzan, 2005; Dickson et al., 2007). Efficient cognitive functioning allows the individual to make accurate choices and manage her health independently. This means that the ability to generate and integrate information in a new and flexible way supports the conscious activity of a patient in the sphere of acquiring the knowledge necessary for developing health-promoting behaviors (Brzezicka-Rotkiewicz & Sędek, 2003).

A review of current research on the assessment of cognitive functions indicates that cognitive malfunctions with patients suffering from IHD develop in a complex manner. In about 80% of patients with cardiac disease, memory and learning impairments are observed, and the seriousness of the disease correlates with the degree of cognitive impairment (Wolfe et al., 2006). In the case of patients with chronic circulatory inefficiency, researchers have pointed to a decrease in the ability to reason logically, impairment of visual memory and psychomotor slowness (Jodzio & Drumm, 2005). In patients treated surgically these disorders usually belong to the group of mild neuropsychological deficiencies, which resolve within approximately 6-24 months (Jodzio & Brzeziński, 1995). They usually involve the processes of attention, memory, visuo-spatial skills and psychomotor fluency. Patients qualified for conservative therapy display these disorders to a higher extent (Jodzio & Drumm, 2005). It is often the case that decreased psychomotor fluency is one of the cognitive and affective symptoms of depression in patients suffering from IHD (Dudek, 2007).

Depressive symptoms in IHD

The intensity of coronary symptoms is positively correlated with the symptoms of depression, which increase the risk of myocardial infarction and cardiac death (Schwartzman & Glaus, 2000; Dudek & Siwek, 2007). The relation of depression and IHD can be considered from two perspectives. On the one hand, depression can be a factor predisposing to coronary disease, while on the other hand, it may be a reaction of the patient to a chronic somatic disease that is potentially life-threatening (Dudek, 2005). Thus depressive symptoms are regarded as an independent risk factor influencing the origin and development of IHD, and as an adaptive reaction to the life situation altered by the disease, which is comparable to a psychological crisis (Gulla & Siwińska, 2004; Suls & Bunde, 2005; Dudek, 2005; Dudek & Siwek, 2007). In 65% of patients who have gone through a myocardial infarction, symptoms of depressive mood are observed, which are usually temporary. Some 16-22% of patients from that group reveal a greater intensity and longer duration of such symptoms, which in consequence matches the criteria for a major depression episode. Nevertheless, patients suffering from IHD usually present mild and moderate intensity of depressive symptoms. These are quite often masked by somatic ailments, which makes correct medical treatment very difficult (Zięba & Dudek, 2001; Dudek, 2005). The dominant symptoms in this

population of patients include vegetative complaints, such as fatigue, exhaustion, insomnia and lack of appetite. At the same time, it is quite rare to observe other symptoms typical for depressive disorders, such as low self esteem, a feeling of guilt, tearfulness, and suicidal thoughts (Zięba & Dudek, 2001). The negative consequences of depressive disorders in IHD include anxiety, low stress tolerance, difficulties in adaptation, improper health-related habits and patterns of behavior (including nicotine addiction), hostility, life under the pressure of time, a tendency to keep playing the role of an ill person, rehabilitative difficulties, a decrease in the subjective quality of life, and a decrease in overall stamina (Dudek, 2005, 2007). It is generally assumed that depressive disorders limit cognitive abilities to a varying extent, leading e.g. to the development of egocentric attitudes and dysfunctional convictions about one's own coping abilities and those of the environment. As a result, regardless of the seriousness of the disease, depressiveness influences the process of treatment, rehabilitation, and prognosis in the course of IHD.

Comprehensive cardiological rehabilitation

The direct therapeutic aims in the case of patients suffering from IHD include improving prognosis and decreasing the risk of such complications as sudden cardiac death, acute myocardial infarction, and cardiac insufficiency. Over a longer perspective medical and rehabilitative treatment is concentrated on improving the broadly understood quality of life of the patient. The entire process of in-patient comprehensive cardiologic rehabilitation (CCR) includes pharmacotherapy, kinesitherapy, psychotherapy and sociotherapy. According to the currently valid Cardiological Rehabilitation Standards (2001), this process is coordinated, continuous, multiphase, and individualized, taking into consideration the clinical state of the patient, and accepted by the patient and her environment. It usually lasts from 4 to 12 weeks, and is directed first of all to those patients who have a high risk of cardiovascular complications and associated ailments. In medical terms, CCR is not only aimed at preventing angina and mitigating symptoms, but also modifying IHD risk factors (Giec & Trusz-Gluza, 1999; Cieśliński, 2000; Chung, 2004; Słowska, 2004).

An integral element of CCR is psychological intervention, aimed first of all at forming a positive self image (including the image of one's own body), decreasing mental tension, indicating alternative ways of perceiving health and illness (and possible behavior in both situations), modifying dysfunctional beliefs connected with excessive expansiveness and haste, shaping a pro-health philosophy of life, building a strategy of constructive coping with stress, replacing health – threatening habits with, among other things, breathing exercises, meditation, psychological training and self-mobilization (Tylka, 1994, 2000; Tymińska-Sędek, 2004; Gamian & Karpiński, 2007).

The positive and direct rehabilitative results in psychological terms include first of all mobilizing the patient to cooperate in the treatment process, which

is achieved by means of activating her and developing her coping resources (Guzińska et al., 2007). In other words, comprehensive cardiological rehabilitation is not limited to blocking the further development of the disease and preventing complications, but is also concentrated on developing and promoting competencies beneficial for health.

MATERIAL AND METHODS

Our research was performed on a group of 57 persons: 32 men and 25 women. Their ages ranged from 45 to 78 years, for an average age of 62.5 years (SD = 8.58). All persons qualified to the research group were right-handed and had not previously undergone any psychiatric or neurologic intervention.

Group I consisted of 29 patients who had diagnosed IHD, including 9 persons who had suffered a myocardial infarction; 5 after coronary artery bypass, 12 after myocardial infarction and coronary artery bypass, and 3 after cardiac valve surgery. Altogether group I consisted of 17 men and 12 women, who participated in a program of inpatient CCR at the Cardiological Rehabilitation Ward in the District Hospital of the Ministry of Internal Affairs and Administration in Sopot. The patients were in residence for 3 to 4 weeks.

Group II consisted of 28 people, all healthy, socially and professionally active, without a diagnosis of IHD. Altogether group II consisted of 15 men and 13 women. Basic data about the research groups are presented in Table 1.

The following research methods were used:

- A questionnaire on demographic data and medical parameters, including age, gender, education, professional activity, IHD diagnosis, previous cardiological interventions and operations, and concomitant diseases, including hypertension and diabetes;
- the Trail Making Test (TMT A & B), assessing psychomotor speed (TMT – A), attention switching, and the visuo-spatial aspect of operational memory (TMT B), (Kądziaława, 1990; Borkowska & Rybakowski, 2005);
- the Wisconsin Card Sorting Test (WCST), assessing executive functions and operational memory (Jaworowska, 2002; Borkowska & Rybakowski, 2005).

Table 1. Characteristics of the research groups

	group I patients with IHD undergoing a comprehensive cardiological rehabilitation, <i>n</i> = 29		group II individuals without IHD, <i>n</i> = 28		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
age	62.98	7.86	62.04	9.38	0.41	0.47
years of education	11.97	2.46	13.18	2.88	-1.71	0.14

- Beck Depression Inventory (BDI), assessing the level of depressive symptoms (Pużyński & Beręsewicz, 1993).

The results obtained were analyzed using the SPSS – 12.0 statistical program, licensed by the University of Gdańsk.

RESULTS

The patients in Group I demonstrated a level of cognitive functioning, in terms of psychomotor speed, operational memory and executive function, within the norms (Table 2).

Moreover, the patients from Group I showed depressive symptoms within norms (Table 3).

At the same time – analyzing partial indicators of depressive symptoms – there was a prevalence of non-specific somatic symptoms over cognitive-affective ones in the case of patients with IHD (Fig. 1).

Additionally, the intensity of particular depressive symptoms was analyzed on the basis of responses to specific questions included in the BDI (Fig. 1).

The results obtained indicate that in the group of IHD patients somatic symptoms prevail (mean > 0.5), such as loss of life energy (21), anxiety about state of health (20), loss of body weight (19), tiredness (17), sleep disorders (16), decrease of activeness (15) and change of one’s own body image (14). Cognitive-affective symptoms include anxiety about the future (2), a feeling of ineffectiveness (3) and problems with making decisions (13).

Table 2. Level of selected cognitive functions in both study groups

test		group I n = 29		group II n = 28		t	p
		M	SD	M	SD		
TMT A		50.31	18.21	43.89	27.70	1.04	0.59
TMT B		143.76	64.30	104.50	75.29	2.12	0.86
WCST indicators	NCM	2.21	1.97	2.86	1.86	-1.28	0.39
	NPR	44.66	35.04	48.29	30.27	-0.42	0.48
	NPM	37.38	25.52	39.54	22.72	-0.34	0.57
	ONM	59.83	23.71	59.57	23.01	0.04	0.52
	PCA	38.76	22.18	39.39	21.70	-0.11	0.66

Number of Categories Matched
Number of Perseverative Responses
Number of Perseverative Mistakes
Overall Number of Mistakes
Percentage of Categorial Answers

Table 3. Level of depressive symptomatology in both research groups

Test	group I n = 29		group II n = 28		t	p
	M	SD	M	SD		
BDI	11.59	8.37	10.04	9.02	0.66	0.76
BDI 1-13	5.38	5.45	5.71	6.42	-0.21	0.61
BDI 14-21	6.21	3.43	4.36	3.25	2.09	0.73

BDI - Beck Depression Inventory; the global indicator of depressiveness level;
 BDI 13 – cognitive-affective depression subscale; an indicator of intensity of cognitive-affective symptoms of depression;
 BDI 14 – 21 – somatic subscale of depression; an indicator of intensity of somatic symptoms of depression;

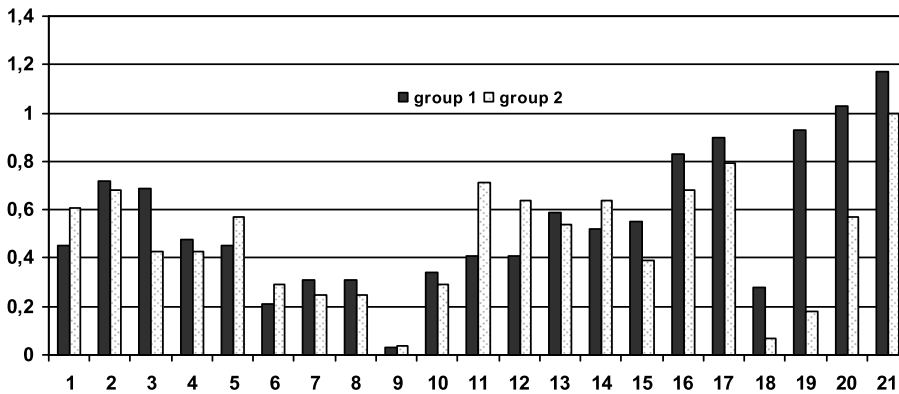


Fig. 1. Intensity of depressive symptoms: cognitive-affective (BDI 13) and somatic (BDI 14-21) in both research groups

The following somatic symptoms (mean > 0.5) were observed within the group of persons without IHTD: loss of life energy (21), tiredness (17), sleep disorders (16), change of one’s own body image (14). The most significant cognitive-affective symptoms included irritability (11), anxiety about the future (2), interest in other people (12), worsening of mood (1), sadness (5) and problems with making decisions (13). At the same time, the least common symptoms (mean < 0.1) in both research groups were loss of appetite (18, somatic) and suicidal thoughts (9, cognitive-affective).

In the case of patients with IHD, an inverse relationship was observed between the level of depressive symptoms and psychomotor speed, since there was a direct correlation between the time to complete the TMTA and the BDI score ($r = 0.44, p = 0.02$).

DISCUSSION

In the light of our results it should be pointed out that these patients with IHD in comprehensive cardiologic rehabilitation possess personal resources in terms of particular intrapersonal qualities. Thus the process of making conscious decisions and implementing a healthy lifestyle in the course of CCR may enhance the actualization of health potential in such aspects as psychomotor speed, operational memory, and executive functions, which are not influenced by the presence of psychopathological symptoms connected with depressive disorders. To clarify:

- psychomotor efficiency is demonstrated by the pace of cognitive processing;
- operational memory is the basis of the internal locus of control and of being aware of one's relations with the environment; it also allows for completion of complex tasks and adapting behaviors in an elastic way to changing environmental conditions.
- executive functions condition the organization and planning of activities connected with knowledge management (Chojnacka-Szawłowska, 1993; Walsh, 2000; Wolska, 2000; Brzezicka-Rotkiewicz & Sędek, 2003; Raz et al., 2003; Borkowska & Rybakowski, 2005; Wecker et al., 2005).

In clinical terms, this means that the efficiency of these cognitive functions regulates the process of acquiring knowledge and skills in the field of health-related psycho-education. At the same time, it facilitates working on such problems as:

- an adequate image of illness and treatment;
- the self-awareness required to recognize somatic symptoms and one's own emotional difficulties;
- changing one's hierarchy of values, plans and life objectives;
- identifying/eliminating/reducing risk factors;
- balancing their influence by means of protective factors;
- modifying behavior towards a more constructive way of coping with stress;
- developing readiness to make use of social support;
- acquiring and maintaining healthy habits (Tylka, 2000; Woynarowska, 2008).

As a result it is possible that the feeling of personal responsibility of a patient with IHD for her own health will increase, which is demonstrated by the ability to take care of herself, i.e. learning without outside supervision (Dolińska-Zygmunt, 2000; Woynarowska, 2008). At the same time conditions are created to allow shifting the emphasis from professional, supportive care, towards an individual kind of health care, which is especially significant in the further stages of cardiologic rehabilitation.

According to the published scientific literature, IHD may secondarily distort the course of cognitive processes (Jodzio & Brzeziński, 1995; Jodzio & Drumm, 2005; Herzyk, 2005; Borkowska & Robakowski, 2005). In the light of our results, which indicate a normal level of the cognitive functions we investi-

gated, it is worth noticing how varied the patients with IHD were, in terms of the kind of disease, its course and the type of treatment being applied. The cross-sectional nature of the research may also be significant, since it does not take into account the dynamics of changes in terms of the analyzed cognitive functions. The inclusion criterion for qualifying patients to the research group, which was taking part in the inpatient CCR program, is also important.

The lack of connection between IHD and depressive symptoms in the case of patients taking part in CCR results, among other factors, from using a higher scoring threshold in the BDI compared to the psychiatric criterion. According to the contemporary diagnostic strategy used in the case of patients with IHD, a score of 12 points in the BDI is the break-off level, since the symptoms of the disease may bring false positive results, especially in the somatic subscale (Dudek, 2005). In addition, episodes of depression in IHD appear more often in the case of patients who have suffered from affective disorders in the past, and these were not revealed in the investigated population of patients. Thus the psychological susceptibility to depressive reactions in stressful situations is a predictor of deteriorating mental state when ill (Dudek, 2005). It should also be noted that the assessment of depression was performed only on the basis of a subjective test, based on self-description of one's own state by the patient, and therefore it is not free from measurement errors, because the patient refers only to the aspects she recognizes and/or declares. Nevertheless, the basis for diagnosing depressive disorders should always be a clinical assessment of a patient's state. Moreover, the symptoms observed in patients with IHD, such as loss of life energy, anxiety about one's state of health, loss of body weight, fatigue, sleep disorders, decrease of life activity, change of one's own body image and anxiety about the future, feeling of inefficiency and difficulties in decision making, may be the product of both somatic disease and mood disorders. From this perspective, what is worth noticing is the non-specific character of the dominant somatic symptoms in the investigated group of patients, which may result in diagnostic difficulties connected with the tendency to ascribe the observed symptoms to the primary somatic disease (Dudek, 2005).

The relation observed in our patients with IHD between the level of depressive symptoms and psychomotor efficiency indicates the coexistence of mild forms of neuropsychological deficiencies, dependent on the intensity of depression, and demonstrated by the pace of cognitive processing (Pachalska, 2007). The deficiencies induce putting much more cognitive effort into performing tasks that require quickness and concentration (Marcopolus, 1999). As a result, patients with IHD who present with a depressive attitude have a lower level of efficiency in performing such tasks, at the same time maintaining the ability to coordinate efficiently simple cognitive activities without any time pressure (Brzezicka-Rotkiewicz & Sędek, 2003). In clinical practice this means that achieving rehabilitative goals requires applying step-by-step procedures when working with such patients.

Taking into account the level of cognitive functioning of patients with IHD, we would like to emphasize not only the necessity to diagnose, but also to enhance the patient's cognitive resources by applying the knowledge acquired during CCR. In practice, this aim may be achieved by updating coping mechanisms, i.e. recognizing one's influence not only on the development of the disease, but above all on the recovery process. The health threat perceived by the patient may be only the beginning of a realization that particular behaviors do have consequences, and at the same time may lead to developing the perception of her own efficacy in undertaking a healthy lifestyle (Bandura, 1997; Dolińska-Zygmunt, 2000; Juczyński, 2001; Łuszczynska, 2004). From this perspective, the key mediator between intention and behavior is planning, which is understood as the process of choosing and formulating mental representations of situations that involve the desired outcome (Brown & Pačalska, 2003). Further cognitive control of activity is also vital, in order to maintain the behavior initiated earlier (Brown & Pačalska, 2003). Thus optimizing rehabilitation for patients with IHD requires working out concrete strategies of using accessible cognitive resources for the purpose of initiating, maintaining and establishing health-oriented change.

CONCLUSIONS

A group of patients suffering from ischemic heart disease, undergoing comprehensive cardiological rehabilitation, demonstrated a normal level of cognitive efficiency, in terms of psychomotor speed, operational memory, and executive functions.

Patients suffering from ischemic heart disease demonstrate a normal global level of depressive symptoms, with a prevalence of non-specific somatic symptoms over the cognitive-affective ones.

In patients with ischemic heart disease, when the level of depressive symptomatology increases, psychomotor efficiency decreases.

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