

## 1955 Eleanor Clarke Slagle Lecture

# **Equipment Designed for Occupational Therapy**

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It is difficult to find words that would adequately express my feelings and appreciation for the honor which you have extended to me in electing me to present the first Eleanor Clarke Slagle lecture. With deep humility and profound professional pride, I thank you for this privilege.

Occupational therapy had its conception in the faith and convictions of our early founders. It developed as a profession because of strong beliefs. Eleanor Clarke Slagle, along with the men and women who shared her convictions, is responsible for our presence here today as the American Occupational Therapy Association. We have been given a wonderful professional heritage of courage and wisdom and as we continue to extend our hand to benefit mankind, may we continue to believe and search for further knowledge.

This knowledge, in our present age, can be secured by correlating and strengthening our beliefs with facts. Empirical methods should be tested when possible, and reasonable doubt should be eliminated. When we consider beliefs we find that they are formations of ideas. Most ideas are really very old. They are rediscovered and formulated and incorporated into one's philosophy and thinking. New ideas are rare, and in a lifetime few individuals are fortunate to accumulate them in even single numbers. In preparing this paper on equipment designed for occupational therapy, it is important to note that the ideas may be old. The newness lies in the formulation of the idea into equipment that has a purposeful use in occupational therapy. The keynote to good design of any type is simplicity that will afford real and effectual usefulness. The refinement of design, structure and engineering aspects of the equipment to be discussed were achieved by close cooperation and consultation with the Franklin Hospital Equipment Company and their staff of technical experts. Three pieces of equipment will be discussed in this paper:

- 1. Tilt table
- 2. Standing table
- 3. Bilateral tilt tables

The first two pieces of equipment you are no doubt familiar with. The tilt table and the standing table will be discussed briefly in relation to the design which has afforded broader usefulness in occupational therapy. The major portion of the lecture will be devoted to the thinking behind the design and use of the bilateral tilt tables, which are a new treatment concept.

### Tilt Table

In recent years we have been increasingly aware of the emphasis which the medical profession has placed on early weight bearing and ambulation. Man's physiological functions improve when he is in an upright position, and his mental attitude is often reflected in improved behavior. The physiological and psychological importance of the vertical position is equally important to all patients, ranging from the temporarily disabled to the permanently disabled.

The tilt table is familiar to you. It is a piece of equipment that permits the patient to be gradually elevated to the supported upright position with full weight bearing. Orthopedists have long reported the importance of weight bearing on the long bones of the body to prevent osteoporosis. Neurologists indicate the reinforcement of complex series of reflexes called postural reflexes which control muscle groups so that the upright position can be maintained. Hellebrandt and associates, in 1949, reported on the effects on the cardio-vascular respiratory systems and the action of the heart in preventing gravity shock when subjects were gradually brought from a horizontal to a semi-vertical position. As we go through the list of medical specialists, to name a few, the urologist, plastic surgeon, cardiol-

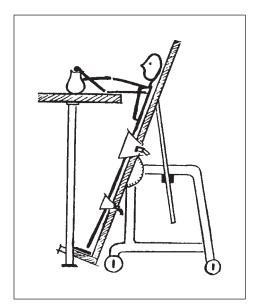


Figure 2.1. Tilt table—secures correct body positioning, frees upper extremities for treatment activities.

ogist, internist, we find further agreement as to the physiological improvement associated with the upright position.

Prescribed degrees of angulation and time are indicated by the physician in the use of the tilt table. The physical therapist reports increased time and angulation tolerance in the severely involved cases. When the patient has been stabilized at a particular angle and can work in that position using his upper extremities, he can be wheeled on the tilt table into occupational therapy. In cases that are routine, without precautionary factors, the patient can be started on the tilt table for the time prescribed by the physician. The availability of a tilt table with wheels which incorporates a secure lock device, and the attachment of suspension slings, broadens the uses of this piece of equipment and makes it valuable in occupational therapy.

Many patients who normally would not be referred for early treatment in occupational therapy can be started on programs of early specific exercise and self care. The effect upon the patient when he is employed in an activity instead of being a spectator is instantaneous. To name a few diagnoses which can benefit by the use of the tilt table in occupational therapy: quadriplegics, rheumatoid arthritics, muscular dystrophics, multiple sclerotics and cardiacs.

The tilt table permits the exercise of the upper extremities and the skeletal muscle from the waist up. This increases muscular activity, forces the blood through vertical channels, increases heart rate and metabolic processes. For the severely disabled patient, permanent or progressive, it provides psychological as well as physiological benefits in being changed from the supine to the supported upright position. Occupational therapists have long related the use of the full body support in treatment of children in the vertical position. The idea is not new; however, the design and mobility of the tilt table with its added accessories make it invaluable in broad usefulness in occupational therapy.

## **Standing Table**

The standing table is a natural piece of equipment which follows progressively the use of the tilt table in treatment. This particular standing table was designed to consider the following:

- Adjustable frontboard which extends from the mid portion of the rib cage to approximately two-thirds of the femur beyond the hip joint. This board acts as a support to the abdominal muscles and diaphragm when the pelvic support is adjusted. In the lower extremities it prevents and corrects flexion contractures due to muscle tightness or spasm;
- Adjustable elbow supports are provided for quadriplegic, ataxic and other patients who need support for anterior, posterior and lateral balance. These elbow supports are not for body weight bearing but for shoulder and shoulder girdle support;
- 3. The table is firmly bolted to the floor or a planked platform and affords structural security for the patient. A height of 46" from the floor is suggested;
- 4. The pelvic support is a heavy canvas binder with a leather strap end which snaps, with a double and nautical sail buckle, to one of three eyelets on the metal upright of the table. This support tilts and stabilizes the pelvis against the front board. When the feet

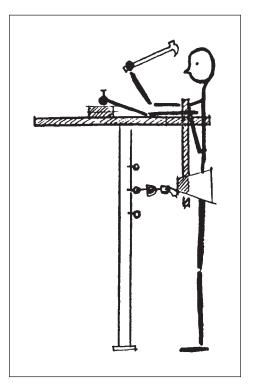


Figure 2.2. Standing table—frontboard, elbow supports and pelvic band aid in body positioning and stability when standing.

are spread to provide a broad base, this stabilization provides correct positioning and enables the patient to use his upper extremities freely.

The table has been used successfully with and without pelvic support. When the support is not used, anterior/posterior balance may be the prime objective. When there is a loss of one or more extremities or where a neuromuscular dysfunction exists, balance must be considered in body compensations. Brunnstrom's<sup>2</sup> article on "The Center of Gravity Line in Relation to the Ankle Joint in Erect Standing" is recommended reading on the subject of posture. Occupational therapists should be aware of the body mechanics involved in maintaining the upright position, as the stability or instability influences the usefulness of the upper extremities in purposeful activities in self care and vocational objectives.

#### **Bilateral Tilt Tables**

This piece of equipment is new in design and incorporates the use in exercise of unilateral, bilateral, reciprocal and alternate motions and considers the total body concept in treatment.

For centuries man has postulated on the relationship of mind and body, and sought answers in the study of the physical and psychic development of man. An awareness of the natural process of physical and mental growth has resulted in consideration of treatment of the total man rather than in single entities. This is further reflected in the term neuromuscular, which denotes the close integration of neurology and kinesiology. The exercise treatment of the isolated muscle has been challenged repeatedly as a physiological impossibility. More and more attention is being devoted to movements and patterns of movements.

In a new born baby, movements and patterns of movements are exhibited entirely by reflex. Ford<sup>3</sup> states that a number of these motor reactions are present in the first few months when they are not inhibited by cerebral function. When volitional activity develops the reflex reactions are obscured. These reactions may be elicited thereafter only in pathological conditions. The neurologists know that at birth the anatomical development of the nervous system is not complete. In 1950, Gesell<sup>4</sup> reported on "Tonic Neck Reflex and Symmetro-Tonic

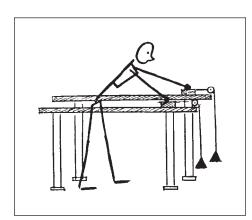


Figure 2.3. Bilateral tilt tables—alternate bilateral exercise, broad base.

Behavior." In his comment he states "In spite of his bilateral construction, man does not face the world on a frontal plane of symmetry. He generally confronts it on an angle." He also felt that the tonic neck reflex behavior reflected three important principles of development: principle of developmental direction, principle of functional asymmetry and the principle of reciprocal interweaving. Ontogenous organization does not move along evenly. Periodic fluctuation of dominance takes place.

In the period 1947–1950 and 1951, Hellebrandt and her associates reported on cross education as related to contralateral, homolateral,

ipsilateral effects of exercise. 5, 6, 7 Bilateral, unilateral, alternate and reciprocal exercises were studied to observe the functional capacity. The vast amount of work covered in these three papers cannot be condensed and they are references for further thought. For the purposes of this lecture, selected comments are brought in to illustrate the influence this work had on the design of the bilateral tilt tables. The therapeutic use of cross education was indicated and the validity of the single muscle test was questioned when considered as a criterion of functional capacity. In the study of bilateral, unilateral, alternate and reciprocal exercise, the effect of the exercise on the functional capacity of the weakened limb was noted. Contractile power and endurance was reportedly increased. The report of 1951 indicated the lack of justification of limiting treatment to the affected side. Hellebrandt referred to postural reflexes as reported by Magnus and Walshe. Reciprocal and alternate exercise and the influence of facilitating mechanisms were considered. In the subjects used for the study it was noted that some gave up because of psychological and not physiological reasons and the reverse was also true. The body will follow the dictates of the mind and the mind will follow the dictates of the body when it is fatigued, but the subject controls both and close observation was made to detect differences. In 1952, Levine and Kabat8 reported on the "Dynamics of Normal Voluntary Motion in Man." The concept that we must think of movement rather than isolated muscle activity was presented. Interdependence of distantly located muscles was stressed. Significant to the bilateral tilt tables was the report that inherent in all movements is the inclusion of the rotation of the trunk and pelvis. Levine and Kabat discussed the purpose of maximum achievement with importance of proprioception, patterns of movement and cocontractions in voluntary movement in man. Eberhard, Inman and Bresler, 1954,9 in the study on locomotion, report that muscles do not act in the traditional anatomical sense, they fit into the whole pattern of motion. In walking there is rotation of the trunk and pelvis and independent of this, rotation of the femur and tibia.

The premise for the functional design and use of the bilateral tilt tables evolved from the above readings and clinical observation of patients in occupational therapy and are listed as follows:

- 1. Reflex patterns of movement that are present at birth and are lost when voluntary activity takes over can be elicited in pathological conditions;
- 2. Functional asymmetric development is found in man and reciprocal correspondence or interweaving of opposite sides takes place;
- Contractile power and endurance of muscles could be increased by use of bilateral and unilateral alternate and reciprocal exercise, in prescribed rhythmic beat and maximum resistance;
- 4. Rotation of the trunk and pelvis are inherent in all movements;
- 5. In locomotion, muscles tend to fit into the whole pattern of motion rather than function in the traditional anatomical sense.

The tables were constructed to permit adequate space for standing or sitting. The tilt is provided by the telescoping mechanism on the forward portion of the tables which permits an angulation of 45°. A series of 21 adjustments permit the desired range of motion of the

extremities from  $0^{\circ}$  to over  $90^{\circ}$  starting from the horizontal position. Surface of the table is a plastic non-friction finish. Full width clamps slide together to wedge and hold project or work of the patient. Small end clamps with pulleys permit the occupational therapist to add resistance or assistance in particular movements. Attachments for a belt support are provided on the stable, upright posts. An audiovisual metronome can be used to establish the rate of speed at which the patient can work and to have a check on the amount of exercise accomplished.

The positions of the feet when standing are:

- 1. Standing, feet close together—small base;
- 2. Standing, feet spread—broad base;
- 3. Standing, one foot ahead of other in pace position.

Exercise patterns of the upper extremities:

- 1. Unilateral—pertaining to one side;
- 2. Bilateral—pertaining to both sides;
- 3. Alternate—complete pattern of movement on one side one or more times; complete pattern of movement on the opposite side, one or more times. Complete pattern of movement on both sides;
- 4. Reciprocal flow of exercise from one side to another in a continuous pattern of movement. Flow of continuous pattern of movement on one side.

#### Position of head:

- 1. Directed toward the involved extremity to reinforce extension pattern;
- 2. Directed away from the involved extremity to reinforce flexion pattern;
- 3. Head in mid position.

In occupational therapy many activities are bilateral and unilateral. In the use of these tables, woodworking, weaving and ceramics have been set up in the exercise patterns described above. Finger painting has also worked out successfully. The element of interest which is stimulated by the craft acts as a motivation for the patient to work and achieve and the sometimes inhibiting psychological factor is less apparent.

The audiovisual metronome was mentioned earlier. This instrument provides a sound

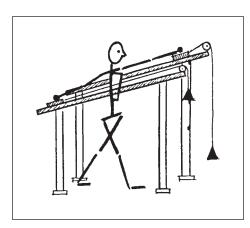


Figure 2.4. Bilateral tilt tables—reciprocal bilateral exercise, pace position.

beat and a simultaneous flash of light. To the patient who has extensive cerebral damage it is advisable to present as many stimuli as possible and this instrument can be used to present this stimulation. The eyes and ears are in this instance reached and the pattern of movement is established along with the stimulus. In all instances it can be used to establish the speed and endurance of a patient to a particular exercise; for example, the patient is set up at the bilateral tilt tables in a selected position, the metronome is set for 40 strokes a minute. If the exercise is unilateral, the 40 strokes would indicate the amount of exercise; if the exercise was bilateral, it would indicate

that 20 strokes for each extremity had been accomplished. By setting a timer the occupational therapist could be certain how much the patient had accomplished in exercise at the end of 1, 5 or 10 minutes or more. The metronome can often be used to set the exercise pace and through its use it is possible for the patient to maintain the established rhythm.

In preparing this paper, an attempt has been made to cover a vast amount of material which represents condensed thinking. The bilateral tilt tables and the premise on which they were designed are presented. The piece of equipment now needs testing in clinical application to remove reasonable doubt and provide facts in terms of its usefulness. It also needs further exploration as to its functional value in other than the physical disability field.

Some of the thoughts that were postulated when the bilateral tilt tables were completed, were as follows:

- Mentally Ill. Would the physical approach in calling into action the primitive pattern of
  movement be beneficial to the mentally ill patient?
   Would the audiovisual metronome assist in establishing early rhythmic patterns of
  movement in craft activities with varied tempo and duration?
- 2. Cardiac, Tuberculosis. Can improved work classifications result in timed, specific work output under supervision of the occupational therapist?
  Could vital capacity be improved through prescribed, closely observed, selected activities which would be closely timed and amount of exercise recorded?
- 3. *Prevocational Exploration.* Should testing be done in patterns of movements? Would it be possible to test motor fatigue and gauge sensory fatigue? Would minimum effort and maximum achievement result in analyzing patterns of movements in job demands?

As each selected field of occupational therapy seeks to improve its clinical application, it is earnestly hoped that more questions will be the result. Study of the vast amount of material that is available in the medical field will result in research that will bring answers and improved treatment techniques in occupational therapy. Our educational backgrounds provide us with a basic philosophy along with knowledge and skill to carry it out. Some occupational therapists have selected the psychiatric field, others the tuberculosis field and so on down the list of specialties. Their efforts in selected fields have increased their knowledge and skill in that field. However, it must be remembered that any knowledge or information in any specialty field is related to helping the human being. Our basic philosophy in occupational therapy embraces in treatment the physical and emotional makeup of the total person. With this thought in mind we are all occupational therapists first, reduced from our specialties by the common denominator, the human being who needs our help.

Early in this paper the beliefs of the pioneers in our profession were mentioned. Our profession is a stimulating and deeply satisfying one, which has grown because of our individual and united beliefs. It is sincerely hoped that this lecture will stimulate broad thinking and that indications of individual and group studies of professional importance will develop; that the growth of a national research laboratory in occupational therapy will result as in individual instances and as an organization, we continue to extend our hand to benefit mankind as we search for knowledge.

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