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Notes and Observations

The Effect of Clothing on Inhalation Volume¹

Merrie MacHose

Kutztown University

Erik Peper²

San Francisco State University

Diaphragmatic breathing is included as an important component of relaxation training protocols. In the present study, we report on the effectiveness of a simple behavioral technique to illustrate that choices of tight, restraining clothing significantly affect the inhalation volume of the breathing pattern. This study investigates the use of the incentive spirometer to observe the effects of tight versus loose clothing on inhalation volume with 17 volunteer subjects. All had been trained in the use of the incentive spirometer and slow diaphragmatic breathing (SDB) techniques. Inhalation volumes in the studies were measured with a 4000-ml incentive spirometer and were recorded for one or two sequential breaths using SDB before and after loosening restrictive clothing. Loosening the subjects' clothing significantly increased inhalation volume. The results indicate that tight clothing significantly interferes with diaphragmatic breathing. We suggest that the demonstration of the effect of tight versus loose clothing can increase the clinician's awareness of the effects of clothing on breathing patterns. The technique also facilitates the acquisition of diaphragmatic breathing skills, and may raise the client's awareness that choices such as clothing can directly affect physiology.

Descriptor Key Words: diaphragmatic breathing; clothing; inhalation volume; relaxation.

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²Address all correspondence to Erik Peper, Ph.D., Institute for Holistic Healing Studies, San Francisco State University: 1600 Holloway Ave., San Francisco: California 94132.

Increasingly, diaphragmatic breathing is included as an important component of relaxation training protocols. Elsewhere we have investigated the use of symptom prescription (Peper & MacHose, 1990b) and imagery (Peper & MacHose, 1990a) as effective clinical strategies to enhance the training of slow diaphragmatic breathing. In the present study, we report on the effectiveness of a simple behavioral technique which can dramatically illustrate to the client that choices of tight, restraining clothing significantly affect breathing style.

Clothing, often chosen more for style or convention than for comfort, may be a factor that helps maintain thoracic breathing. Tight jeans, tight pantyhose, belts, etc. all restrict the movement of the abdomen. Cultural inhibitions about allowing the abdomen to expand may also play a role in the maintenance of the problem.

During inhalation in normal diaphragmatic breathing, the diaphragm pushes downward when it contracts with subsequent expansion of the abdomen. If the abdomen is restrained by clothing and/or cultural inhibitions, diaphragmatic movement may be restricted.

In diaphragmatic breathing training, as in other self-regulation training, client's awareness of behavior choices is raised. Clinical demonstrations of how behavior affects the self-regulation process can be an important part of this cognitive preparation process; Schwartz (1987) discusses the importance of the client's cognitive preparation in order for biofeedback training to be effective.

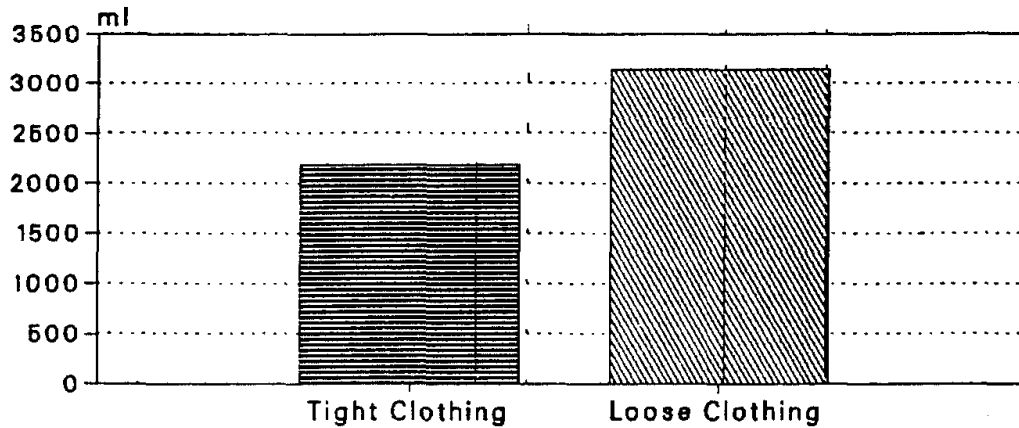
In this study, we investigate the clinical use of the incentive spirometer to observe the effects of tight versus loose clothing on inhalation volume. If loosening clothing (e.g., belts, buttons on waistbands, zippers, neckties) could significantly increase inhalation volume, then this technique could be an effective clinical tool. The technique would demonstrate to the client that behaviors that are within the individual's control, such as their choice of clothing, are an important aspect in the success of clinical training in diaphragmatic breathing.

METHOD

Subjects

Seventeen volunteers from a breath-training workshop for clinicians were the subjects in this study. All had been trained in the use of the incentive spirometer and slow diaphragmatic breathing techniques.

Tight vs Loose Clothing Effect on Inhalation Volume



N=17

Mean volume increased 30%

Fig. 1. After loosening clothing, inhalation volume for the group increased approximately 30%.

Equipment

All inhalation volumes in the studies were recorded with a Sherwood Medical Inc. incentive spirometer (Voldyne). This instrument is designed for single subject use and records up to a total capacity of 4000 ml.

Procedure

Subjects were instructed to take one or two (mean = 1.59) slow diaphragmatic breaths using the incentive spirometer (along the lines described in Roland & Peper, 1987) and to record the volumes. Next, subjects were instructed to loosen all tight clothing. Belts and ties were loosened; any buttons or zippers in slacks or skirts were opened. Once all constraining clothing had been loosened, subjects were instructed to take one or two (mean = 1.65) slow diaphragmatic breaths through the incentive spirometer and to note the volumes.

RESULTS

Loosening subjects' clothing significantly increased inhalation volume. (paired t test, $p < .0001$, $t = 6.69$, $df = 16$). Overall, volume increased by 30% from a mean of 2187 ml to 3146 ml as illustrated in Figure 1. All

Table I. Distribution of Subjects' Increase in Volume

Increase in volume:	0%-20%	20%-50%	50%-80%	Over 80%
Number of subjects:	5	5	5	2

subjects reported an increase in volume, although some subjects increased more than others, as shown in Table I. One of the subjects reported that she had no tight clothing to loosen, as she was wearing a loose elastic-waisted skirt. Volumes for her trials are not included in the group data. Inhalation volume for this subject was 4000 ml in each trial.

DISCUSSION

It appears that tight clothing significantly interferes with diaphragmatic breathing. A clinical implication of this phenomenon is related to the increasing use of diaphragmatic breathing as a part of overall relaxation training. Diaphragmatic breathing is a useful and important component in teaching individuals to relax. In this training, it is important for clients to see the effect behavioral choices, such as clothing, have on the mastery of the relaxation techniques.

Obviously, clothing is not the only factor that may restrict abdominal movement. Clients may hold the abdominal wall muscles tight in a protective stance. The early childhood injunction to "pull your stomach in" in an effort to promote good posture may foster the internal bracing pattern. Past traumatic injury or surgery to the abdomen may also contribute to the development of a bracing pattern, as individuals may have learned to guard an injured area. In these cases, loosening clothing may only slightly increase inhalation volume; these clients need to learn to allow the abdomen to expand. This process may affect the client's entire self-image.

Subjects in this study were surprised at the difference in volumes in the "tight" and "loose" conditions. This type of surprise is a useful clinical tool, and it may contribute to the "Aha!" effect that accompanies sudden insight in the therapeutic setting. Therapists can easily use the demonstration of "tight" versus "loose" clothing to (1) facilitate acquisition of diaphragmatic breathing skills, and (2) raise clients' awareness that choices, such as clothing, can directly affect their physiology.

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