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Effect of progressive muscle relaxation in adolescent female bronchial asthma patients: A randomized, double-blind, controlled study

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Abstract

Objective: The aim of this study is to examine the efficacy of progressive muscle relaxation (PMR) on change in blood pressure, lung parameters and heart rate in female adolescent asthmatics. **Method:** In a prospective, randomized, double-blind, controlled study, adolescent female asthmatics ($n=31$) were tested to find out how the systolic blood pressure (SBP), forced expiratory volume in the first second (FEV_1), peak expiratory flow (PEF) and heart rate change after PMR. The control group (CG; $n=30$) received a placebo intervention. **Results:** A significant reduction in SBP and a significant increase in the FEV_1 and PEF were observed after PMR. The heart rate showed a significant increase in the coefficient of variation (CV), root-mean-square of successive differences (RMSSD) and at the high frequency (HF) range, in addition to a significant reduction at the low and middle frequency (LF and MF, respectively) ranges. **Conclusion:** PMR appears to be effective in improvement of blood pressure, lung parameter and heart rate in adolescent female asthmatics.

Keywords: Bronchial asthma; Progressive muscle relaxation; Heart rate; Lung parameter

Introduction

Heart rate and respiration are governed by the regulation of the autonomic nervous system [1]. Parasympathetic nerve impulses lead to a slower heart rate, more regular respiration and general relaxation [1,2]. Asthma patients experience shortness of breath and a sensation of asphyxiation due to bronchial constriction, with simultaneously enhanced vagal drive, leading to an imbalance of sympathetic/parasympathetic influences [2]. Various emotional states and stress increase oscillatory resistance [2]. Stress can also exacerbate airway hyperactivity and airway inflammation in bronchial asthma and increase blood pressure and heart rate [1–4].

Adolescent asthma patients are a distinct group of patients with different treatment requirements from either paediatric or adult patients [5]. When properly used, they can be a form of effective nonmedicinal aid in asthma treatment that may be appealing to adolescents [5]. The negotiation of treatment plans is crucial in this group of patients [5]. Noncompliance with prescribed antiasthma medication is considered to be a major problem [6,7]. Relaxation techniques have a positive effect on autonomic balance. When properly used, they can be a form of effective nonmedicational aid in antiasthma therapy [8–12].

One of the most simple and easily learned techniques for relaxation is progressive muscle relaxation (PMR), which

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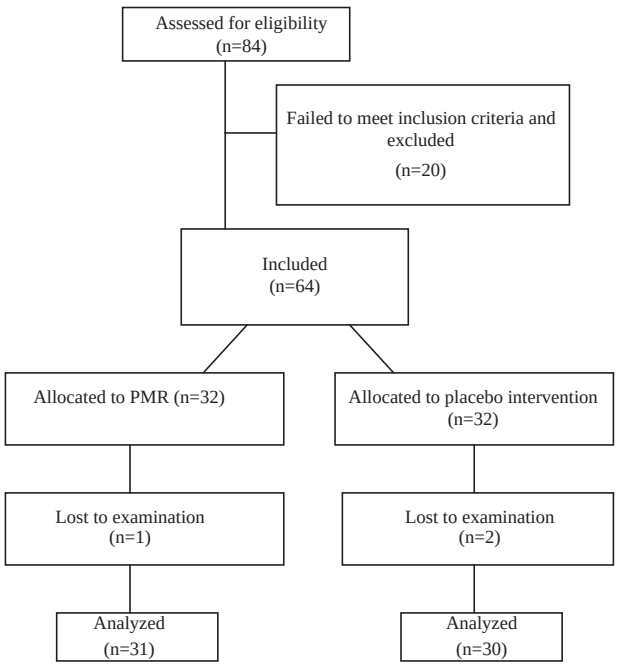

Fig. 1. Flow diagram of the patients' progress through the phases of the trial.

has, in the literature, resulted in the greatest effects on behavioural and self-report measures of relaxation [9]. The procedure consists of having patients sit comfortably in a quiet room, tense a group of muscles, such as those in the right arm, hold the contraction for about eight seconds, and then relax it for about 30 seconds while breathing out. After a short rest, this sequence is repeated with another set of muscles [9]. Through repetitive practice, the patients learn to recognize the associated feelings of a tensed muscle and completely relaxed muscle [9]. The extent of relaxation experienced by asthma sufferers can be depicted through the measurement of systolic blood pressure (SBP), lung parameter and heart rate variability (cf. Refs. [1–4,13–18]).

There have been hints of the effectiveness of relaxation in asthma patients for a considerable time [19–24]. The review by Huntley et al. [25] showed significant effects of PMR or mental and muscular relaxation therapy in asthma patients in two out of five studies. Ritz [26] analysed several studies on this topic in adults, and McQuaid and Nassau [27] in children. They concluded that relaxation training may contribute to the standard treatment of asthma for some individuals [26]. However, owing to the inherent problems of conducting such trials, there is still a lack of evidence for the efficacy of relaxation therapies in the management of asthma [25,27]. The aim of this study was, therefore, to examine the efficacy of PMR on changes in SBP, lung parameter and heart rate variability in female adolescent asthma patients in a randomized, double-blind, controlled trial.

Method

Participants

Female adolescents with a history of mild or moderate bronchial asthma were recruited through advertisements in churches, doctors' practices and schools. Eighty-four participants, all natives of Bavaria, agreed to take part in the study (Fig. 1). A general medical history was taken at the time of the first telephone contact. Sociodemographic data from adolescents from the same ethnic group and a similar degree of severity of asthma were compared. In our opinion, these sociodemographic data were adequate for this age group (Table 1).

The criteria for exclusion were severe bronchial asthma, use of medication other than common asthma medication during the previous 4 weeks, psychosis, severe anxiety and/or depression, substance abuse, the current use of psychotropic medication (cf. Refs. [28,29]) or psychotherapy, as well as smoking and hypertension. Common antiasthma agents, e.g., beta-2 agonists such as salbutamol, may not influence heart rate variability [30]. However, there are studies that have shown the opposite [31].

Design

Participants were next invited to participate in face-to-face interviews. The Structured Clinical Interview (SCID I and II) was then carried out for each participant, to exclude diagnosable psychiatric disorder. The participants then underwent a physical and laboratory examination.

The necessary sample size was calculated for a Type I error of 5% (z_1=1.96) and a power analysis of 80% (z_2=0.842), based on the mean values (m_1=25.7 and m_2=22.0) and standard deviations (s_1=7.9 and s_2=7.0) for the root-mean-square of successive differences (RMSSD; see below), which were obtained from a small pilot study. The formula is $n(\text{per group})=[(z_1+z_2)^2(s_1^2+s_2^2)]/(m_1-m_2)^2$ [32]. This resulted in a group size of $n=64$ patients: 32 of them were chosen for the PMR group (PMR-G) and 32 for the control group (CG), using randomized numbers generated by an Excel table (Fig. 1). The clinic patients' administrative office

Table 1
Sociodemographic data at time of randomization

	Age (years)[a]	Body mass index (BMI)[a]	Going to school	Doing an apprenticeship	Has a boyfriend	Living with both parents
PMR-G (n=31)	19.0±2.5	22.7±3.6	16 (51.6%)	19 (48.4%)	14 (38.7%)	17 (54.8%)
CG (n=30)	18.5±3.0	23.5±3.2	17 (56.7%)	13 (43.3%)	10 (33.3%)	18 (60.0%)

[a] Mean values±S.D.