

Impact of anxiety-trait level and coping styles on a six-minute walk test in patients undergoing cardiac rehabilitation

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INTRODUCTION

The six-minute walk test (6MWT) is a simple test, useful in assessing physical capacity, eligibility for rehabilitation, and its effectiveness [1]. There is a demonstrated impact of depression on the distance covered during 6MWT, but the impact of anxiety remains inconclusive [2, 3]. Additionally, a question arises whether coping styles related to anxiety and depression affect the course of 6MWT. For fibromyalgia patients, a positive correlation was found between the 6MWT and active strategies [4]. There are no data on cardiac rehabilitation patients.

The protocol for the 6MWT recommends the test be performed twice. Repetition affects results, and the second test is considered reliable. The change in distance is attributed to learning effect [5].

Study objectives included (1) analysis of the influence of anxiety trait and coping styles on learning process of the 6MWT; (2) analysis of the influence of anxiety trait and coping styles on rehabilitation outcomes.

METHODS

The study involved patients participating in second-stage cardiac rehabilitation for 21–35 days under stationary conditions at the Military Institute of Medicine in Warsaw. Patients were recruited consecutively. Criteria for exclusion from the study included respiratory failure, infections, neurological deficits, mobility deficits, and cognitive or somatic deficits preventing completion of paper-pencil tests. All patients gave their written consent to participate in the study. The study was approved by the Bioethics

Commission at the Military Institute of Medicine in Warsaw.

The measure of the learning process (Objective 1) was defined as the difference between results obtained in the second and first 6MWT ($\Delta 6MWT2-1$), and the effect of the rehabilitation process (Objective 2) was measured by the difference between results of the last and second study ($\Delta 6MWT3-2$).

The first 6MWT was performed between the first and third day after admission and was repeated on the following day. The final test was performed during the last two days of the rehabilitation process. The test was conducted by a skilled physiotherapist.

Anxiety trait was defined as a relatively permanent personality characteristic and was measured with the State-Trait Anxiety Inventory (STAI) [6]. Coping styles were measured with the Coping Inventory for Stressful Situations (CISS) [7] and were defined as a relatively permanent disposition toward reactions to stress across different situations and over time. Psychological tests were filled out by patients between the first and third days of the rehabilitation process.

Statistical analysis

Results were subject to statistical analysis using SPSS 26.0. Quantitative variables distribution was examined with the Shapiro-Wilk test. In descriptive statistics, data were presented in the form of mean, standard deviation median, and interquartile range (IQR). Frequency distributions were prepared for categorical variables. For Objective 1, Spearman correlation and linear regression analyses were applied; for Objective 2, only Spearman correlation

Table 1. Mean, median values and Spearman correlation coefficients between distance covered in the 6MWT, difference between the results of the 6MWT and anxiety trait and different styles of coping with stressful situations

				6MWT1	6MWT2	6MWT3	Δ6MWT 2-1	Δ6MWT 3-2	Δ6MWT 3-1
		Mean (SD)		—	497.80 (120.95)	541.88 (107.20)	38.75 (53.95)	—	—
		Median (IQR)		471.00 (401.00–538.00)	—	—	—	47.00 (12.00–90.00)	90.00 (50.00–135.70)
Anxiety trait	Mean (SD)	42.39 (8.90)	rho	-0.28	-0.37	-0.30	-0.23	0.14	-0.03
	Median (IQR)	—	P	<0.001	<0.001	<0.001	0.004	0.10	0.74
Coping styles	Task oriented style	Mean (SD)	rho	0.22	0.15	0.27	-0.04	0.04	0.09
		Median (IQR)	P	0.01	0.10	0.004	0.65	0.64	0.33
	Emotion oriented style	Mean (SD)	rho	-0.16	-0.25	-0.10	-0.18	0.16	0.03
		Median (IQR)	P	0.08	0.006	0.30	0.048	0.09	0.73
	Avoidant style	Mean (SD)	rho	-0.07	-0.15	-0.09	-0.24	0.09	-0.03
		Median (IQR)	P	0.47	0.10	0.36	0.007	0.36	0.76

Abbreviations: 6MWT, six-minute walk test; Δ6MWT2-1, difference between results of the second and the first six-minute walk tests; Δ6MWT3-2, difference between results of the third and the second six-minute walk test; Δ6MWT3-1, difference between results of the third and the first six-minute walk test; IQR, interquartile range; SD, standard deviation; rho, Spearman correlation coefficient

analysis. For Objective 1, two hierarchical regression models were calculated. The difference between results obtained in the second and first 6MWT (Δ6MWT2-1) was the explained variable in both models. In the first model, the first measurement of the 6MWT was entered in the first block, and then anxiety trait was added in the second block. In the second model, the first 6MWT was entered in the first block, and then task-oriented coping, emotion-oriented coping, and avoidant coping were entered in the second block. Therefore, the analyzed models included the first 6MWT as a controlled variable. In the first model, anxiety trait was analyzed as the predictor of Δ6MWT2-1. In the second model, coping styles were analyzed as predictors of Δ6MWT2-1. The variables with distributions different from normal were log transformed before regression analysis. The value of $P < 0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

The study involved 170 patients (115 men and 55 women; aged from 28 to 88 years) recovering from cardiovascular events (detailed data in Supplementary material, *Table S1*).

The tests' course was uncomplicated, with no significant deviations from the norm in terms of basic clinical parameters. Patients' heart rate, blood pressure, oxygen saturation value, and Borg subjective effort scores were within limits. As stipulated in the psychological assessment (STAI and CISS), patients were diverse.

Spearman correlation analysis was performed for all variables. An association was observed between Δ6MWT2-1 and the level of anxiety trait ($\rho = -0.23$; $P = 0.004$), avoidant style ($\rho = -0.24$; $P = 0.007$), and emotion-oriented style ($\rho = -0.18$; $P = 0.048$). No correlation was noted between psychological variables and Δ6MWT3-2 (*Table 1*).

The analysis was enhanced by linear regression analysis. According to the value of the determination

coefficient, anxiety trait along with the results of the first 6MWT accounted for 6% of variability of results of Δ6MWT2-1 ($R^2 = 0.06$; $SE = 50.16$; $P = 0.01$); only anxiety trait was statistically significant ($\beta = -0.23$; $P = 0.007$). According to the value of the determination coefficient, coping styles with the results of the first 6MWT explain 10% of result variability of Δ6MWT2-1 ($R^2 = 0.10$, $SE = 47.73$, $P = 0.01$). Avoidant style ($\beta = -0.20$; $P = 0.03$), and results of the first 6MWT ($\beta = -0.21$; $P = 0.02$) were statistically significant (detailed results in supplementary material, *Table S2*). Statistical analysis confirmed that anxiety trait and avoidant style were good predictors of an increase in the distance between the first and second 6MWT. Patients with a higher level of anxiety trait achieved a smaller increase in distance in the repeated 6MWT than persons with a lower level of anxiety trait. In other words, for these patients, the learning effect was less visible. The 6MWT is based on spatial capabilities, including spatial memory. Studies conducted by Thoresen [8] indicated that persons with a higher level of anxiety trait and lesser spatial capabilities are less effective in cognitive processing of spatial representations. Their ability to learn in stressful situations is inferior, explaining worse results achieved in the 6MWT by patients with a higher level of anxiety trait. Most probably a person with higher levels of anxiety trait, when performing a consecutive 6MWT, must devote more attention to processing spatial information, which impacts test results negatively.

The difference in the distance between the second and first 6MWT is lower for patients with an avoidant style. Lack of focus on the task, i.e. a walk at the highest pace possible, impairs patient performance. In other words, for patients with an avoidant style, the learning effect will also be less visible.

Surprising is the lack of influence of psychological factors on the increase in the distance between the final

and second 6MWT. Studies indicated that an increased risk of cardiac diseases and related mortality occur in people with type-D personality (more susceptible to stressful situations) and high anxiety [9]. Thus, the fact that anxiety had no significant impact on rehabilitation results in this study leads to questions about the psychological mechanism determining effectiveness of cardiac rehabilitation. Cardiac rehabilitation aims, inter alia, to reduce emotional tension [10] and so it might reduce the significance of the 6MWT as a stress-inducing agent and of anxiety trait and coping styles. Another possible hypothesis is that the results obtained were caused by the impact of social support provided during stationary rehabilitation. These hypotheses require further analysis.

CONCLUSION

The study indicated that it is beneficial to take patients' anxiety proneness and coping styles into consideration when interpreting the 6MWT, as these psychological traits may influence the results in addition to the physical capacity of patients.

Supplementary material

Supplementary material is available at https://journals.viamedica.pl/kardiologia_polska.

Article information

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