

USEFULNESS OF THE FULLERTON TEST IN QUALIFYING PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE FOR REHABILITATION

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SUMMARY

Adequate, individually based choice of training type and intensity is a prerequisite for physiotherapy of patients with COPD. The basic criteria for qualification include effort tolerance assessment by means of exercise test on cycloergometer or treadmill or 6-minute walk test and determining the degree of lung ventilation activity impairment, dyspnea level and patient's physical condition. The Fullerton test is an easy and time-effective tool allowing for effort tolerance and physical condition assessment in case of patients above the age of 60. The objective of this work was to assess the usefulness of the Fullerton test in qualifying patients with COPD for rehabilitation.

Thirty two patients with diagnosed COPD were tested in the research. The group comprised in-patients treated in the MSWiA Hospital in Glucholazy between February 1 and May 10, 2011. All patients in the research were above 60 years of age, with median age of 68 ± 5.2 . The patients were given pulmonary rehabilitation model A and B according to Szczegielniak. In the research, the results recorded in 6 trials of the Fullerton test were compared to the results of standard tests qualifying for pulmonary rehabilitation. For this purpose, a 10-point scale was created by the authors, which included parameters achieved in the Fullerton test allowing comparison of the results achieved in the Fullerton test and standard qualification procedure. The T-student test was used to assess the relationships between the tested parameters. Statistical significance level was established at $p < 0.05$.

The analysis of research results showed that patients who scored higher on the scale were qualified for higher pulmonary rehabilitation models, which means they achieved higher results in qualification tests.

The Fullerton test might be useful for the assessment of the results and progress of pulmonary rehabilitation process.

Keywords: Fullerton test, effort tolerance assessment, pulmonary rehabilitation.

INTRODUCTION

Adequate, individually based choice of training type and intensity is a prerequisite for physiotherapy of patients with COPD. The basic criteria for qualification include effort tolerance assessment by means of exercise test on cycloergometer or treadmill or 6-minute walk test and determining the degree of lung ventilation activity impairment, dyspnea level and patient's physical condition. Achieving positive results of physiotherapy is possible with appropriately designed rehabilitation program adjusted to patient's individual needs and abilities [1, 2].

Basic criteria for qualifying for rehabilitation include effort tolerance and physical condition assessment, evaluating the level of dyspnea and functional test of respiratory system [1, 3].

Among effort tolerance assessment tests, exercise test on the cycloergometer or treadmill is the most frequently used one. It is conducted according to standard test protocols evaluating energy expenditure in MET or Watt and HR effort limits. The 6-minute walk test [4] and the 12-minute walk test are also frequently used [1].

Functional Fitness Test, known as the Fullerton test, was introduced in 1997 by two physiotherapists, Robert Rikli and Jessie Jones, of The Fullerton University in California. It allows for easy and repeatable functional assessment in patients above 60 years of age. The test comprises six trials which aim at indirect assessment of the upper and lower body strength, flexibility, agility, dynamic balance and aerobic endurance.

What is interesting is the fact that there is a range of simple tests enabling functional assessment in patients with COPD for rehabilitation model qualification purposes and the Functional Fitness Test seems to be one of them.

Objective. The objective of this work was to evaluate the usefulness of the Fullerton test in the process of qualifying patients with COPD for rehabilitation. The results of the six trials of the Fullerton test were compared with the results of pulmonary rehabilitation qualification tests. For this purpose, a 10-point scale determining indexes achieved in the Fullerton test was created to allow for comparison of the results of the Fullerton test and the results of standard qualification.

MATERIAL AND METHODS

Thirty two patients with diagnosed COPD were tested in the research. The median age of the patients was 68 ± 5.2 . The group included in-patients treated in the MSWiA hospital in Glucholazy between February 1 and May 10, 2011.

All patients in the research were above 60 years of age. The patients were given pulmonary rehabilitation model A (17 patients) or B (15 patients) based on the results of the 6-minute walk test, lung ventilation activity test, 10-point Borg scale dyspnea assessment and physical condition evaluation.

Table 1. Qualification for pulmonary rehabilitation according to J. Szczegieliński [1, 2]

Exercise test	< 3MET < 50 W	3–4.9 MET 50–75 W	5–6.9 MET 75–100 W	≥ 7 MET ≥ 100 W
Spirometry				
< 30% FEV1	D	D	C	B
30–50% FEV1	D	D/C	C/B	B/A
50–80% FEV1	D	C	B	A
> 80% FEV1	D	C	B	A

All patients were given the Functional Fitness Test one day after the test qualifying for adequate rehabilitation model (Table 1).

The Fullerton test comprises the following trials:

1. Arm curl – indirectly assessing upper body strength
2. Chair stand – lower body strength assessment
3. Back scratch – upper body flexibility assessment
4. Chair sit and reach – lower body flexibility assessment
5. Foot-up and go – the agility/dynamic balance assessment
6. 6-minute walk test – indirectly assessing the level of aerobic endurance

2-minute walk-in-place can be performed instead of the 6-minute walk trial in case of patients who use orthopaedic devices during walking or in case of patients with difficulties associated with balance maintenance.

Aiming at evaluating the usefulness of the Fullerton test for pulmonary rehabilitation qualification, average values of the results and standard deviations achieved in 6 trials were calculated for each patient.

Aiming at verifying whether average values recorded for patients in rehabilitation models A and B differed significantly, they were compared with the T-student paired difference test at the statistical significance level of $p < 0.05$.

The results recorded for all Fullerton test trials for models A and B formed the basis for calculating, with the use of MatLab program, a 10-point scale allowing for comparison of the Fullerton test results and standard qualification results. Each trial was awarded 1–10 points. The maximum number of points to be achieved was 60 (Table 2).

Table 2. 10-point scale for all Fullerton test trials

Trial	Arm curl, number of repetitions	Chair stand, number of repetitions	Chair sit and reach, cm	Back scratch, cm	6MWT, MET	Foot-up and go, s
1	13	10	(–21)–(–19)	(–30)–(–28)	6.6–6.3	9.1–8.8
2	14	11	(–18)–(–16)	(–27)–(–24)	6.7–7.1	8.7–8.4
3	15	12	(–15)–(–13)	(–23)–(–21)	7.2–7.5	8.3–7.9
4	16	13	(–12)–(–10)	(–20)–(–18)	7.6–7.9	7.8–7.5
5	17	14	(–9)–(–7)	(–17)–(–14)	8–8.4	7.4–7.1
6	18	15–16	(–6)–(–4)	(–13)–(–11)	8.5–8.8	7.0–6.7
7	19	17	(–3)–(–1)	(–10)–(–7)	8.9–9.2	6.6–6.2
8	20	18	0–2	(–6)–(–4)	9.3–9.7	6.1–5.8
9	21	19	3–5	(–3)–(–1)	9.8–10.1	5.7–5.4
10	22	20	6	0	10.2	5.3

RESULTS

The result analysis showed statistically significant differences between values of indexes achieved by patients in models A and B in the 6-minute walk test, chair stand trial and chair sit and reach trial. In the other three trials, statistically significant differences were not observed because they pertained to physical fitness and not to effort tolerance which is lower in patients with COPD (Table 3).

Statistically significant differences were recorded in the 6-minute walk test. The average result expressed in MET's [4] achieved by patients in rehabilitation model A was 8.7 ± 0.8 , whereas in model B it was 6.7 ± 0.8 (Figure 1).

The research showed statistically significant differences in the indexes of chair stand trial. Average

Table 3. Average values of analysed indexes

Rehabilitation models	6MWT	Chair stand	Arm curl	Back scratch	Chair sit and reach	Foot-up and go
Model A	8.7 ± 0.81	16.41 ± 2.45	18.88 ± 2.23	-8.94 ± 8.17	0.52 ± 2.91	6 ± 0.61
Model B	6.71 ± 0.8	13.73 ± 2.64	16.66 ± 3.08	-16.53 ± 6.73	-6.26 ± 7.17	6.58 ± 0.94

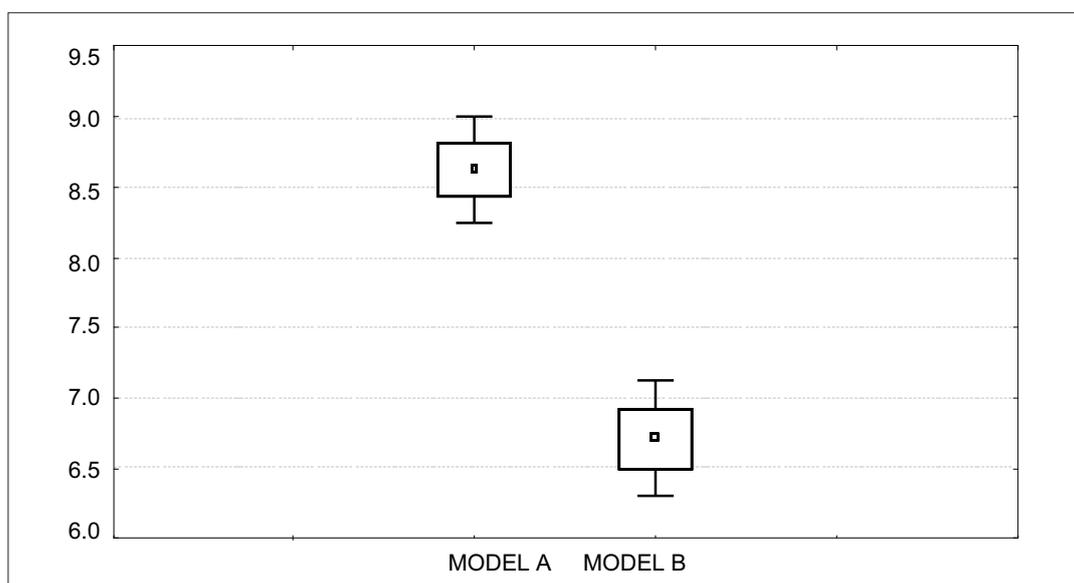


Figure 1. Average values achieved in the 6-minute walk test in rehabilitation models A and B expressed in MET

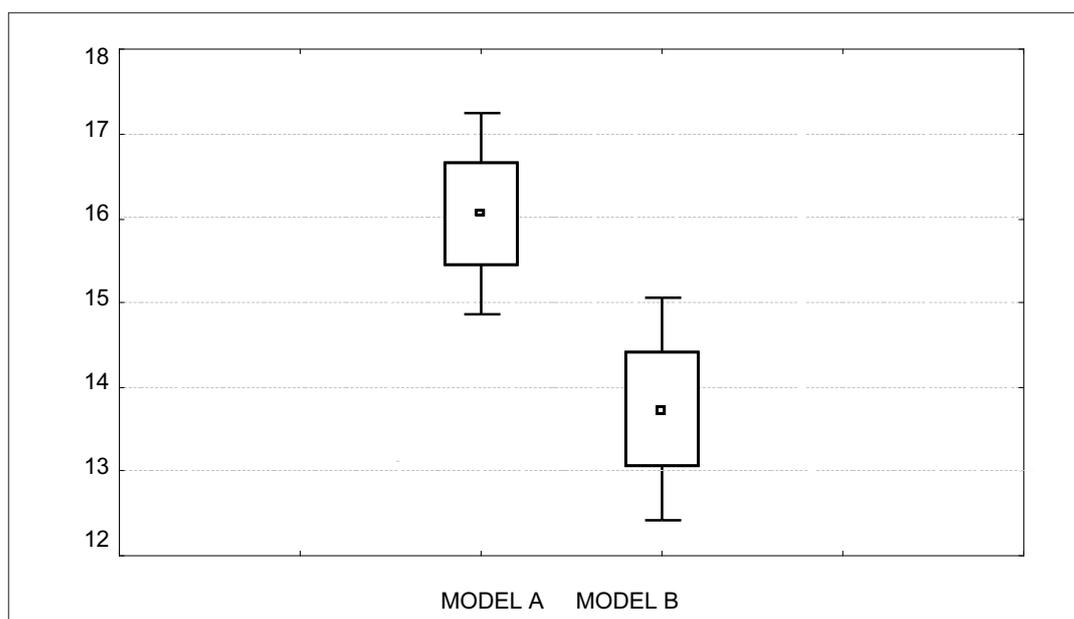


Figure 2. Average values achieved in the chair stand trial in pulmonary rehabilitation models A and B

value achieved by patients in rehabilitation model A was 16.4 ± 2.45 , and in model B it was 17.7 ± 2.64 (Figure 2).

Statistically significant differences were observed in the chair sit and reach trial. Average value achieved by patients in rehabilitation model A was 0.52 ± 2.9 , and in model B it was 6.26 ± 7.1 (Figure 3).

Statistically significant differences were also observed between average values achieved by patients from rehabilitation models A and B when the 10-point scale was used for each trial (Table 4).

Statistically significant differences were observed with the use of the 10-point scale. For patients from rehabilitation model A the average result was 42.8 ± 7.46 and for model B – 25.28 ± 10.56 (Figure 4).

Table 4. Average values achieved on the 10-point scale in six trials of the Fullerton test for rehabilitation models A and B

Model A	42.8 ± 7.46
Model B	25.28 ± 10.56

Patients qualified for rehabilitation model A scored between 27 and 55 points. Patients qualified for rehabilitation model B scored between 9 and 33 points. Higher index values were recorded for patients in rehabilitation model A characterised by higher effort tolerance, lower dyspnea level, better physical condition and smaller degree of ventilation activity disorder in comparison with patients qualified for model B.

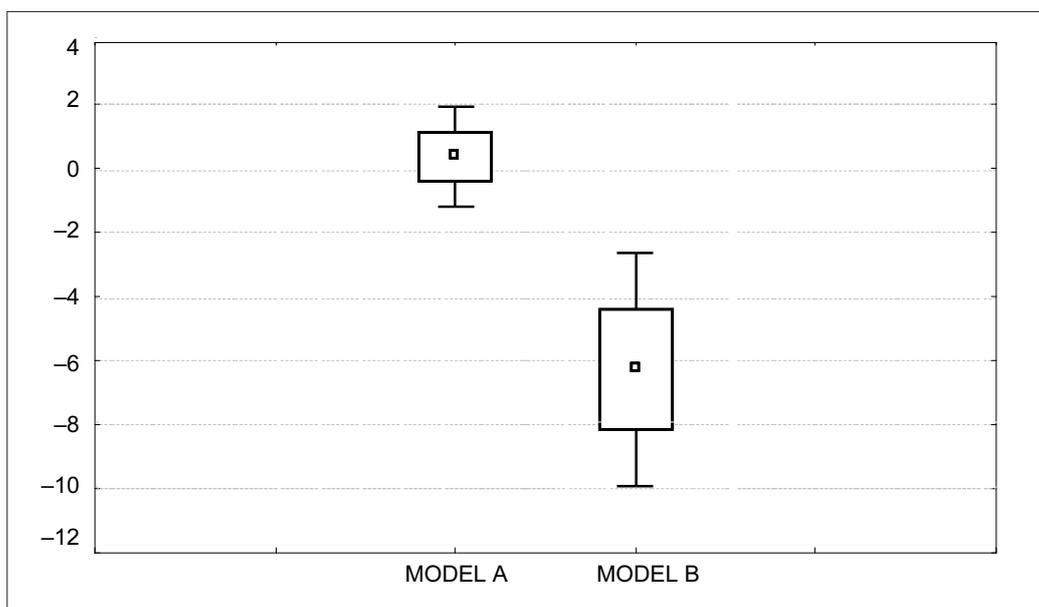


Figure 3. Average values achieved in the sit and reach trial for rehabilitation models A and B

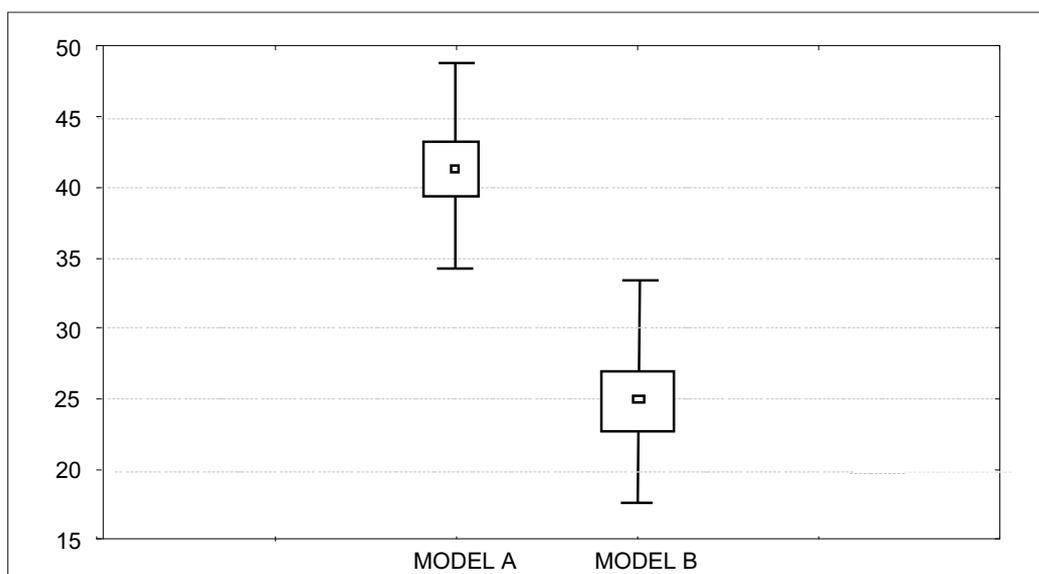


Figure 4. Average values recorded on the 10-point scale in six trials of the Fullerton test for rehabilitation models A and B

DISCUSSION

The Functional Fitness Test was created to assess functional fitness in elderly patients and is widely used for this purpose [5, 6, 7]. The norms of values for each component of the test were drawn up by the authors, R. Rikli and J. Jones, based on the sample of 7183 healthy volunteers from California aged 60–94 [5, 6]. In Poland, the first attempt to assess the usefulness of the Fullerton test as a measure of elderly people's fitness was made by A. Rozanska-Kirschke [7]. P. Raglewska et al. [9] also used the six simple trials of the Fullerton test to assess the influence of rehabilitation on physical condition of the elderly and patients with respiratory

system diseases [8, 9]. The results showed the test's usefulness in the assessment of rehabilitation progress. Professional literature does not provide complex study on the usefulness of using the Fullerton test in the process of qualifying patients for pulmonary rehabilitation. Based on own research we suggest that the Fullerton test might be useful for qualifying patients with COPD for pulmonary rehabilitation. However, it seems that it cannot replace standard qualification which includes lung functional activity and dyspnea assessment which constitute a significant element of functional assessment in pulmonary rehabilitation. The possibility of using the Fullerton test for qualification purposes requires further research.

CONCLUSIONS

1. Patients who scored higher on the scale invented by the authors were qualified for higher pulmonary rehabilitation models, which means they achieved higher results in qualification tests.

2. The Fullerton test might be useful for the assessment of the results and progress of pulmonary rehabilitation.

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FULLERTON TESTO NAUDINGUMAS SKIRIANT REABILITACIJĄ LIGONIAMS, SERGANTIEMS LĒTINE OBSTRUKCINE PLAUCĪŅU LĪGA

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SANTRAUKA

Asmeniškai parinkti pratybų rūšis ir intensyvumą yra labai svarbu taikant fizioterapiją (kineziterapiją) sergantiesiems LOPL (lėtine obstrukcine plaučių liga). Pagrindinis pratimų skyrimo kriterijus yra ligoņių pastangų tolerancija, kuri įvertinama veloergometrija arba šešių minučių ėjimo testu, taip pat matuojant plaučių ventilacijos sutrikimo laipsnį, dusulio stiprumą ir bendrą ligoņio fizinę būklę. Fullerton testas yra lengvas ir laiką taupantis metodas, leidžiantis ištirti vyresnių nei 60 metų ligoņių pastangų toleranciją ir bendrą fizinę būklę. Tyrimo tikslas – ištirti Fullerton testo naudingumą skiriant rehabilitaciją sergantiesiems LOPL.

Buvo tiriami 32 ligoņiai, kuriems diagnozuota LOPL. Visi jie buvo stacionarūs ligoņiai, gydomi Glucholazų MSWiA ligoņonėje nuo 2011 metų vasario 1 d. iki gegužės 10 d. Visi tirti ligoņiai buvo vyresni nei 60 metų (amžiaus vidurkis – $68 \pm 5,2$ m.). Visiems buvo paskirta A ir B modelio rehabilitacija pagal J. Szczegieliński metodiką. Šio tyrimo metu šešių Fullerton testo taikymo atvejų rezultatai buvo lyginami su standartinių testų, naudojamų plaučių ligų rehabilitacijos metu, rezultatais. Buvo sukurta 10 balų skalė, kuri leistų palyginti Fullerton ir standartinio testo rezultatus. Taikant Studento t testą, buvo įvertinti ryšiai tarp tiriamų rodiklių. Pasirinktas statistinio reikšmingumo lygmuo – $p < 0,05$.

Tyrimo rezultatų analizė parodė, kad tiems ligoņiams, kurie surinko daugiau skalės balų, buvo skiriamas stipresnės rehabilitacijos modelis, taigi jie surinko ir daugiau rehabilitacijos testų taškų.

Fullerton testas gali būti naudingas vertinant sergančiųjų plaučių ligomis rehabilitacijos rezultatus ir stebint rehabilitacijos eigą.

Raktažodžiai: Fullerton testas, pastangų tolerancijos vertinimas, plaučių ligų rehabilitacija.