TABLE 2*

Position	cpm	%D
Anterior temporal region	R ——→ 4920 L ——→ 5086	L. 2.5
" frontal	R ——→ 4760 L ——→ 3618	Rt. 24
Midtemporal	R ——→ 5325 L ——→ 4108	" 22
Midtemporal (above ears)	R ——→ 5614 L ——→ 2916	" 48
Posterior temporal	R ——→ 3679 L ——→ 3147	" 15

* D.V. 3½ U.H. 814982 7-2-51.
Tracer: I^{131} 100/μc.
Counter: scintillation.

Interpretation: Extensive focus in right frontotemporal region. Craniotomy: Extensive cystic astrocytoma in right frontal and temporal lobes.

ported previously. Further data are needed to clearly substantiate this point.

If the high "uptake" of $(I^-)^{131}$ in tumor tissue is due to disruption of blood-brain-barrier (BBB), plus an abnormality of protein-binding in the tumor tissue, it would be reasonable to venture the hypothesis that $(I^-)^{131}$, being a negative ion, will readily penetrate through the disrupted BBB and be bound to "abnormal protein radicals" present in the tumor tissue. Since NaI* per se will supply more available $(I^-)^{131}$ than either DIF* or RIHSA*, the high difference of uptake seems to be reasonable.

The advantages of $(I^-)^{131}$ are: (1) economy, (2) ease of oral administration, and (3) adequate localization characteristics.

References

1. CHOU, S. N., *et al. Proc. Soc. Exptl. Biol. Med.*, **77**, 193 (1951).
2. MOORE, G. E., *et al. Radiology*, **55**, 334 (1950).
3. ———. *J. Neurosurg.*, **5**, 392 (1948).
4. MOORE, G. E. *Science*, **107**, 569 (1948).
5. KOHL, D. A., MOORE, G. E., and CHOU, S. N. *Nucleonics*, **9**, (1), 68 (1951).

Manuscript received August 27, 1951.

Mechanical Group Therapy[1]

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Therapeutic relaxation (TR) purports to be primarily a self-help treatment system. It can be used for individuals or groups, with or without a recording device. The treatment for all patients is the same. No effort is made to select those with a particular type of disease or disorder for this therapy. Some symptomatic improvement has been reported by most patients. TR can also be used prophylactically from the mental health standpoint.

This mental health program is recorded on reels of tape. Each daytime broadcast is divided into a half-hour discussion period and a half-hour treatment period. The 100 discussion periods are of four general types, which serve in part to give plausible explanations for the whys and wherefores of the treatment periods and the sleep program. The 20 daytime treatment periods are made up of a series of simple repetitive phrases (recitations) that have been recorded at a monopitch. The scanning, droning monotone is intended to create a soporific effect. The sleep program is comprised of these recitations only.

A reel of tape plays for 30 min. Each of the 20 reels is used for both the treatment periods and the sleep program, and each reel contains a different set of recitations. Each reel has its set of 8 recitations recorded on both sides of the tape. When one side of a reel has been played out, it is "pancaked" by a nurse or hospital aide. Thus, time is not lost in rewinding.

It is believed that two of the recitations—the first and the eighth—can be very important. For this reason, both appear on each of the 20 reels. Each lasts for 6 min as compared with 3 min for each of the intermediate six recitations. The first recitation is "I *can* rid myself of any symptoms, completely and in less than a minute." The eighth recitation is "I'm not *overly* dependent on medicines or doctors."

Periodically, the phrase "Pay attention, pay attention" is heard because the recitations used all through the night are also broadcast during the treatment periods of each forenoon and afternoon program. For the same reason the phrase "Mind a blank, relaxing more" appears from time to time.

The daytime program schedule is essentially as follows: Between 9:00 and 10:15 A.M., between 1:00 and 2:15 P.M., and between 4:00 and 4:30 P.M. This last half-hour is a "live" group therapy period and is held the first 4 workdays of each week. All other portions are transcribed and broadcast 7 days a week.

Sleep program. It is difficult in some ways to separate the night portion of TR from the remainder of the mental health program. I hasten to say that the benefits to be mentioned later are not to be ascribed to the sleep program alone. The sleep therapy component of TR was first used at the Aiea Heights Naval Hospital in June 1945. The opportunity for considerably more extended observations did not appear until five years later, when the sleep treatment study was renewed on the neuropsychiatric service at Kennedy Hospital in May 1950.

Recitations constitute the sleep program, which is broadcast 7 nights a week. Wires run from the tape recorder to a loudspeaker on each of the five wards of this neuropsychiatric service. The volume levels can be controlled independently from each adjacent nurse's office.

Because the sleep program reels are also used during the treatment periods in the daytime therapy ses-

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sions, each of the 20 reels begins: "Remember to get a checkup from your doctor every three months. Let the 1st of January, the 1st of April, the 1st of July, and the 1st of October remind you of your appointment." This is followed by: "Relaxing more, relaxing more, relaxing more, relaxing more." Then come the recitations themselves.

The sleep program begins at 10 P.M. and continues uninterruptedly through the night. Although the patients are roused at 6 A.M., the recordings are played for another hour thereafter. The recitations are continued during the hour from 6:00 to 7:00 A.M. for several reasons: (1) The patients receive one more hour of this kind of therapy than they otherwise would. (2) They are thereby given facilitated opportunity to apply one of the techniques (reciting) of TR while they arise, dress, and prepare their toilet. (3) It is believed that this first hour of their day may be an important one from a psychotherapeutic standpoint. (4) It is assumed that this annexation to the sleep program may serve a useful function in forming some sort of continuum which can link and influence the various states and degrees of consciousness in both sleep and wakefulness.

A good volume index to use is a level just distinctly audible to the patients farthest from the loudspeaker. The vocal pitch of the last two repetitions of the eighth recitation is dropped half a step. This lowering of one note can serve as a signal to the nurse or aide operating the tape recorder. It means that 30 sec remain before the reel should be "pancaked."

Clinical experience indicates that patients do not become dependent on the sleep program for sleep at night. This statement is based on informal questioning of those patients who return from week-end passes, and from information obtained after patients have been discharged from Kennedy Hospital.

Results. Most patients have reported gratifying results within 2–4 weeks after their admission to the NP service. Some have stated that they are able to take daytime naps for the first time in their lives. Others say sleep becomes less fitful and more refreshing. Terror dreams are reported as being replaced by more pleasant ones, and the frequency of dreams of all sorts is allegedly reduced.

Subjective and objective reports indicate a general decrease in the amount of awakening during the night. There is less arising to smoke, to pace about restlessly, and to void urine. Many patients seem to be successful in freeing themselves of symptoms through their independent use of recitations.

Disadvantages during inauguration. (1) The inauguration of TR at a facility is nearly always met with indignation and resentment by the patients. Their disordered thinking makes them highly incredulous as to its merits—of the sleep program especially. (2) Some nurse or aide nearly always points out to patients that the mechanics of the method are as ridiculous as the claims for it are preposterous. (3) Hospital administrators and trustees nearly always express grave concern that the reputation of the hospital may be placed in jeopardy. They take the position that the method is beguiling in its simplicity, iconoclastic in its theory, and unconventional in its practice. (4) The uninitiated medical staff members nearly always receive its inauguration with poorly concealed disrespect and skepticism. Its working principles are considered by them to be manifestly outmoded and historically ineffectual. (5) The latitude beween the success and failure of the clinical results appears to be narrow. Good results are in part contingent on rigorous adherence to the precise and exact execution of certain of its principles. The effective therapist must be positive, vigorous, and forceful in his support of such a program. Such a stand is untenable for those who feel constrained to give relentless emphasis to the importance of client-centered, nondirective, conflict-diluting, complex-resolving, and insight-promoting methods.

Advantages after establishment. (1) Clinical impression suggests that the average hospital stay is shorter than it might be without the sleep program. (2) There is a conspicuous decrease in the amount of medication prescribed *and requested.* (3) Insofar as has been determined, none of the results seems to be harmful. (4) The number of patients who can be treated in this way need be limited only by such physical factors as available beds, speakers, wiring, etc. (5) Reciting at bedtime is one of the principles of TR that the patients are encouraged to use after they leave Kennedy Hospital. It now seems quite certain that this procedure is one of those that can help to stave off recurrence of symptoms. (6) Because it is recorded, this type of therapy can be mechanically administered by anyone who can learn to operate a tape recorder. The related advantages to overburdened practitioners must be obvious.

Considerable thought has been given to a search for a suitable control group. To date, no satisfactory investigation has been devised for dividing the Kennedy patients into two matched groups, control and experimental.

Determination and evaluation of the factors that may contribute to the professed symptomatic benefits should include consideration of a therapist's interest in and influence upon his patients. Awareness that their doctor is doing something for them repeatedly makes many patients feel better. And TR is a sustaining type of program.

The first recitation almost always provokes expostulation. Here, again, the discussion periods attempt to clear up misunderstandings. For example, the point is repeatedly made that "I *can* rid myself of any symptoms, completely and in less than a minute" does not imply that incurable disease melts away before this ennobling incantation. Specific exceptions are given throughout the daytime portions of TR. Furthermore, numerous clinical observations and certain neurophysiologic considerations detract from the humorous regard with which that recitation is initially received.

When viewed through the eyes of the general

semanticist or in the light of the principle of negative feedback, more sobering possibilities loom on the horizon. It would appear that patterns of reverberating circuits constitute a singular manifestation of the behavior of the nervous system. A large segment of the philosophy of TR revolves about reiteration. Repetitiousness characterizes especially the sleep program and the treatment periods. Such perseveration may influence decisively those patterns that already are or can become clinically significant.

Manuscript received September 17, 1951.

Water of Crystallization in the Plant-Growth Regulator α-Naphthaleneacetic Acid and its Salts[1]

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α-Naphthaleneacetic acid or its sodium salt has been used extensively as a plant-growth regulator. Some laboratories, including our own (*1*), have used this growth substance as the standard of comparison in screening chemicals for growth-regulator activity. However, caution must be used where accurate knowledge of dosage is essential, since the sodium salt may vary in its content of biologically active chemical owing to water of crystallization.

Although the literature does not refer to the existence of water of crystallization for naphthaleneacetic acid or its salts, data reported here indicate that under normal humidity conditions the sodium salt may contain 4 molecules of water and the potassium salt 1 molecule of water, with the free α-naphthaleneacetic acid remaining anhydrous.

Varying degrees of hydration were observed in several lots of naphthaleneacetic acid and its potassium and sodium salts. Pure naphthaleneacetic acid appears to be free of water of crystallization. Drying at 100° C resulted in a weight loss of only 0.6%. Potassium naphthaleneacetate has 1 molecule of water of crystallization under Honolulu storage conditions. $C_{10}H_7CH_2COOK \cdot H_2O$ has a theoretical water content of 7.4%, whereas the one sample tested lost 7.6% on oven-drying.

Sodium naphthaleneacetate appears to have 4 molecules of water of crystallization under Honolulu storage conditions. $C_{10}H_7CH_2COONa \cdot 4H_2O$ has a theoretical water content of 25.7%. Five of 6 samples of this salt tested had a water content of this order of magnitude. The sixth sample contained approximately 3 molecules of water (found = 18.0–20.6; theory = 20.6%) but when placed in a humid environment (80% RH) immediately took up an additional molecule of water; a purified sample of the sodium salt already containing 4 molecules of water of crystallization as evidenced by a water content of 25.5% remained essentially unchanged in the humid atmosphere. Sample #6 was obtained from the Pineapple Research Institute Experiment Station in Wahiawa, Oahu, and apparently had been stored in a dry, hot warehouse, where some of the water of crystallization was driven off.

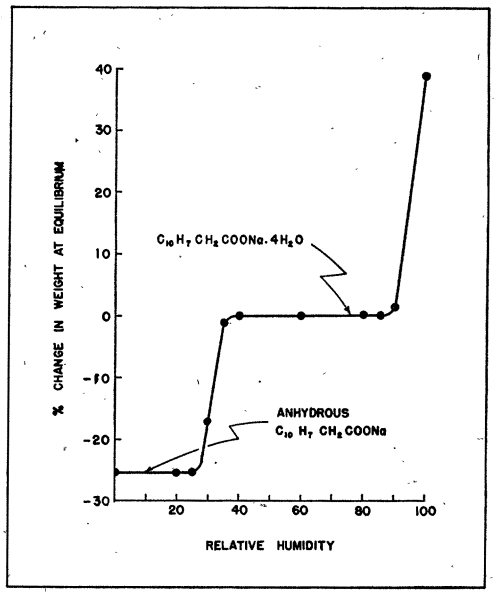

FIG. 1. Effect of relative humidity on gain or loss in weight of hydrated sodium α-naphthaleneacetate.

The effect of humidity on hydration of sodium naphthaleneacetate is shown in Fig. 1. One-gram samples of recrystallized salt containing 25.5% water (100° oven) were weighed into tared beakers and placed in desiccators containing water or 18, 23, 28, 38, 48, 51, 53, 56, 59, or 95% sulfuric acid. These desiccators thus represented relative humidities of 100, 90, 85, 80, 60, 40, 35, 30, 25, 20, and 0%, respectively (*2*). The samples were left in the desiccators for 6 days; all had reached equilibrium in 3 days except in the saturated atmosphere.

It is clear that hydrated sodium naphthaleneacetate readily loses water of crystallization, even at room temperature in an atmosphere of 25% relative humidity. This is in contrast to the potassium salt, which lost only 0.6% water after 3 days in a desiccator over 95% H_2SO_4, but which lost 7.6% of its weight as water after 1 day at 100° C. Both the potassium and sodium salts rehydrated to 1 and 4 molecules of water, respectively, when the anhydrous samples were again exposed to the open air.

The composition of sodium naphthaleneacetate remains constant over the humidity range of 35–90%, but when the humidity drops from 35 to 25%, all 4 molecules of water come off. This is significant, since in biological testing for plant-growth-regulator activity, the reported dose could be in error by over 25%, depending on whether the chemical was kept

[1] Published with the approval of the director as Technical Paper No. 193 of the Pineapple Research Institute of Hawaii. Acknowledgment is made of the technical assistance of Martha Kent and Laura Okubo.