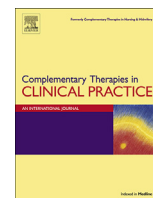




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Listening to motivational music while walking elicits more positive affective response in patients with cystic fibrosis



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ABSTRACT

Objective: The purpose of this study was to investigate the effects of motivational and relaxation music on affective responses during exercise in patients with cystic fibrosis (CF).

Methods: Thirty-seven patients with CF performed the 6-min walk test (6MWT) under three experimental conditions: listening to no music, relaxation music, and motivational music. 6-min distance × body weight product (6MWORK) was calculated for each trial. Patients' affective responses during exercise was evaluated with Feeling Scale (FS). The motivational qualities of music were evaluated with the Brunel Music Rating Inventory-2 (BMRI-2).

Results: 6MWORK was significantly lower while listening to relaxation music compared to 6MWORK without music ($p < 0.05$). FS and BMRI-2 scores were significantly higher during 6MWT with motivational music than 6MWT with relaxation music ($p < 0.05$).

Conclusions: Carefully selected motivational music can lead to positive affective response during exercise and increase the enjoyment of patients from exercises in CF.

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1. Introduction

Cystic fibrosis (CF) is an inherited autosomal recessive multi-system disorder characterized by obstructive lung disease, pancreatic insufficiency, malnutrition and high electrolyte levels in sweat [34]. CF occurs due to mutation in the *Cystic Fibrosis Transmembrane Conductance Regulator* gene located on the long arm of chromosome 7 [6] and the prevalence of CF is one in every 2500 live births [46]. It is expected that newborns with CF will survive to the age of 50 in the twenty-first century [36].

The exercise capacity of patients with CF has been shown to be lower than in healthy controls [2,11]. Pulmonary, cardiac and

peripheral skeletal muscle function, along with physical activity, all contribute to exercise limitation in CF [1]. Exercise capacity, which is an objective measure of exercise tolerance, predicts the risk of mortality and hospitalization in patients with CF [31,32]. Although the value of physical activity and exercise training in the therapeutic intervention for patients with CF is well recognized by clinicians [30,43], it has not yet been established how best to implement physical activity and exercise to ensure a positive behavioral change, and clinicians are not aware of the beneficial effects of listening to music during exercise.

It has been shown that music therapy could affect oxygen saturation (SpO₂), heart rate (HR), respiratory rate, anxiety, depression, and quality of life in the medical environment [35]. Sliwka et al. showed in their study that patients with mild asthma benefit from music therapy; their pulmonary function improves and dyspnea perception decreases [38]. Music leads to improvements in the psychological outcomes such as quality of life, dyspnea and anxiety and physiological outcomes such as pulmonary functions among individuals living with COPD [29]. Rating of perceived exertion (RPE) was found to be lower during low-

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intensity exercise in the presence of music compared to exercise performed without music in healthy people [45]. Evidence suggests certain musical experiences can positively affect mood during exercise [5,24].

Although studies have shown that music can have a positive effect on exercise participants [13,24] and increase physical performance [9,40], the findings in the literature are not consistent. In addition, the studies were often done on healthy subjects and cardiac patients. There is only one study that evaluates the benefits of music therapy as an adjunct to chest physiotherapy in patients with cystic fibrosis [15]. Considering the lack of literature on this subject and of any study regarding the effects of music during exercise on patients with CF, we planned this clinical trial. The present study is the first to examine the effects of music during walking on patients with CF. In this study we aimed to investigate the effects of motivational and relaxation music on functional exercise capacity, vital signs, RPE and affective responses during exercise in patients with CF. Because the findings regarding the effects of music have been controversial, no specific hypotheses were advanced and the investigation was exploratory in nature.

2. Methods

2.1. Participants

Thirty-seven stable CF patients between the ages of 8–18 who were diagnosed by Hacettepe University, Faculty of Medicine, Department of Child Health and Diseases, Unit of Chest Diseases according to CF-compliant clinical manifestations and sweat chloride above 60 mEq/L in both measurements; who were ambulant and cooperative; and who volunteered to participate in the study were enrolled. Patients who were in acute exacerbation period or had severe pulmonary dysfunction, hearing impairments, neurological disease, severe orthopedic disease or any systemic disease that would interfere with the tests performed were not included in the study. The study was approved by the Ethics Committee of Hacettepe University and subjects and their families signed an informed consent form.

2.2. Procedure

Each patients' exercise capacities were assessed by 6MWT with motivational music, relaxation music and without music in a random order determined by draw. The three 6MWT trials were conducted with 30 min intervals between each test. During the 30 min resting period after each exercise test, patients provided feedback by marking scales related to affective responses and the motivating level of the music during exercise.

2.3. Music selection

Songs were played with a portable MP4 device (GOLDSMART Digital MP4 Player, Model No: MP4-224, China) and patients listened the music via earphones (Sony MDRZX100W White Headband Headphones). The volume of the music was increased individually for each participant to a level that was easily audible and comfortable. A song with a tempo of 120 beats/min ('Survivor'-Eye of the Tiger, 1982) was selected as motivational music and a song with a tempo of 60 beats/min (relaxing music-slow instrumental music for meditation and more-rdN 019) was selected as relaxation music [17,21]. The selected musics were the songs which can appeal to these age group.

2.4. Assessments

The physical and sociodemographic characteristics of all subjects were recorded. Body mass index (BMI) was calculated from the formula (body weight/height², kg/m²). Subjects were classified as thin (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²) and obese (30–39.9 kg/m²) [44]. Patients provided information regarding the numbers of emergency department visits, hospitalizations, and doctor visits they had during the previous year, their symptoms, and physiotherapy techniques they had used. The drugs they used and laboratory test results were recorded from their hospital file.

2.4.1. Pulmonary functions

The pulmonary function test was performed with a spirometer (Zan100USB, nSpire Health Inc, USA). The test was performed in the sitting position. The best of three technically acceptable maneuvers with 95% compliance was selected for analysis [12]. Pulmonary function test results were expressed as percentages of the expected values adjusted for age, height, body weight and sex [39].

2.4.2. Dyspnea perception

Patients' dyspnea levels were determined with the Modified Medical Research Council (MMRC) Dyspnea Scale. The MMRC Dyspnea Scale is a five-level rating scale to describe breathlessness in daily activities. Level 0 represents the lowest level of dyspnea impairment perceived, level 4 the greatest dyspnea perception [4].

2.4.3. Functional exercise capacity

In the 6-min walk test (6MWT), subjects were requested to walk along a 30-m level corridor as fast as they could at their walking speed for 6 min. The test was administered three times (with motivational music, with relaxation music and without music in a randomized order) in the same day with half-hour intervals. Pre- and post-test HR and SpO₂ with a pulse oximeter (Nonin Model 2500C, Nonin Medical, Inc., Plymouth, MN, USA) were recorded. Dyspnea, general fatigue and quadriceps fatigue perceptions were assessed with the Modified Borg Scale and pre- and post-test scores were recorded. RPE during the test was assessed with Modified Borg Scale and recorded after each test. Distance results of the three tests were used in the statistical analysis for each patient [3]. The 6MWT distance was expressed as a percentage of the expected values from age and sex (%6MWT distance) [27,37]. The 6MWORK (kg.m) was calculated as 6MWT distance (in m) × body weight (in kg) for each test [37].

2.4.4. Motivational qualities of music during exercise

The motivational qualities of music during exercise were evaluated with the Brunel Music Rating Inventory-2 (BMRI-2). In this study, The second part of BMRI-2 was only used for assessing motivational qualities of motivational and relaxation musics. The first part of BMRI-2 that contains 13 items for selecting music was not used. The BMRI-2 is comprised of six items, each concerning a musical component (rhythm, style, melody, tempo, instrumentation and beat). After participants listened to motivational and relaxation music during the 6MWT, they indicated the extent of their agreement with each item (e.g. 'The rhythm of the music would motivate me during exercise') on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The total score is summed to give a value ranging from 6 to 42 which represents the motivational quotient for that piece of music [19]. The motivational quotients of music are described as high (36–42), moderate (24–35), and outdeterous (≤24) [20]. The BMRI-2 can be used both by exercise instructors and participants. It is easy to use and provides a valid and internally consistent tool for selecting music to

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