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## Original Article

# Effect of combining music media therapy with lower extremity exercise on elderly patients with diabetes mellitus<sup>☆</sup>



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## ABSTRACT

**Objective:** To evaluate the compliance with lower extremity exercise and blood circulation in the feet of elderly diabetics following a combination of music media therapy and a lower extremity exercise regimen.

**Method:** The 72 elderly diabetic patient subjects were divided into two groups: control group ( $n = 38$ ) and intervention group ( $n = 34$ ). Both groups were exposed to the same comprehensive therapy to control glucose levels. While the control group was given the lower extremity exercise, the intervention group received the extremity exercise in addition to the music media.

**Result:** After three months of intervention, the adherence to the lower extremity exercise regimen in the intervention group was significantly higher than that of the control group ( $p < 0.05$ ). Additionally, following six months of treatment, both the dorsal artery peak values and ankle-brachial indices (ABIs) showed significant differences between the control and intervention groups ( $p < 0.05$ ).

**Conclusion:** Music media treatment combined with lower extremity exercise can both significantly increase the extent of exercise compliance of elderly patients suffering from diabetes mellitus, as well as improve blood circulation in their feet.

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## 1. Introduction

Along with an increasingly expanding elderly population worldwide, the percentage of elderly patients diagnosed with diabetes mellitus is continually increasing and is currently as high as 20.4 percent [1]. This pattern can also be seen in elderly

patients with peripheral vascular disease. A recent American study revealed that 29 percent of type II diabetes patients older than 50 suffered from lower extremity vascular disease [2]. Furthermore, it is known that peripheral vascular disease that is highly associated with diabetes can impede the healing of ulcers and increase the risk of amputation necessity [3]. The recently

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updated American Diabetes Association exercise guidelines state that exercise should be performed at least three times per weeks [4]. Exercising regularly for a long period of time is critical for promoting metabolism, improving insulin sensitivity and decreasing blood sugar. In addition, exercise is also critical for both stimulating blood circulation in the lower limbs and preventing foot ulcers [5–8]. Due to a low rate of movement in elderly patients and their general unwillingness to comply with a regular exercise regimen, exercise therapy often proves challenging to enforce. It is therefore critically important to formulate methods to drastically improve the compliance with movement in diabetic elderly patients. In this study, we expose elderly diabetic patients to a combination of music media therapy with a lower extremity sports programs. We reveal that this unique approach is successful in both promoting blood circulation in the patients' lower extremities as well as increasing the extent of elderly patient compliance to a consistent exercise regimen.

## 2. Methods

### 2.1. Patient selection

Seventy-two diabetic patients above 60 years of age and categorized as level 0 according to the Wagner Classification Scale of Diabetic Foot were selected as research subjects for this study. All patients were acquired between April 2013 and October 2013 from the department of endocrinology in Hua Dong Hospital, which is affiliated with Fudan University in Shanghai, China. Exclusion criteria included those who were unable to walk independently, those who had lower limb pain, severe arthritis, nervous system and cardiovascular disease, as well as other complications that limited their physical activity and cognitive dysfunction.

### 2.2. Study design

This study was performed as a randomized controlled trial. The 72 diabetes mellitus patient subjects were randomly assigned to one of two groups: the intervention group ( $n = 34$ ) receiving music media therapy with a lower extremity exercise regimen and the control group ( $n = 38$ ) that only received the lower extremity exercise regimen. Each patient continued to receive standard treatment and care from their physicians throughout this study. The primary endpoint categories of this study included compliance with exercise, peak velocity of dorsal artery and ankle-brachial index (ABI). Table 1 displays each patient subjects' characteristics according to their assigned treatment regimen at allocation: sex, level of education, age, time since diagnosis, etc. Approval for this study was obtained from the Fudan University ethics committee and all patients provided their signed informed consent of participation.

### 2.3. Exercise therapy

Both experimental and control groups accepted the intervention of the lower extremity exercise regimen, which mainly consisted of resistive exercise and was developed by the United States Joslin Diabetes Center (the branch of the Teaching and Research Institution in Harvard Medical School)

**Table 1 – Characteristics of subjects by assigned treatment regimens at group allocations.**

	Intervention group	Control group	t or $\chi^2$ value	p Value
Sex			0.001	0.583
Male	20	20		
Female	14	18		
Level of education			2.315	0.314
Primary and below	24	28		
Junior or high school	8	10		
College and above	2	0		
Age (M $\pm$ SD)	68.79 $\pm$ 2.78	67.55 $\pm$ 2.16	2.124	0.057
Time since diagnosis (M $\pm$ SD)	21.56 $\pm$ 6.01	21.89 $\pm$ 5.93	-0.238	0.812
HbA <sub>1c</sub> (M $\pm$ SD)	7.25 $\pm$ 0.29	7.24 $\pm$ 0.30	0.711	0.944
FBG (fasting blood-glucose, M $\pm$ SD)	7.56 $\pm$ 1.45	7.67 $\pm$ 1.56	0.452	0.872
BMI (M $\pm$ SD)	24.65 $\pm$ 2.32	24.62 $\pm$ 2.22	0.044	0.965
Score of knowledge questionnaire (M $\pm$ SD)	37.12 $\pm$ 1.77	37.18 $\pm$ 1.78	0.159	0.874

[9]. These specific exercises included the strengthening of quadriceps, balance and ankle/foot as well as kicking before and after the strengthening exercises. The researchers typically led the patients through these exercises. The patients exercised for 15 minutes every day if possible and the regimen lasted for at least six months. Each patient's condition was observed at all times throughout the process of movement to prevent any potential health complications.

### 2.4. Music media intervention

#### 2.4.1. Music media selection

According to the specific musical preferences of the 15 elderly participants, five musical genres were initially selected, including classical, folk instrumental, cheerful, religious and soothing. The final selection of musical genre was "soothing aesthetic" based upon the preferences of the patients after listening to sample music from each style. After assessment, the musical professor composed a synthetic piano song with a 4/4 beat, and this musical exposure was combined with a lower extremity exercise program.

#### 2.4.2. Intervention

The diabetic elderly patients in the intervention group finished the throughout treatment led by researchers. These patients exercised 15 minutes every day while listening to group music, with the lower extremity movement being introduced every week for four consecutive weeks. Patients were then exposed to the collective musical piece combined with lower exercise every month for at least six months.

### 2.5. Measures

#### 2.5.1. Compliance with elderly diabetics to the lower extremity exercise regimen

The exercise regimen compliance with elderly diabetics was measured using a diabetic exercise adherence scale. This

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