Trager Psychophysical Integration

A Method to Improve Chest Mobility of Patients with Chronic Lung Disease

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The purpose of this study was to ascertain if Trager Psychophysical Integration would have an effect on patients with documented chronic lung diseases. The criterion measures were forced vital capacity (FVC), forced expiratory volume at one second and at three seconds (FEV_1, FEV_3), chest expansion, respiratory rate (RR), and subjective breathing difficulty. After a two-week regimen of Trager Psychophysical Integration administered by a physical therapist trained in the technique, our subjects exhibited significant changes at the $p < .05$ level in FVC, RR, and chest expansion. We noted no significant changes in FEV_1 and FEV_3 or in subjective breathing difficulty. Because Trager Psychophysical Integration appears to have a positive effect on the restrictive component of chronic lung disease, physical therapists should learn this technique to treat more effectively their patients with chronic lung disease resulting from restriction.

Key Words: Lung diseases, Lung volume measurements, Physical therapy, Respiration.

Physical therapists are involved in the treatment of patients with chronic lung diseases. Therapists assist patients with secretion removal, active breathing exercises, general fitness regimens, and progressive relaxation techniques.[1-5] They educate patients and their family members in the disease processes and in therapeutic techniques designed to improve the quality of their lives.[1,3-5] Therapists have paid less attention, however, to the maladaptive musculoskeletal changes that accompany the disease processes, such as decreased rib cage mobility and the neck stiffness that occurs as patients attempt to use accessory muscles to aid them in breathing.[6] A passive joint mobilization technique might help to minimize the extent of the maladaptive musculoskeletal changes that tend to occur with these patients.[7]

High tension and anxiety levels are common in individuals with chronic lung diseases, and various relaxation techniques have been used to alleviate these problems.[1,3,5] Most of the mobilization exercises and relaxation techniques used by therapists to treat patients with chronic lung diseases unfortunately require conscious effort by the patient. This creates a dissonant situation for the patient, because the more conscious he is of his muscles when relaxing, the more difficulty he has in meeting his body's respiratory demands and the more tension and anxiety are produced.

A potentially productive approach to this situation is a technique that does not require conscious effort but can decrease tension levels and increase joint mobility effectively. Such an approach should help the patient to breathe spontaneously more efficiently. It also should make breathing exercises more effective because anxiety levels and joint limitations will have been reduced.

One approach that meets these criteria is Trager Psychophysical Integration (TPI).[8] Developed over the last 60 years by Dr. Milton Trager, Trager Psychophysical Integration consists of a series of very gentle, painless, passive movements done in a manner that allows participants to maintain the freedom of movement that they experience during treatment. The patients do not have to do anything but merely allow the movements to assist in reducing tension, decreasing anxiety, and restoring more normal mobility. Therapists could combine this approach with more traditional respiratory exercises for a complete rehabilitation program for patients with respiratory dysfunction.

The purpose of this study was to test our hypothesis that TPI would have a positive effect on patients with documented chronic lung diseases. The specific hypotheses to be tested were that four 20-minute sessions of TPI administered to the neck, rib cage, and abdomen would increase the subjects' forced vital capacity (FVC), forced expiratory volume at one second and at three seconds (FEV_1 and FEV_3), and chest expansion. We expected that respiratory rate (RR) and a subjective rating of breathing difficulty would decrease.

We intentionally limited our research to four 20-minute sessions of TPI. We determined that if we could prove our hypotheses to be acceptable at a statistically significant level, further research would be needed.

METHOD

Subjects

Twelve members of the Wake County Lung Association, an affiliate of the American Lung Association, volunteered to participate in the study. Each subject had a documented chronic lung disease. Descriptive aggregate information on the subjects appears in Table 1. We obtained informed consent from each subject before the study in accordance with the procedures outlined by the Committee on the Protection of the

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Rights of Human Subjects at the University of North Carolina at Chapel Hill. All subjects served as both experimental and control subjects during some phase of the study.

Materials

Treatment and testing took place in the physical therapy department at Dorothea Dix Hospital in Raleigh, NC. The subjects were treated on a standard physical therapy treatment table. A Seiko stopwatch was used to time the period for taking brachial pulse rate (HR) and RR. A standard stethoscope and sphygmomanometer were used to measure blood pressure (BP). Forced vital capacity (FVC), FEV_1, and FEV_3 were measured on a Vitalograph® Single Breath Wedge bellows spirometer,* and a strip chart recorder graphically displayed the respiratory data on calibrated paper. Chest expansion was measured in centimeters using a cloth tape measure. The tape was placed around the subject's chest at the level of the xyphoid process. The difference in measurements between maximum inhalation and maximum exhalation was used as the measure of chest expansion. The subject quantified breathing difficulty subjectively using a 10-point scale with 1 meaning that the subject had no trouble breathing and 10 meaning that the subject was experiencing maximal breathing difficulty.

Procedure

A diagram of the experimental sequence is presented in Table 2. We tested all subjects one week apart during the baseline phase in all criterion measures: FVC, FEV_1, FEV_3, RR, chest expansion, and breathing difficulty. Subjects rated their breathing difficulty immediately upon entering the room. Heart rate, RR, BP, and chest expansion then were measured in that order. Finally, FVC, FEV_1, and FEV_3 were measured. Each subject was allowed three trials, with the best result used for the calculation.[4] We recorded HR and BP readings for each subject as a gross monitor of the subject's physical condition and to alert the therapist to any excessive cardiac demands the subject might be experiencing. Had a subject been

* Vitalograph Medical Instruments, 834 Quivire Rd, Lenexa, KS 66215.

TABLE 1
Descriptive Information on Participating Subjects

Age (yr)		Sex		Diagnoses	Process
$\overline{X}$	s	M	F		
64.08 ± 8.26		4	8	7 emphysema 2 emphysema, asthma 1 emphysema, bronchitis 2 asthma	8 obstructive and restrictive 3 obstructive 1 WNL (asthma only person)

TABLE 2
Experimental Sequence Used in the Study

		Treatment and Follow-up					
Baseline		Phase 1		Phase 2		Phase 3	
Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Mª All subjects (N = 12)	M		M E^b-1 (n = 6) C^c-1 (n = 6)		M C-2 follow-up (n = 6) E-2 (n = 6)		M C-2 extra follow-up (n = 6) E-2 follow-up (n = 6)

[a] M = measurement times.
[b] E = experimental subjects.
[c] C = control subjects.

found to be in cardiac distress, appropriate medical care would have been sought and the experimental testing and treatment would not have been conducted. At no time in the study did we find a patient to be in cardiac distress; these two measurements, therefore, were not included in the data analyzed.

We randomly assigned the subjects to either the first experimental group (E-1) or the first control group (C-1). Subjects in the C-1 group continued their normal daily routine and returned in two weeks to be tested. Subjects in the E-1 group were treated two times a week for two weeks for 20 minutes each session. We retested all 12 subjects at the end of two weeks. At that time, the six subjects in the C-1 group became the second experimental group (E-2), and the six subjects in the E-1 group became the second control group (C-2). Subjects in the C-2 group continued their normal routine and returned in two weeks to be tested. That constituted their follow-up phase. Subjects in the E-2 group were treated in the same manner as the E-1 subjects had been, receiving treatment two times a week for two weeks for approximately 20 minutes each session. At the end of their two-week treatment period, all E-2 subjects were tested. These subjects were then retested two weeks later for

their follow-up phase. At the end of the study, we asked all subjects for their opinions about the treatment and its effect on them.

Treatment Protocol

We followed a set treatment protocol that had an anticipated progression. It was not possible, however, to standardize the exact movements performed, the number of repetitions given, or the speed of each movement because TPI is subject-specific. Modification of movements depends on the responses of the subject during the treatment session. A tightly structured treatment regimen with a specific number of repetitions at a particular speed, with a standardized force, and within a given range certainly would make data analysis easier, but one then would not be analyzing TPI. Such a tightly structured regimen might be appropriate for subject one, useless for subject two, and even harmful to subject three.

The therapist administering the treatments in this study standardized the treatment time at 20 minutes. He had the same goals for each subject: 1) to increase the mobility of the neck, chest, and abdomen and 2) to provide the subject with a kinesthetic awareness of

TABLE 3
Means and Standard Deviations for the Criterion Measures (N = 12)

Measurement		Pretest	Posttest	Follow-up	p
FVC (L)	$\overline{X}$	1.79	2.03	2.01	<.05
	s	0.75	0.67	0.63	
FEV$_1$/Observed FVC (%)	$\overline{X}$	64.33	57.59	58.16	NS
	s	14.80	24.30	22.13	
FEV$_3$/Observed FVC (%)	$\overline{X}$	84.30	83.96	90.00	NS
	s	10.70	10.50	14.30	
RR (breaths/min)	$\overline{X}$	17.70	15.70	15.90	<.05
	s	3.60	2.60	4.30	
Chest expansion (cm)	$\overline{X}$	3.60	6.15	5.60	<.05
	s	2.00	2.60	1.90	

being able to move a body part freely. The same general protocol was followed for each subject. The sequence of body parts treated was neck, abdomen, and chest. Movements progressed from small to larger ranges of motion, as each patient's tissues allowed. Although TPI has specific movements with specific hand placements, they must be modified to account for patient variability. As a patient progresses through the treatments, additional movements are added. In this study, each subject received the movements that were appropriate for the subject at the time. Not all subjects, therefore, received exactly the same treatment, although the general protocol was standardized. For example, if subject one had a very tight, restricted neck motion and subject two had relatively free neck motion, the neck movements given these two people would differ in range, speed, and complexity. As subject one improved, however, the movements would approach the movements subject two was doing.

A treatment session consisted of one physical therapist trained in TPI administering very gentle, painless, passive movements of the neck, abdomen, and chest wall for the subject, who rested in a supine position on a treatment table. The same therapist treated all of the subjects. The movements were designed to help the subject relax, experience increased mobility of the areas treated, and therefore breathe more freely. The subject had no duties to perform other than to tell the therapist if he felt pain.

The neck treatment consisted of gentle rotations in both directions while gradually increasing the range of movement, manual cervical traction, gentle neck arches into extension, medial-lateral and anterior-posterior glides, and stretching of the upper trapezius and levator scapulae muscles. The chest wall treatment consisted of gentle, passive, rhymical movements of the chest wall that mimicked the movements of natural respiration, stretches of the pectoralis muscles, and alternating shoulder depression and chest wall compressions. The abdominal treatment consisted of a gentle rocking of the body along with pressure on the abdominal muscles and petrissage-like strokes on the abdominal muscles. The duration of the particular movement, the number of repetitions, the speed of the movement, and the motion obtained depended on how the subjects responded individually to the movement. This method, like other hands-on techniques, is learned best in workshops consisting of several days of instruction and supervised practice; it is not within the scope of this paper for us to describe TPI in sufficient detail to enable untrained persons to perform the technique proficiently.

Data Analysis

We performed all comparison testing between baseline days or between pretests and posttests using the Wilcoxon[9] matched pairs signed ranks test at a significance level of $p < .05$. Spearman's coefficient of rank correlation was used to test for test-retest reliability of the criterion measures. We chose nonparametric correlation and statistical testing because we could not ensure that the underlying assumptions of the parametric analysis of variance for repeated measures would be upheld.[10] We used an intact existing group of people from the respiratory health club and, therefore, did not have a random sample from a larger population. This group may not represent the larger population because, being members of the respiratory health club, they showed an extra interest in their well-being. We took

every member who wanted to be in the study; therefore, we had a range of severities and types of disease processes and could not assume an homogeneity of variance. We also consider 12 to be a small sample size better suited to be analyzed with nonparametric methods.

RESULTS

During the baseline phase of this study, the subjects demonstrated no statistically significant changes in any of the criterion measures. We found high test-retest reliability for FVC ($r = .92$), FEV$_1$ ($r = .86$), FEV$_3$ ($r = .88$), and the breathing difficulty rating scale ($r = .88$). Low reliability was noted for RR ($r = .57$) and chest expansion ($r = .58$). Because the reliabilities of RR and chest expansion were low, we tested to determine whether the differences between the scores of the first tests and the retests were statistically significant but found they were not. An examination of the scores shows why the reliabilities were low. Some scores increased slightly, some decreased slightly, and some remained the same. If the scores of all subjects increased or decreased or stayed the same, the reliabilities would be higher. Chest expansion and RR still are useable measures. High reliability alone does not indicate a good criterion measure. One could have high reliability and the scores higher or lower on the retest as long as the scores changed in a similar manner. We would prefer high reliability of all measures; however, we believe that if the effect caused by the treatment is large enough to achieve statistical significance, results are reportable and useful.

After the first two-week treatment phase, E-1 subjects demonstrated significant positive changes in FVC, RR, and chest expansion at the $p < .05$ level. No significant changes were noted in the C-1 subjects. After the second treatment phase, E-2 subjects also showed significant positive changes in FVC, RR, and chest expansion. The C-2 subjects' measurements remained unchanged during this time. Because both experimental groups demonstrated similar changes, their data were pooled for the final analysis.

Table 3 presents the mean data for the criterion measures. The average posttest FVC was 2.03 L (± 0.67). This was a significant (n = 12, $d = 4$, $p < .05$) 13.02% increase. This increase sig-

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nificantly changed (n = 12, d = 7.5, $p <$ .05) the subjects' percentage of normal FVC from 60.12% (±23.05) to 65.5% (±23.08). The FEV_1 and FEV_3 did not change significantly during this study. Respiratory rate decreased significantly during the treatment phase (n = 12, d = 4, $p <$ .05) by 2.0 breaths per minute, an 11.3% decrease. Chest expansion showed a significant (n = 12, d = 0, $p <$ .05) increase of 2.55 cm (±1.4), a 70.8% increase. During the follow-up phase, the subjects' measurements remained unchanged from their posttest scores.

We also asked the subjects to report any treatment effects they had noted while participating in the study. Most subjects reported feeling better after the course of treatment. Tape-recorded comments from participants included, "I sleep longer at night. Before this treatment, I used to wake up several times a night. This is the first time in years I have been able to sleep for eight hours." Another person said, "Before I participated in the study, all I had energy to do after work was to go home and sleep. Now I am able to socialize in the evenings." Other participants noted using abdominal breathing spontaneously and having less frequent and less severe episodes of shortness of breath. One man was able to sleep without having two pillows under his head and was able to discard the cane he had been using.

DISCUSSION

All of the criterion measures in this study changed as we had hypothesized with the exceptions of FEV_1 and FEV_3. The restrictive component of the subjects' chronic obstructive pulmonary disease was affected favorably by TPI, while the obstructive component did not improve. We can postulate that TPI may be effective in improving chest wall mobility, as evidenced by the increased chest expansion of the subjects in the study, which would enable patients with a chronic lung disease to have larger FVCs. Increased chest mobility also probably would result in decreased RR because of the increased FVC. We eliminated the subjective breathing scale from consideration because in follow-up interviews it became apparent that some subjects did not understand the scale well enough to rate their own breathing difficulty reliably.

The subjects' personal comments reflected a variety of positive changes that occurred after treatment. Although the changes were rather specific from individual to individual, the responses were indicative of a general relaxation, decrease in anxiety, and decrease in tension.

CONCLUSION

Based on the results of our study, we conclude that TPI produces positive effects in patients with chronic lung disease. We postulate the mechanism of influence to be increased chest wall mobility, which favorably affects the restrictive component of chronic obstructive pulmonary disease. Therapists who desire to improve the functioning of their patients with respiratory problems should become familiar with this technique to provide their patients with a more complete rehabilitation program. We plan to continue research in this area, testing additional criterion measures, using a larger patient population, and using a more intensive treatment regimen.

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