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The health locus of control in middle-aged low-risk patients qualified for coronary artery bypass grafting with extracorporeal circulation

Joanna Pielok[1], Włodzimierz Płotek[2], Regina Samborska[3], Marcin Cybulski[4]

[1] Operative and Post-Operative Department, Holy Family Hospital, Specialist Health Care Centre for Mother and Child, Poznań, Poland
[2] Department of Teaching Anaesthesiology and Intensive Therapy, Poznan University of Medical Sciences, Poland
[3] Department of Cardiac Surgery with Intensive Cardiological Supervision Wards, Józef Struś General City Hospital in Poznań, Poland
[4] Department of Clinical Psychology, Poznan University of Medical Sciences, Poland

ABSTRACT

Introduction. The health locus of control gives a possibility to determine the patient's self-efficacy resources, which are specific in locating health control actions. It also enables prediction of the type of health behaviours the patient will exhibit during recovery after a cardiac surgery.
Aim. The aim of the study was to use the Multidimensional Health Locus of Control (MHLC) to assess the occurrence of the internal health locus of control (IHLC), powerful others (PHLC) and chance (CHLC) in patients undergoing coronary artery bypass grafting according to their sex, occupational activity and education. The occurrence of types of health locus of control was also assessed.
Material and methods. 52 patients aged 47–63 years were tested (46 men – 88.5% and 6 women – 11.5%). The position of health control was tested by means of the Polish version of the American MHLC adapted by Juczyński.
Results. The average scores were as follows: I – 27.92 points, O – 29.60 points, C – 22.61 points. The research revealed statistical dependencies for some MHLC dimensions and for the sex and education. MHLC Type 7 – undifferentiated, strong (19 patients, 36.6%) was the most common.

Key words: anaesthesia, locus of control.

Introduction

Ischaemic heart disease is the most common disease of the cardiovascular system in developed countries. It turned out that somatic causes of the development of coronary artery disease and genetic conditions account for only 80% of its aetiology. The multi-centre research 'Interheart' resulted in identification of psychosocial factors as an independent cause of the development of ischaemic heart disease [1]. In daily medical practice it is difficult to make a precise psychological assessment of a patient scheduled for cardiac surgery because it requires broad knowledge and time. Therefore, we need research tools which will enable us to identify patients with high risk of occurrence of emotional and mental disorders, which will negatively affect the process of treatment and rehabilitation. The Multidimensional Health Locus of Control scale is one of such tools [2].

In the contemporary holistic model health is approached in a multidimensional manner. It consists of the physical, mental, spiritual and social dimension. In spite of the presence of a somatic disease many people remain healthy in the psychosocial

aspect or vice versa [3]. On the one hand, the occurrence of an illness results in passive, biological surrender to it. On the other hand, it results in a creative reaction to challenges, difficulties and threats brought by the illness. The effectiveness of reaction depends on the patient's perception of themselves in the situation of disordered balance between health and illness. Some people are convinced that they can control their response to the situation and have influence on harmful and negative events. Although these people need medical assistance, they actively participate in these events at all times. On the other hand, for other people an illness is an event which remains beyond their control. They are passive and assume that recovery is a result of external factors [4]. The relation between the patient's perception of their illness and their potential to cope with it and ability to exhibit health-promoting behaviour is defined as the health locus of control [5]. The construct of the health locus of control was based on the social learning theory developed by Rotter in 1954. According to the theory, one's own action is a tool to achieve the goal. Rotter distinguished between the internal and external locus of control. The sense of locus of control was defined as a causation between one's activity and the event which led to this activity. As far as the internal locus of control is concerned, events are the consequence of an individual's actions and personal control. The internal locus of control expresses one's efforts to control one's environment and emotions, to take responsibility for one's actions and take autonomous decisions. As far as the external locus of control is concerned, events are perceived to be determined by factors beyond one's personal control, independent of one's deliberate actions. People with the external locus of control think that they are guided by chance, fate and social environment. Everything in their lives depends on external factors, which are beyond their control [6].

Referring the theory of locus of control to health facilitates determination of one's attitude to illness and enables prediction of behavioural and cognitive actions during illness and recovery [7]. The internal health locus of control involves taking greater responsibility for one's health and it favours health. As far as the external health locus of control is concerned, the patient makes his/her recovery dependent on external factors, such as good luck, chance, belief or action of third parties. It is impossible to put the equals sign between chance and professional medical care. Therefore, the external health locus of control was divided into the one related to other people's influence and the one related to chance [8]. As far as the internal locus is concerned, health control depends on the patient. When we take other people's influence, health is the result of other people's actions, especially the result of actions taken by medical personnel [9]. The influence of chance means that health depends on random external factors. People with the internal health locus of control are characterised by greater optimism and actively solve problems. On the other hand, people with the external health locus of control react to difficult situations with greater stress and fear. The external health locus of control is positively correlated with neuroticism, whereas the internal health locus of control is negatively correlated with neuroticism [10].

There are differences in the health locus of control, which depend on respondents' age, sex, state of health and place of residence [11]. The internal health locus of control decreases with age, whereas the belief in other people's influence and chance increases with age. The tendency for the internal health locus of control is greater in men than in women [12]. This tendency is also greater in urban than in rural inhabitants. Studies comparing the health locus of control between healthy and sick people revealed that healthy people find the internal health locus of control more significant than sick people do. The lowest level of the internal health locus of control was observed in dialysed patients and in pregnant women, whereas other people's influence was rated highest by patients of oncological departments [13]. So far most publications have assessed and compared the health locus of control in healthy and chronically ill patients [14, 15]. There have been few observations concerning patients treated in hospitals, especially immediately before surgery [16, 17].

The aim of the study was to assess the types of health locus of control in patients qualified for coronary artery bypass grafting with extracorporeal circulation and to check the distribution of the MHLC types in the group under study, depending on the subjects' sex, education and occupational activity.

Material and methods

The research was planned according to the requirements of Good Clinical Practice included in the regulation issued by the Minister of Health on 10 December 2001 (based on Article 6, Paragraph 5, Section 5 of Pharmaceutical Law issued on 6 September 2001 – Official Journal No. 126, Pos. 1381 and Official

Journal 2001, No. 113, Section 984, No. 141, Section 1181 and No. 152, Section 1265).

On 1 March 2012 we received approval of the Bioethics Committee, Poznan University of Medical Sciences (Resolution No. 265/12). The research was conducted at the Department of Cardiac Surgery, Józef Struś General City Hospital in Poznań, Poland. We proposed participation in the research to patients living in the Poznań agglomeration (the fifth largest city in Poland) who were qualified and prepared for scheduled coronary artery bypass grafting with extracorporeal circulation. The patients were qualified for the surgery according to the current standards of the Department of Cardiac Surgery, Józef Struś General City Hospital in Poznań, which was in agreement with the generally accepted clinical practice. The patients met the inclusion criteria for the group under study.

The inclusion criteria were as follows:

- Patients scheduled for coronary artery bypass grafting under general anaesthesia with extracorporeal circulation;
- Ejection fraction before the surgery equal to or greater than 40%;
- Age 45–65 years;
- Native speakers of Polish
- At least eight years of primary school education
- Informed consent to participate in the research.

The exclusion criteria were as follows:

- Surgical emergencies;
- Surgeries with coronary artery bypass grafting and valve replacement, valve surgeries, aortic aneurysm surgeries or reoperations;
- Cerebrovascular accident (stroke, transient ischaemic attack) within 3 months before the surgery;
- Mental illness diagnosed and treated;
- Cognitive impairment: Mini Mental State Examination (MMSE) < 24 points, Schulman's Clock Drawing Test above the first level of errors, sense of coherence according to Antonovsky's subscale of reasonableness < 34 points;
- Permanent pacemaker;
- Chronic liver disease (understood as alanine aminotransferase (ALAT) and aspartate aminotransferase (AspAT) levels being twice as high as the norm in initial tests);
- Chronic renal failure diagnosed (creatinine level in initial tests > 2mg/dl);
- Chronic intake of psychotropic medications (understood as daily intake of these drugs for at least 3 months before the surgery);
- Alcoholism (understood as daily consumption of at least 25 g of pure alcohol or weekly consumption of 500 g of pure alcohol);
- Unregulated diabetes (understood as postprandial concentration of glucose above 11.1mmol/l and glycated haemoglobin of HbA1c > 9% [which was measured in patients with diagnosed diabetes and qualified for the research on the day before the surgery]);
- Preoperative anaemia (understood as haemoglobin (Hb) < 7.0mmol/l and haematocrit (HCT) < 34%);
- Hyperthyroidism or hypothyroidism
- No consent to the test.

72 patients were offered to take part in the research. 18 patients refused to participate for the following reasons: excessive preoperative anxiety (5 patients), unwillingness to take part in scientific research (7 patients), lack of glasses for reading (2 patients), inability to read (1 patient), no reason for refusal given (2 patients). One patient was not qualified for the research due to incorrect results obtained in screening tests (MMSE <24 points; Clock Drawing Test –the fourth level of errors). One patient was disqualified because he admitted his wife had done the test for him.

Research tools

Multidimensional Health Locus of Control (MHLC) version B

The Polish version of the American Multidimensional Health Locus of Control (MHLC) scale was adapted by Juczyński. It enables identification of generalised expectations in three dimensions of health control: the internal health locus of control (IHLC), the powerful others health locus of control (PHLC), and the chance health locus of control (CHLC). The scale is a self-report tool. It contains 18 statements about the health locus of control. The respondent is supposed to rate them using a six-point scale provided above the statements. Among the 18 statements in the scale, 6 statements concern the IHLC, 6 statements concern the PHLC, and 6 statements concern the CHLC. The minimum score for each scale is 6 points, whereas the maximum score is 36 points. The higher the score is, the stronger the respondent's belief is that this factor has influence on their state of health. Depending on the interrelation between the three dimensions, the score is allocated to one of eight MHLC types, according to demographic standards. The internal consistency (Cronbach's alpha) is 0.74 for I, 0.69 for O and 0.54 for C [18].

Research procedure

The patients who agreed to take part in the research and met the inclusion criteria were allocated to one of three groups, depending on their sex, occupational activity and education. One day before the surgery the patients were requested to respond to the questions provided in the MHLC test. When the scores were allocated to one of the types of health locus of control, the dependence between the types and the respondents' sex, occupational activity and education was analysed.

Statistical analysis

The statistical analysis was made with a computer package for statistical calculations SPSS v.21.

When describing basic biometric data, MHLC results and cardiac surgery data were presented as minimum, maximum and mean values as well as standard deviation. When describing the distribution of data in the subgroups of sex, occupational activity and education, standard error of the mean was also added. The results of the patients qualified for IHLC, PHLC and CHLC in the MHLC test were correlated with their sex, occupational activity and education. When analysing sex-dependent and occupational activity-dependent differences between the subgroups in individual MHLC dimensions, the homogeneity of variance was checked with Levene's test. Next, Student's t-test was conducted. ANOVA and post-hoc LSD test were used to assess the influence of education on the results. In all statistical tests $p < 0.05$ was assumed as the limit of statistical significance.

Results

Research group characteristics

The research was completed by 52 patients aged 47–63 years (middle adulthood according to Erikson) [19]. 46 men (88.5%) and 6 women (11.5%) took part in the research. 6 patients (11.5%) had primary education, 24 patients (46.2%) – vocational education, 14 patients (26.9%) – secondary education, 8 patients (15.4%) – higher education. 31 patients (59.6%) were employed and 21 patients (40.4%) were unemployed. None of the unemployed patients received a disability pension due to cardiac diseases. The patients' biometric data and ejection fraction are shown in **Table 1**.

Concomitant diseases

The most common concomitant diseases were:

- hypertension – 24 patients (46.2%);
- nicotine addiction – 14 patients (26.9%);
- myocardial infarction – 11 patients (21.2%);
- diabetes with stabilised blood glucose – 5 patients (9.6%);
- gout – 5 patients (9.6%);
- bronchial asthma, chronic obstructive pulmonary disease, active stomach ulcers, hypothyroidism treated by a specialist endocrinologist during euthyroidism, obliterating arteritis – 2 patients (3.8%) with each disease;
- prostate cancer after hormonal treatment in remission, rheumatoid arthritis, systemic lupus erythematosus, psoriasis - without treatment, nasal polyps - 1 patient (1.9%) with each disease.

MHLC dimensions

- The mean scores in the research group were as follows: IHLC: 27.92 points (SD – 5.19), PHLC: 29.60 points (SD – 4.08), CHLC: 22.61 points (SD – 6.08). Detailed data can be found in **Table 2**.
- The mean scores – according to the respondents' sex, occupational activity and education

  The mean value of the scores in individual dimensions was compared in relation to the respondents' sex. Detailed data can be found in **Table 3**.

The analysis revealed a statistically significant difference only in dimension PHLC, where the men had higher scores. However, the results were close to the limit of statistical significance (Student's t-test, $p = 0.047$).

The analysis of the scores in the MHLC dimensions in different groups of occupational activity did not show statistically significant differences despite differences between the scores (Student's t-test, $p > 0.05$). Detailed data can be found in **Table 4**.

Table 1. The research participants' body weight, height, body mass index, body surface area and ejection fraction

Basic biometric parameters	N	Minimum	Maximum	Medium	Standard deviation
Body weight (kg)	52	54.00	143.00	86.28	17.76
Height (cm)	52	156.00	187.00	172.13	7.51
Body Mass Index (kg/m^2)	52	21.60	46.20	28.91	4.6
Body Surface Area (m^2)	52	1.59	2.51	1.20	0.21
Ejection Fraction (EF) (%)	52	40.00	61.00	51.19	5.88

Table 2. Descriptive statistics of the MHLC test results in the whole group (N = 52)

Dimensions of the MHLC	Minimum	Maximum	Mean	Standard deviation
IHLC	14.00	36.00	27.92	5.19
PHLC	12.00	36.00	29.60	4.08
CHLC	10.00	35.00	22.61	6.08

MHLC - Multidimensional Health Locus of Control scale; IHLC – Internal Locus of Control, PHLC- Powerful Others Locus of Control, CHLC – Influence of Chance Locus of Control

Table 3. A comparison of mean scores in the MHLC scale according to the participants' sex

Dimensions of the MHLC	Sex	N	Mean	Standard deviation	Standard error of mean
IHLC	men	46	28.30	4.96	0.73
	women	6	25.00	6.48	2.65
PHLC	men	46	30.00*	3.40	0.50
	women	6	26.50*	7.29	2.97
CHLC	men	46	22.09	5.98	0.89
	women	6	26.67	5.78	2.36

* - statistically significant
MHLC - Multidimensional Health Locus of Control scale; IHLC – Internal Locus of Control, PHLC – Powerful Others Locus of Control, CHLC – Chance Locus of Control

Table 4. A comparison of mean scores in the MHLC scale according to the participants' occupational activity

Dimensions of the MHLC	Occupational activity	N	Mean	Standard deviation	Standard error of mean
IHLC	employed	31	28.19	4.76	0.86
	unemployed	21	27.52	5.87	1.28
PHLC	employed	31	29.74	3.38	0.61
	unemployed	21	29.38	5.02	1.10
CHLC	employed	31	21.55	5.92	1.06
	unemployed	21	24.19	6.11	1.33

MHLC - Multidimensional Health Locus of Control scale; IHLC – Internal Locus of Control, PHLC – Powerful Others Locus of Control, CHLC – Chance Locus of Control

Table 5. A comparison of mean scores in the MHLC scale according to the participants' education

Dimensions of the MHLC	Education	N	Mean	Standard deviation	Standard error of mean
IHLC	primary	6	30.83	4.21	1.72
	vocational	24	28.46	4.05	0.83
	secondary	14	26.57	6.65	1.78
	higher	8	26.50	5.78	2.04
PHLC	primary	6	30.67*	2.34	0.95
	vocational	24	30.46*	3.36	0.67
	secondary	14	29.00	5.45	1.46
	higher	8	27.25*	4.08	0.57
CHLC	primary	6	25.83	6.55	2.68
	vocational	24	24.25	5.19	1.06
	secondary	14	20.71	6.60	1.76
	higher	8	18.63	5.07	1.79

* - statistically significant
MHLC - Multidimensional Health Locus of Control scale: IHLC – Internal Locus of Control, PHLC – Powerful Others Locus of Control, CHLC – Chance Locus of Control

The mean value of the scores in individual dimensions differed according to the respondents' education. Detailed data can be found in **Table 5**.

The ANOVA test did not reveal statistically significant differences in IHLC or PHLC. As far as CHLC is concerned, the mean values in the groups with primary and vocational education were greater and they were significantly different from the mean value in the group with higher education (ANOVA F = 3.077, p = 0.036). The post-hoc LSD test resulted in p = 0.024 for dif-

Table 6. The occurrence of MHLC types according to the participants' sex, education and occupational activity

			MHLC Type						Total
			2	3	4	5	6	7	
Sex	women	number	1		1	1	1	2	6
		%MHLC	16.67		16.67		16.67	33.33	100
	men	number	3	2	11	14		17	46
		%MHLC	6.52	2.17	23.91	30.44		36.96	100
Occupational activity	unemployed	number	2		5	5	1	8	21
		%MHLC	9.52		23.81	23.81	4.76	38.10	100
	employed	number	2	1	8	9		11	
		%MHLC	6.45	3.22	25.81	29.04		35.48	100
Education	primary	number			1			5	6
		%MHLC			16.67			83.33	100
	vocational	number	5	1	2	7		9	24
		%MHLC	20.83	4.17	8.33	29.17		37.50	100
	secondary	number			4	5	1	4	14
		%MHLC			28.57	35.71	7.15	28.57	100
	higher	number			4	3		1	8
		%MHLC			50	37.5		12.5	100

MHLC - Multidimensional Health Locus of Control Scale

ferences between higher and primary education and p = 0.02 for differences between higher and vocational education.

MHLC types

Next, according to the test methodology, the patients were qualified for one of the eight types of health locus of control. The most common was type 7: undifferentiated strong – it was observed in 19 respondents (36.6%).

The frequency of occurrence of individual MHLC types was checked according to the respondents' sex, occupational activity and education.

Type 7 was the most common among the women (33.33%). Among the men the following three MHLC types were predominant: type 7 (36.96%), type 5 (23.91%) and type 4 (23.91%).

The distribution of the types of health locus of control in the subgroups of employed and unemployed patients was similar. Type 7 was the most common in both subgroups – it was found in 38.10% of unemployed patients and in 35.48% of employed respondents.

The patients with primary education exhibited only two types of health locus of control. Most of them (83.33%) were qualified for type 7. The patients with vocational education exhibited five MHLC types, but type 7 (37.5%) and type 5 (29.17%) were the most common. Type 5 was the most common among the patients with secondary education (35.71%). In the group of patients with higher education type 4 was the most common (37.5%). In contrast to the other groups, type 7 was the least common in this group. Detailed data can be found in **Table 6**. Due to the small number of research participants in individual MHLC types the data were only used for observation and no detailed statistical calculations were made.

Discussion

The Multidimensional Health Locus of Control (MHLC) was developed by Wallston et al. It enables assessment of individual competences in developing one's behaviour in health and illness. The scale illustrates three dimensions of health locus of control: the internal, the powerful others and influence of chance. On the one hand, the identification of the type of health locus of control in patients undergoing surgeries gives a possibility to determine how an individual can cope with stressful situations. On the other hand, it enables prediction how the patient's immunity resources may influence the course of postoperative therapy [20]. The health locus of control depends on respondents' age, their place of residence, state of health and socioeconomic conditions. In this study the participants were residents of an urban agglomeration, aged 47–63 years (middle adulthood). They had a short medical history of ischaemic heart disease, which did not limit their current life activity. Having conducted screening tests, those participants were included in the research who did not suffer from concomitant cognitive disorder or depression.

Laboratory tests confirmed that the research participants were in good somatic condition. They did not suffer from significant concomitant diseases which might affect their health locus of control. Before the research we assumed that the variables which might affect the respondents' health locus of control were their sex, education and occupational activity. The analysis of the results revealed that they were similar in all the three dimensions. The participants' scores were the highest in PHLC and slightly lower in dimension I. The CHLC had the lowest scores. In one of few studies on patients who underwent coronary artery bypass grafting Sorlie observed that in comparison with the general surgery group they were characterised by higher internal health locus of control. It resulted from three factors. First of all, ischaemic heart disease affected the patient's lifestyle. Second of all, these patients contacted cardiologists more often. Third of all, the qualification and preparation for the surgery were more standardised than in other branches of surgery. According to Sorlie, due to these three factors patients had better knowledge of their illness and they knew and followed the rules of health-promoting behaviour [16]. In our study the results were different because the patients rated other people's influence higher than their internal control. This situation may have resulted from the following three reasons. First of all, most of the patients in the research group had a short medical history and during the preoperative period none of them exhibited the symptoms which would force them to change their lifestyle. Apart from that, health education in Poland is less developed than in Scandinavia and patients' contact with the cardiologist is limited. The third factor of equal importance which may have affected the lower internal health locus of control in our group of patients was different economic status. According to Fitzgerald, the higher the economic status and everyday living standard are, the stronger the internal health locus of control is [21]. However, when we compare our findings with the results received from patients in cardiac centres in Poland, they are very similar. Guzińska conducted research on patients participating in the rehabilitation treatment after coronary artery bypass grafting surgeries. In the first test, which was conducted at the beginning of the rehabilitation treatment, the results were similar to ours. The highest score was noted for PHLC, average score for IHLC and the lowest score for the CHLC. When the test was repeated after the rehabilitation treatment, when the patients had been instructed by experts how to live with their illness, IHLC was rated higher, whereas PHLC decreased [22]. Opuchlik studied a group of 60 patients with ischaemic heart disease and hypertension. Like in our study, the patients' scores were the highest in PHLC and the lowest in CHLC [23]. Kurowska studied 97 patients with hypertension. She found that the patients' scores were the highest in IHLC, average in PHLC and lowest in CHLC [24]. In Kurowska's study men had higher scores than women in all of the three dimensions. In Opuchlik's study, like in ours, men's scores were higher in IHLC and PHLC, whereas women's scores were higher in CHLC [23, 24]. In our study there were many more men than women. It limits the interpretation of data, but it seems inevitable because ischaemic heart disease and coronary artery bypass grafting surgeries are more common in men. In our study there was a statistically significant difference between men's and women's scores in PHLC. However, in view of the fact that the statistical analysis produced the result close to the limit, it should be interpreted with due care because of high disproportion between the subgroups of men and women. The result may have been coincidental. Further, more detailed research might result in more definite conclusions.

There were also differences in the results, depending on the respondents' occupational activity. In spite of the fact that the statistical analysis did not reveal significant differences, the employed respondents' mean scores were slightly higher in the IHLC and in the dimension of PHLC, whereas the unemployed respondents' mean scores were slightly higher in the CHLC. This observation is in agreement with most other studies, which indicate that unemployed people are characterised by much higher external health locus of control than employed respondents [21, 25].

In our study the respondents' scores also differed depending on their education. The comparison of IHLC, PHLC and CHLC between the groups of education revealed that the patients with primary education had the highest score in PHLC. It is noteworthy that as the respondents' education grew higher, the mean value of CHLC decreased, resulting in a statistically significant difference between the patients with higher education and those with primary or vocational education. Most studies assessing the health locus of control according to socioeconomic conditions show that as the level of education increases, it is positively correlated with the internal health locus of control, whereas the external health locus of control is negatively correlated with education [26, 27]. However, some reports negate

this dependence [26]. Most studies assessing the relation between education and health locus of control are conducted on a very large number of people. This population is usually very diversified and includes both healthy subjects and those suffering from different, often chronic illnesses, whose influence was not taken into consideration in the assessment of health locus of control [26, 28]. In our study there were selected cardiac surgery patients without significant concomitant diseases. As Sorlie reports, this group of patients is characterised by greater internal health locus of control than the rest of the population [16]. It cannot be ruled out that the construction of the MHLC test itself caused such high scores in the group with primary education. The result may have depended on the possibility to gain introspective insight. When the patients were responding to the questions, they had to choose one of the descriptive statements in the test. When they chose extreme responses, i.e. "Strongly agree" or "Strongly disagree" they had no doubt about the right response. The choice of less definite responses was more difficult. It resulted from the fact that there is a relatively subtle difference between the statements "Slightly agree" and "Slightly disagree" and it requires longer consideration. For some patients, especially those with primary or vocational education, this difference was indistinguishable and therefore, they tended to give more extreme and definite responses.

In our study the greatest number of patients exhibited the undifferentiated, strong type (36%), followed by the type lessening the influence of chance (28.8%). 23% of the patients maximised the influence of chance, whereas 7.7% of the patients belonged to the strong external type. The type lessening other people's influence and the type maximising the influence of chance was observed only in 1.9% of the patients. None of the research participants was qualified to either of the extreme types of health locus of control, i.e. type 1 – strong, internal, or type 8 – undifferentiated, weak. None of the participants exhibited the undifferentiated, weak type, whereas the undifferentiated, strong type was the most common. In the only available study analysing the occurrence of MHLC types in cardiac patients the largest group was characterised by the undifferentiated, weak type, whereas the smallest number exhibited the undifferentiated, strong type and the type maximising other people's influence [24]. By contrast, in our study the patients were a more homogenous group in terms of their age, concomitant diseases and history of their illness. This may have caused different distribution of MHLC types in the groups under study. Sex and occupational activity did not influence the frequency of occurrence of MHLC types. Type 7 – undifferentiated, strong was the most common both among the men and women, regardless of their employment or unemployment. The analysis of dependence between the types of health locus of control and education revealed that as the patients' level of education increased, so did the diversity of types exhibited and there was variation in the most common MHLC type. Type 7 was predominant among the respondents with primary or vocational education, type 5 – among the respondents with secondary education and type 4 – among 50% of the respondents with higher education. It is also noteworthy that type 7 was the least common in this group of education. Unfortunately, we have not found a study with the results that could be compared with our observations.

In view of the investigations which have been conducted so far, it seems that the identification of the type of health locus of control in patients qualified for cardiac surgeries might help to individualise postoperative treatment and further rehabilitation [20, 22]. Patients with the internal health locus of control try to improve and maintain their state of health and they use social support effectively [29]. By contrast, patients with the external health locus of control, which is dependent on other people's influence, tend to be more passive and follow other people's decisions [30]. According to Luszczynska, on the one hand, due to passiveness, patients consume less alcohol, smoke less and eat more fruit and vegetables. On the other hand, they make healthy physical effort less frequently, do not clean their teeth so often and consume more salt [31]. According to the study by Bergvik, the patients whose health locus of control depends on other people see doctors less often and start appropriate therapy later [32]. They are also characterised by neuroticism, which results in their greater tendency to react to stressful situations with fear and negative emotions [23, 31]. On the contrary, Kurowska arrived at different conclusions. She claims that patients with the external health locus of control are characterised by better health-promoting behaviours and greater optimism. In consequence, they pay more attention to health-promoting practices than patients with the internal health locus of control [24]. Unlike Kurowska, Kugler observed in his study that in the group of patients awaiting heart transplantation the external health locus of control, i.e. both PHLC and CHLC, was related with high preoperative fear and depression. Divergent observations made by different authors point to the need to continue research on

the subject. Also, during the postoperative period fear and depression were more often observed in patients with the external health locus of control [33]. Reynaert made interesting observations on patients undergoing scheduled cardiac surgeries. Patients with the internal health locus of control reported lesser intensity of postoperative pain than those with the external health locus of control. During the study it turned out that patients with the internal health locus of control consumed 40% less morphine in patient-controlled analgesia than other patients [34]. The Norwegian study also shows that the type of health locus of control is related with patients' life activity after coronary artery bypass grafting and percutaneous transluminal coronary angioplasty. The study was conducted on a large group of 348 patients and revealed that the occurrence of the internal health locus of control was positively correlated with returning to work and life activity before the illness. The patients whose type of health locus of control depended on other people less frequently returned to their occupational activity after the therapy [32]. Burker analysed the fate of 100 patients who underwent lung transplantation. It turned out that the patients with a high or even medium internal health locus of control were characterised by longer survival rate than the patients with a low internal health locus of control [35].

Due to the fact that the health locus of control identifies patients' individual competence in the form of their own efficacy in the location of control of activities related with health, it gives a possibility to predict whether the patients will take responsibility for their health in the long-lasting process of cardiac surgery treatment. It also enables assessment of the patient's ability to cope with different stressful situations. It seems to be a valuable tool for identifying a group of patients who need help to control their fear and negative emotions related with a scheduled cardiac surgery. Identification of the type of health locus of control gives a possibility not only to choose a group of patients in need of psychological assistance but also to select appropriate instruments for effective behavioural therapy [5, 20, 29]. As it has turned out, in spite of the fact that the health locus of control is a relatively stable construct, an appropriate cognitive therapy may strengthen patients' internal health locus of control and thus, improve the effects of the long-lasting process of treatment [36]. Therefore, it seems that hospitalised patients may benefit from a broad-spectrum psychological examination during the perioperative period. The examination is not only a diagnosis, but it may also help to implement the therapeutic procedure. In view of this fact, the popularisation of knowledge of MHLC may strengthen the holistic approach of medical staff to patients.

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Correspondence address:
Włodzimierz Płotek
Department of Teaching Anaesthesiology
and Intensive Therapy
Poznan University of Medical Sciences
14 Św. Marii Magdaleny St, 61-861 Poznań, Poland
phone: +48616687836
email: plotekw@poczta.onet.pl