

⟨Brief Note⟩

## Cardiac rehabilitation: Evaluation of group dance therapy in heart disease patients in the maintenance phase

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**Summary** Cardiac rehabilitation was first developed for the restoration of patients with acute myocardial infarction in society within a short term. Nowadays, it is regarded as total program to improve quality of life and prognosis. Here, we assessed group dance therapy integrated into cardiac rehabilitation in heart disease patients in the maintenance phase (150 days or more after the onset of heart disease) at our cardiac rehabilitation center established in October, 2014. This study conducted on 10 patients, including 5 men ( $69.2 \pm 7.5$  years old) and 5 women ( $71.0 \pm 2.1$  years old). The strength during dance exercise was  $2.8 \pm 0.3$  metabolic equivalents (METs). The anaerobic threshold of dance exercise was significantly lower than that of the cardiopulmonary exercise testing ( $4.4 \pm 0.6$  METs,  $p < 0.05$ ). The result of this study suggested that dance exercise rehabilitation should be noninvasive and safely performed in heart disease patients in the maintenance phase.

**Key words:** Dance exercise rehabilitation, METs, Anaerobic Threshold, Heart rate

### 1. Introduction

Cardiac rehabilitation in Japan was previously designed to benefit recently hospitalized or undergoing treatment for patients with myocardial infarction at the acute phase and make them live ordinary lives within a short term. Over time, cardiac rehabilitation has been applied to various cardiac diseases owing to the accumulation of useful evidence and data<sup>1,2</sup> nowadays, it is a total program for heart health, including the improvement of patients' quality of life and prognosis. In 2006, the health insurance coverage for the cost of cardiac

rehabilitation was expanded and defined as follows within 150 days after the initiation of cardiac rehabilitation. Cardiac rehabilitation varies; aerobic exercise using bicycle ergometer, walking and aerobic dance are employed in many medical facilities. Since 2014, we have diligently been working on therapeutic exercise cardiac rehabilitation, such as aerobic exercise using equipment and resistance training. Here, this study assessed the significance and efficacy of group dance therapy in patients with heart disease in the maintenance phase whose insurance coverage for cardiovascular rehabilitation was expired.

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## 2. Subjects and Methods

This study included 10 patients with heart disease who were previously admitted to our hospital (male:  $n = 5$ ; age,  $69.2 \pm 7.5$  years old; height,  $164.23 \pm 3.0$  cm; weight,  $68.4 \pm 4.2$  kg; and female:  $n = 5$ ; age,  $71.0 \pm 2.1$  years old; height,  $152.4 \pm 3.3$  cm; weight,  $54.2 \pm 8.3$  kg). All study patients underwent the cardiopulmonary exercise test (CPX) after the 150-day cardiac rehabilitation term. Strength Ergo 8 (Fukuda Denshi, Co., Ltd, Tokyo, Japan) was employed for the CPX. After an initial 4-minute rest on the ergometer and 4-minute warm-up, the patients underwent CPX at a gradually increasing intensity by 10W at 1-minute intervals. Expired gas analysis was performed throughout the test on the breath-by-breath basis. Oxygen uptake, carbon dioxide production and minute ventilation were recorded during exercise; the obtained data, at 3-second intervals, were averaged by 8 points. Throughout the CPX, 12-lead electrocardiography (ML-5000, Fukuda Denshi Co., Tokyo, Japan) continuously monitored heart rate (HR) and ST changes.

While undergoing dance exercise in a group, all patients wore an activity monitor (Active style Pro HJA-750C, OMRON, Kyoto, Japan) at their hips to record metabolic equivalents (METs) every 10 seconds. One metabolic equivalent (MET) is defined as the amount of oxygen consumed while sitting at rest and is equal to  $3.5 \text{ mL O}_2$  per kg body weight  $\times$  min.



Fig 1: Dance instruction.

A portable expire gas analyzer was used to determine exercise strength while the dance instructors were rehearsing songs with different tempos (Figure left). According to the obtained data, dance exercise therapy was provided to heart disease patients wearing activity monitors (Figure right).

The professional dance teachers instructed the study patients; the same music was used throughout the study period (“Boy Meets Girl” by the TRF which is a Japanese music group, Fig. 1). The employed activity monitor was equipped with a 3-dimensional accelerometer sensor, which enabled to provide appropriate filtering process, summarization by epoch, and conversion from acceleration signals to activity outputs during different body activities. The nature and purpose of this study and the risks involved were explained to all participants before their enrollment. Written informed consent to participation in the study was obtained. The study protocol was approved by the Ethics Committee of Saitama University.

## 3. Results and Discussion

The study patients underwent dance exercise 3 times in their 60-minute exercise therapy. The average exercise strengths during dance exercise were  $2.8 \pm 0.3$  METs at the 1<sup>st</sup> time,  $2.8 \pm 0.2$  METs at the 2<sup>nd</sup> time, and  $2.9 \pm 0.3$  at the 3<sup>rd</sup> time (Table 1). Metabolic equivalents (METs) were calculated from 60-minute exercise activities in all study patients with heart disease. The dashed line expresses exercise intensity of the Anaerobic threshold (AT) (Fig 2-1, Fig 2-2). The analysis based on time course and exercise strength demonstrated that all patients did not exceed the anaerobic threshold (AT) level.

The establishment of cardiac rehabilitation in the maintenance phase is one of the important issues



Table 1 Clinical characteristics and exercise parameters

NO	Age(y)	Height (cm)	Weight (kg)	Sex	Disease	Peak VO <sub>2</sub> (METs)	AT(METs)	Dance(exercise intensity)(METs)			
								The first dance	The second dance	The third dance	Mean
1	73	162.6	62	M	coronary artery bypass grafting	7.9	2.2	3.0	2.6	3.0	2.9
2	71	151.4	52.1	F	angina pectoris	8.1	2.3	2.7	2.5	3.0	2.7
3	58	165.1	66.9	M	angina pectoris, hypertension	7.3	2.1	2.6	2.9	2.9	2.8
4	74	161	69.5	M	angina pectoris	6.8	2.0	2.7	2.7	2.7	2.7
5	71	152	59	F	congestive heart failure, atrial fibrillation	6.4	1.8	2.4	2.5	2.4	2.4
6	71	150	44.9	F	mitral valve replacement	6.2	4.1	3.0	3.1	3.0	3.0
7	68	150.5	65.8	F	angina pectoris, hypertension,	5.4	4.5	2.9	3.1	3.1	3.0
8	74	158.2	49.3	F	angina pectoris, hypertension,	6.7	5.1	2.9	2.9	2.9	2.9
9	65	164.4	71.2	M	angina pectoris, diabetes mellitus	5.3	3.9	3.1	3.0	3.2	3.1
10	76	169	72.7	M	angina pectoris, hypertension,	4.5	3.3	2.5	2.4	2.5	2.5
Mean	70.1	158.4	61.3			6.5	3.1	2.8	2.8	2.9	2.8
SD	5.3	7.0	9.7			1.2	1.2	0.2	0.3	0.3	0.2

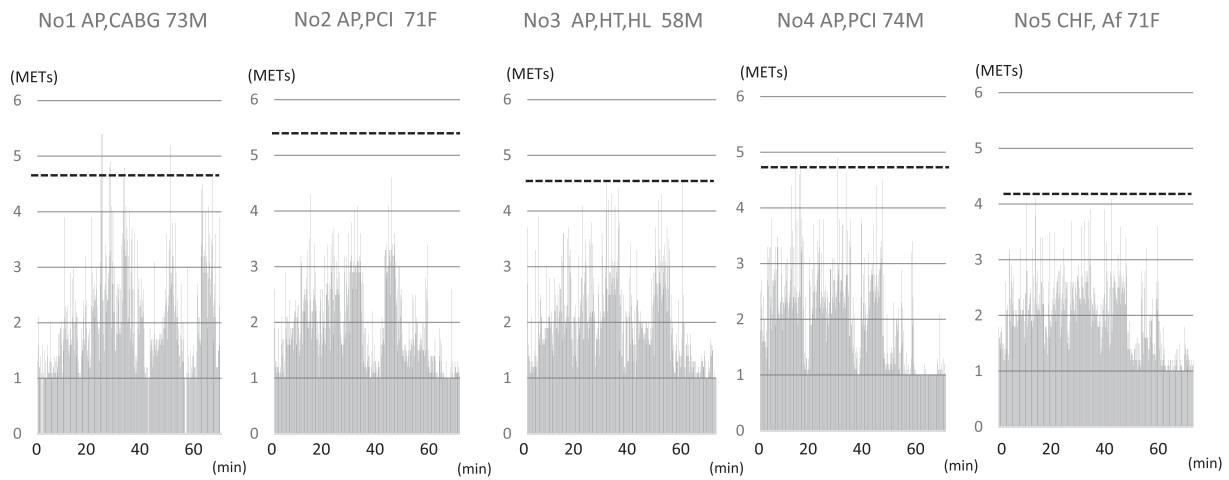


Fig2-1 Dance Exercise Rehabilitation(DER)

----- Anaerobic threshed(AT)

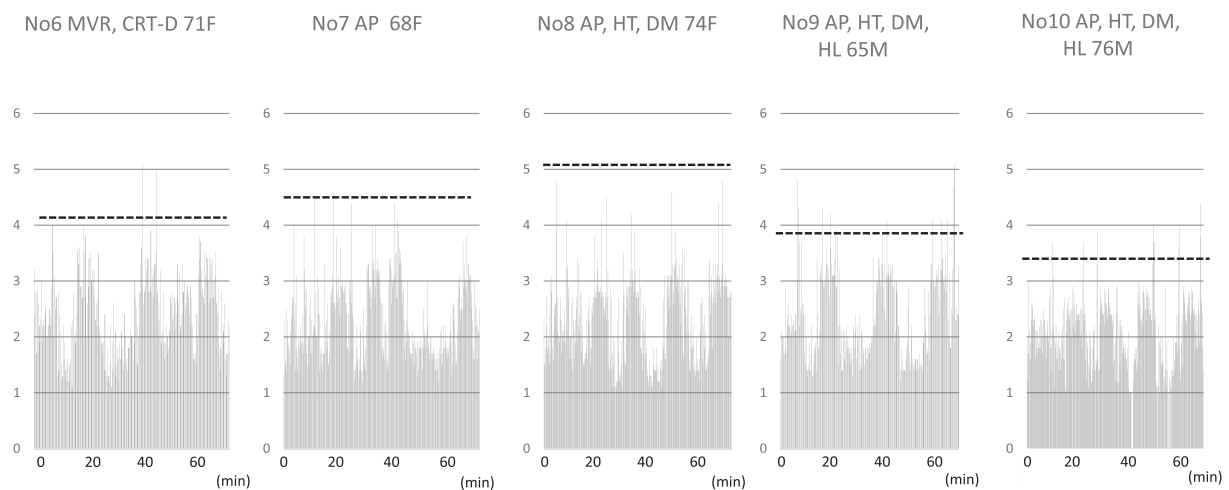


Fig2-2 Dance Exercise Rehabilitation(DER)

----- Anaerobic threshed(AT)

Fig 2: Dance exercise rehabilitation.

Metabolic equivalents (METs) were calculated from 60-minute exercise activities in all study patients with heart disease. The dashed line expresses exercise intensity of the Anaerobic threshold (AT).

in the field of cardiology. Goto et al.,<sup>3</sup> conducted a study in 2007 and reported that, among the 526 specific cardio/cardiovascular facilities, cardiac rehabilitation was provided by 65 facilities (12.4%) at the acute phase and only 47 facilities (9%) in the maintenance phase. The investigation conducted by the European Society of Cardiology (ESC) in 2010 demonstrated that, among the 28 countries participating ESC, 11 countries (39%) provided a systematic cardiac rehabilitation program in the maintenance phase, whereas 24 countries (86%) at the acute phase and 13 countries (46%) at the convalescent stage<sup>4</sup>. This study evaluated the introduction of cardiac rehabilitation with dance exercise performed in a group of heart disease patients. Group therapy has several merits as follows: 1) patients can know the others in the similar situations; 2) while taking cardiac rehabilitation, patients do not feel loneliness; and 3) patients can get moral support, leading to the improvement of their mental status. Meanwhile, exercise tolerance in each patient greatly differs even though they had the same disease. When we provide group therapy, we should be fully aware of this point. Moreover, we definitely need to devise a way to advance this group therapy in patients with different exercise tolerance. In the present study, an activity monitor was used to measure exercise strength. Our previous study reported the accuracy of activity monitors based on the association between energy metabolic rates calculated from oxygen uptake and indicated by an activity monitor<sup>5</sup>. Also, it was the exercise intensity that was lower than an AT level, but, as for this dance exercise rehabilitation(DER), what we could perform safely was suggested in all cases because the Wasserman et al.<sup>6</sup> reported even patients with heart disorder if it was the exercise intensity that was lower than AT when it was possible for exercise safely.

When we provide group therapy, the following

2 matters should be reminded: 1) aerobic dancing is sometimes complicated to the elderly, particularly the movement of lower extremities, which might trigger orthopedic injuries; and 2) patients who walk slowly tend to ignore their physical abilities and struggle to keep up the faster pace. Since patients with heart disease have type A behavior, the medical associates should fully comprehend it.

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