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APPENDIX

STIMULUS SENTENCES SELECTED FROM THE CARROW ELICITED LANGUAGE INVENTORY

1. Both balls *are* bigger than hers.
2. The big green ball *is* mine
3. The girl *is* not happy where she lives.
4. That's not a baby, *is* it?
5. The boy *is* jumping because it's fun.
6. The dog *is* up in the tree.
7. The tree *is* between the houses.
8. The dog *is* under the house.
9. Whose puppy *is* black and white?
10. Those toys may have *been* mine.
11. The next house *is* the last.
12. Where *are* the dolls?
13. Bring me the car that *is* on the chair.

TECHNIQUES FOR INDUCING AND MANIPULATING LUCID DREAMS

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Summary.—In research conducted over several years and with over 200 subjects we have developed various techniques for inducing and manipulating lucid dreams. Lucidity can be achieved in the following ways: by practice in developing a critical-reflective frame of mind concerning one's state of consciousness, by intention and autosuggestion, and by methods involving apparatus. It is also possible to employ a variety of methods to retain lucidity while falling asleep and then to induce hypnagogic lucid dreams. In these methods one concentrates on visual phenomena, one's body, or one's own thinking ego. Intentional and suggestive acts while falling asleep not only help in inducing lucid dreams but also in manipulating their content. Various techniques of manipulation enable a lucid dreamer to influence while dreaming the events of the dream (within certain limits). The dreamer's desires, emotional state, looks, verbal utterances, and certain actions are all of importance. In addition, the dreamer can call upon the aid of other dream figures in manipulating lucid dreams.

This article describes various techniques for inducing and manipulating lucid dreams. The author has developed these techniques on the basis of a wide range of empirical data derived from experiments with more than 200 subjects, mainly students, on the findings of empirical studies carried out by seven colleagues as subject of their diploma theses, on case studies by a psychotherapist who has used lucid dream techniques in therapy with his patients, and on numerous reports of lucid-dream experiences sent to the author in reply to his publications and a radio broadcast. Altogether more than 1500 lucid dream reports by persons of different sexes, ages, and occupations have constituted the material on which the author has based his conclusions. Details of methods, results, and physiological as well as psychological interpretations of these results can be found in the primary literature, which also provides numerous examples of lucid-dream experiences.

Methods for inducing lucid dreams fall into two groups: those which enable one to achieve lucidity and those which enable one to retain it. The former help the dreamer to realize that he is dreaming; the latter make it possible for a person falling asleep to remain lucid concerning his state of consciousness and, in this manner, to induce a hypnagogic lucid dream. In general, such dreams differ in appearance only in the initial stage from other lucid dreams which arise primarily during REM-phases.

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TECHNIQUES FOR ACHIEVING LUCIDITY

The Reflection Technique

This technique rests on the following basic assumption. If a subject develops while awake a critical-reflective attitude toward his momentary state of consciousness by asking himself if he is dreaming or not, then this attitude can be transferred to the dream state. The unusual nature of dream experiences as a rule makes it possible for the subject to recognize that he is dreaming. The effect of the critical question concerning the state of consciousness on inducing lucid dreams is subject to three factors: frequency, temporal proximity, and similarity.

This means that to induce lucid dreams, the subject should ask himself the critical question (1) as frequently as possible, (2) as close to the point of actually falling asleep as possible, and (3) as often as possible in situations or conditions which bear a strong resemblance to dream experiences.

The factor of frequency is of primary importance for inducing the very first lucid dream. In the beginning the critical question should be asked at least five to ten times a day. The effectiveness of the factor of similarity is demonstrated by the fact that in the first lucid dreams the critical question is predominantly asked in situations in which it was asked during the day. The factor of temporal proximity is mainly of significance for experienced lucid dreamers who want to have lucid dreams on specific nights.

By applying the reflection technique the subject may become aware that he is dreaming, either after a period of doubt in which he asks himself the critical question ("am I dreaming or not?") or immediately because of an unusual experience, or sometimes for no apparent reason whatsoever. To answer the critical question (dream or wakeful state), the subject can rely on a number of criteria, none of which, however, are absolutely reliable (Tholey, 1980). Since dream experiences in the reflective phase (in which the subject asks the critical question) are as a rule less bizarre than in the preceding dream phase, it is important for the recognition of the dream state that the subject try to recollect the events immediately preceding the question. The subject is more likely in this manner to come upon unusual experiences than if he were merely to observe contemporary events. In addition, one often experiences discontinuity in memory in this process; these help the dreamer to realize that he is dreaming.

The Intention Technique

With this technique one resolves to achieve awareness of the dream state while actually dreaming. To do so, the subject should try as intensely as possible to imagine that he is in dream situations which would typically cause him to recognize that he is dreaming. Even better would be an attempt to carry out a simple action in the dream simultaneously. For example, one could fol-

low Don Juan's suggestion and observe one's own hands (Castaneda, 1972), which should be moved back and forth to avoid the danger of waking up. Resolving to carry out a particular activity not only makes it easier to recognize the dream state; it also prevents this awareness from being quickly lost again.

The intention technique is particularly suited for inducing a lucid dream during a specific period of time. It is especially effective when one awakens in the early morning hours. The intention technique agrees in some points with La Berge's 'mnemonic technique for the voluntary induction of lucid dreams' (MILD). We agree with Lewin (1926), however, that memory processes, especially mental associations, play only a subordinate role in intentional actions. Furthermore, we consider it to be too uncomfortable, after awakening in the early morning hours from a dream to engage "in 10 to 15 min. of reading or any other activity demanding full wakefulness" (La Berge, 1980, p. 1041). If one of the techniques described below for retaining lucidity has been mastered, it even makes sense to try to achieve the lucid dreaming stage immediately upon awakening from a dream.

The Autosuggestion Technique

In this technique the subject suggests to himself, if possible immediately before falling asleep and while in a relaxed state, that he is going to experience a lucid dream. A conscious effort of will must be avoided. The earliest references to an autosuggestive technique for inducing lucid dreams can be found in Juergens (1953). The effectiveness of suggestive formulas can be improved by employing special relaxation techniques. In our research we have found autogenous training to be a successful relaxation technique.

The Combined Technique

Our research has shown the reflection technique to be the most effective technique (among those described above) for inducing lucid dreams. This was especially evident in the case of subjects who had never previously experienced a lucid dream. In the following we will describe a combined technique which primarily stresses training in the development of a critical-reflective frame of mind, but which also contains elements of intention and suggestion:

(1) The subject should ask himself the critical question ("am I dreaming or not?") at least five to ten times a day.

(2) At the same time the subject should try to imagine intensely that he is in a dream state, that is, that everything he perceives, including his own body, is merely a dream.

(3) While asking himself the critical question the subject should concentrate not only on contemporary occurrences, but also on events which have already taken place. Does he come upon something unusual, or does he suffer from lapses of memory? A minute suffices to answer the question.

(4) The subject should ask himself the critical question as a rule in all situations which are characteristic for dreams, that is, whenever something surprising or improbable occurs or whenever he experiences powerful emotions.

(5) It is especially helpful in learning how to dream lucidly if the subject has dreams with a recurrent content. For example, if he frequently has feelings of fear or often sees dogs in his dreams, then he should ask himself the critical question concerning his state of consciousness whenever he finds himself in threatening situations or sees a dog in the daytime.

(6) If the subject often has dream experiences which never or very seldom occur in a waking state, such as floating or flying, then he should, while awake, try intensely to imagine that he is having such an experience, telling himself all the while that he is dreaming.

(7) If the subject has difficulty recalling his normal dreams, he should employ methods for improving dream recollection such as are described in recent literature on dreaming. In most cases, however, practice in attaining the critical-reflective frame of mind will improve the subject's ability to recall his dreams.

(8) The subject should go to sleep thinking that he is going to attain awareness of dreaming while in this state. Any conscious effort of will must be avoided while thinking this thought. This method is especially effective when the subject has just awakened in the early morning hours and has the feeling that he is about to fall asleep again.

(9) The subject should resolve to carry out a particular action while dreaming. Simple motions are sufficient.

On the basis of our findings we conjecture that whoever consistently follows the advice given can learn to dream lucidly. Subjects who have never previously experienced a lucid dream will have the first one after a median time of 4 to 5 wk., with great interindividual deviation. Under the most favorable circumstances the subject will experience his first lucid dream during the very first night, under unfavorable circumstances only after several months. Practice in attaining a critical-reflective frame of mind is only necessary in the beginning phase, which may last a number of months. Later on, lucid dreams will frequently occur even if the subject has not asked himself the critical question during the day. The frequency of lucid dreams then depends to a large extent on the will of the subject. Most subjects who consistently follow the above advice experience at least one lucid dream every night.

TECHNIQUES FOR RETAINING LUCIDITY

Techniques for retaining lucidity can most successfully be employed in the early morning hours, either immediately upon awakening from a dream or after a period of wakefulness. As far as the ability for learning these techniques

is concerned, great interindividual differences exist. Only those techniques that were successfully used by at least five normal subjects are described below. We may distinguish between various techniques depending on whether one concentrates while falling asleep on hypnagogic images, the body, or merely the thinking ego.

The Image Technique

In this technique the subject concentrates while falling asleep only on visual images. Although there are considerable differences among individuals, the following sequence of images has been frequently observed: Initially the subject sees flashes of light and rapidly changing geometric forms. Then come images of objects or faces, until finally complete sceneries are constructed which at first only flash in and out, but then later become more stabilized.

The phenomena described above are customarily of a fleeting nature and somewhat indistinct, so that considerable practice is necessary to follow them attentively. If it is possible to retain lucidity concerning the state of consciousness until entire sceneries appear, then the question arises as to how one should behave to enter into such a scenery. Experiments which have been conducted to clarify this point have demonstrated that it is not desirable to want actively to enter into the scenery, since such an intention as a rule causes the scenery to disappear.

Facial and bodily sensations in the borderline state between waking and sleeping are evidently still so responsive to peripheral stimuli that the phenomenal body cannot yet move as freely with respect to visual images as it can in normal dreams. Instead of actively wanting to enter into the scenery, the subject should attempt to let himself be carried into it passively.

It has also proved to be helpful if the subject firmly resolves before falling asleep to carry out a particular action while dreaming. Occasionally, when a subject has tried to attempt entering the lucid dream state in the manner described above, he momentarily loses lucidity. By recalling the intention to carry out an action, the subject is then able to regain lucidity.

The Body Technique

If the subject concentrates while falling asleep on his body, it often happens that the body begins to become immobile. Depending on the method by which the subject overcomes this immobility, we can distinguish between a one-body technique and a dual-body technique. We will first discuss the latter technique, since there are various references to it in esoteric literature.

The dual-body technique.—With the aid of this technique, which is comparable to so-called astral projection, it is possible to produce a variety of out-of-the-body experiences. The subject detaches himself from the immobile body by means of a second body, the 'astral body'. In contrast to esoteric views we should emphasize that we are discussing dream-like experiences and

not real processes. Contrary to the assumptions of the occultists, it is impossible to detach oneself from the physical organism. If this point is understood, then there is no need to worry about returning to one's body. Also, numerous detachment techniques can be employed which are not constrained by esoteric mythology. The only important thing is to imagine intensively that one has a second, moveable body with which one can float out of, fall out of (through the bed), twist out of, or in some other fashion detach oneself from the immobile body. After separation from the immobile body, the second body, which is initially 'airy' or 'etherial', solidifies until it appears to be completely identical to the usual waking body.

The one-body technique.—In our opinion the experience of a second body is an unnecessary assumption based on a naive epistemology. The one-body technique is simpler—one merely makes the immobile body (appear to be) moveable again. The subject attempts to imagine that he is in a different situation or in a different place from the physical body, which is sleeping in the bed. It is relatively easy to bring about this experience because one receives in this state hardly any sensory information concerning the physical world. If the subject actually does experience that his body is no longer in the bed, then its immobility disappears after a short time. Another method to make the immobile body moveable again consists in (apparently) dissolving it into an 'airy' form and then solidifying it to a moveable body.

The state of immobility is not a necessary intermediate stage in body technique. Experienced lucid dreamers are able to apply the varieties of this technique described above before the body falls into a state of immobility—which is often considered to be an unpleasant occurrence. One gradually attains an unerring feeling for the best time to realize the transition between waking and sleeping as described above. When applying the body technique the surroundings at first appear dark; they become lighter when one moves further away from the initial location.

The Image-Body Technique

In this technique, the subject concentrates not only on the visual images but also equally strongly on his own body. If the subject suggests to himself in a relaxed state that his own body is light and can move freely, then it can occur that his phenomenal body begins to move. It seems to glide into the dream scenery or even to drive or ride into it, if an appropriate vehicle is imagined. The body is most likely to enter a gliding state if previously an impression of unified motion was apparent in the visual field, as is frequently observed during the process of falling asleep. In the initial stage the subject observes a moving pattern of dots; later, when a scenery is established, he sees, e.g., a wandering herd of sheep, a passing flock of birds, or something similar. If the visual field is filled in this manner with uniformly moving objects, then the

motion of the objects can change into a motion by the body in the opposite direction, so that the objects now either stand still or move with a reduced velocity. Experienced subjects can intentionally influence the movement of the body within certain limits by controlling the direction of their glances. The gliding state sometimes ends with a rapid change of scene. One seems to be put into a dream scenery in which one can freely move, similar to the feeling in the method mentioned above. For a psycho-physiological explanation of these phenomena see Tholey (1981).

The Ego-point Technique

This technique is based on the assumption that the experiencing of one's own body in a dream is merely a phenomenon transferred from the waking state and is essentially expendable. In fact it is possible to imagine after falling asleep that one consists merely of an ego-point from which one perceives and thinks in the dream world. To bring about this experience it is necessary to concentrate while falling asleep on the thought that the body will soon no longer be perceived. As soon as this state is reached, it is possible to float freely as an ego-point in a space which seems to be identical with the room in which one went to sleep.

The Image-Ego-point Technique

This technique differs from the preceding one only in that the subject also concentrates on the images seen while falling asleep. If a visual dream scenery has become established, then it is possible to travel into this scenery. The ego-point can under certain circumstances enter into the body of another dream figure and take over its 'motor system'.

Although all the details and varieties of techniques for retaining lucidity cannot be described here, it is hoped that these references will suffice. Above all, it is important initially to collect a wide range of one's own experiences of falling asleep, to discover which of the varieties described above are most suitable. The techniques for retaining lucidity require at the outset considerable practice, but they have the great advantage of enabling one to induce lucid dreams at self-appointed times, thus considerably increasing their frequency.

Sometimes the achievement of the lucid dreaming stage can be prevented by a 'false remaining-awake', which is comparable to a 'false awakening'. For example, the subject feels that he cannot go to sleep and then for some reason gets up out of bed. Later (after awakening) he discovers that he was already dreaming.

ADDITIONAL TECHNIQUES

In our research work the process of learning to dream lucidly can be accelerated by methods involving apparatus. Lucid dreams were also induced by acoustic and tactile signals transmitted to subjects while falling asleep (Stich.

1981) or while sleeping (Kern, 1982; Reis, 1983; Scholz, 1983). Methods using apparatus served primarily to acquaint unexperienced subjects with their first experiences of a lucid dream. They are, however, in principle dispensable and should also not be used without due consideration, because they imply a foreign intrusion into a person's dream life. We hold a similar attitude with regard to posthypnotic treatment (see Tart, 1979) as a means of inducing lucid dreams.

Numerous subjects reported that in their dreams other dream figures had voiced their opinion on the state of consciousness of the dreamer. Some of these figures tried to convince the dreamer that he was awake, others that he was dreaming. The latter case gave the author the idea of willfully allowing a certain dream figure to aid him in attaining lucidity. The figure concerned is one he meets frequently in his dreams and whom he can call up in his lucid dreams. During a lucid dream he agreed with this figure to meet him in his next dream and tell him that he was dreaming. This then actually happened. To what extent the author's procedure can be used by other lucid dreamers in calling upon dream figures to induce lucid dreams is at present still being studied.

TECHNIQUES FOR MANIPULATION OF LUCID DREAMS

Manipulation Prior to Sleep by Means of Intention and Autosuggestion

Just as lucid dreams can be induced by means of appropriate intentions or autosuggestive formulas, so can their contents be influenced (within certain limits). This fact has proved helpful mainly in applying lucid dreams in the field of psychotherapy. Patients who went to sleep with the intention of learning something about their psychological problems through lucid dreaming were indeed confronted with their conflicts while in a lucid state. This confrontation often led to important insights toward the resolution of their problems. These insights were either directly expressed by dream figures or were indirectly obtained through an interpretation of the events of the dream.

Manipulation by Wishing

In the course of our research experienced lucid dreamers succeeded in altering a dream scenery by simply wishing it so. They were able to change the environment of a dream or even their own person, as well as being able to transport themselves to other locations in space or time. The dreamers could never be sure, however, whether, when, and in what manner their wishes would be fulfilled. If desired changes in dream events did occur, these were felt to be independent of and not immediately affected by the act of wishing. The wish-oriented manipulation of the scenery of a lucid dream was accordingly completely different from the wishful influencing of images in so-called day-dreams.

The easiest wishes to fulfill in a lucid dream are those that do not require any miracles. For example, subjects who wanted to meet a particular person in a lucid dream were only rarely successful if they simply tried to conjure the person up. On the other hand, they often had success when they called the person in question or when they went to a particular locale where they wished to meet this person. Similarly, it was easier to get high in a lucid dream if one used drugs (in the dream) for this purpose than if one simply wished to get high without any assistance.

Manipulation by Inner State

The environment of a dream is strongly conditioned by the inner state of the dreamer. It has been shown that the scenery of a dream, and in particular the appearance and behavior of other dream figures, depend to a great degree on the emotional attitude of the dreamer. If the dreamer courageously faced up to a threatening figure, its threatening nature in general gradually diminished and the figure itself often began to shrink. If the dreamer on the other hand allowed himself to be filled with fear, the threatening nature of the dream figure increased and the figure itself began to grow. The manipulation of dream content by means of inner emotional state has been successfully employed in the elimination of unpleasant dreams (Falt-Schriever, 1981).

Manipulation by Means of Looking

Appropriate control of the direction of looking can end, prolong, or alter lucid dreams. Fixation on a stationary point in the dream environment causes the dreamer to awaken after 4 to 12 sec. In this process the fixation point begins to blur, and the entire dream scenery commences to dissolve. Experienced subjects can use this stage of dissolution to form the dream environment according to their own wishes. Reestablishing the dream by means of rapid eye movements can prevent awakening.

In previous work the author (1977) has tried to arrive at a psychophysiological explanation for the fact that fixation leads to awakening. He considered two different hypotheses: (1) that the awakening was conditioned by the lack of motion of the eyes; and (2) that the awakening was brought about by the physiological process of saturation of the central nervous system. Recent results rather tend to support the second hypothesis (Tholey, 1981).

There is yet another way to use looks in a dream: if hostile dream figures are looked directly in the eye, they are robbed of their threatening nature. The method of pacifying hostile dream figures by looking at them, however, ran into difficulties. For one reason, it was impossible to look too long in one direction without awakening; for the second reason, the dream figures tried to avoid the look in various ways. Several subjects reported that hostile dream

figures were able to escape the look of the dreamer by jerking their heads, by putting on a cowl, or by attacking the dreamer from the rear.

Manipulation by Means of Verbal Utterances

One can considerably influence the appearance and behavior of dream figures by addressing them in an appropriate manner. The simple question "Who are you?" brought about a noticeable change in the dream figures so addressed. Figures of strangers have changed in this manner into familiar individuals. Evidently the inner readiness to learn something about oneself and one's situation by carrying on a conversation with a dream figure enables one to expose disfigurements (in the psychoanalytic sense) and to achieve in this fashion the highest level of lucidity in the dream: lucidity as to what the dream symbolizes.

We consider conversations with other dream figures to be some of the most interesting and also most therapeutically effective experiences in lucid dreaming. Violent encounters with other dream figures, as advocated, for example, by Faraday (1975), are on the basis of our experimental findings neither necessary nor effective (Tholey, 1982).

Manipulation with Certain Actions

Our research subjects developed a number of techniques (much like ritual actions) to elicit extraordinary experiences such as out-of-the-body-experiences, dreams of flying or being high, time travel, etc., in their lucid dreams. Since these techniques often differed greatly from person to person, it may be assumed that suggestive elements were important in producing such experiences. On the other hand, several common techniques were also developed; for instance, most of the subjects used a leap from a great height as the most effective technique for producing experiences of flying or floating.

Manipulation with Assistance of Other Dream Figures

In their lucid dreams several subjects sought the assistance of other dream figures in bringing about certain experiences. For instance, a female student was taught to fly by a ghost, and a male student used a dream hypnotist to achieve an ecstatic experience. Other subjects had themselves metamorphized or transported to other places by magicians. It should be mentioned at this point that the author achieved lucidity with the assistance of another dream figure.

At the moment, we find the extraordinary achievements of the dream figures to be most puzzling. We have developed a number of subtle experimental procedures to test their abilities. Our results up to now have shown that some dream figures behave as if they possessed their own perceptual perspectives, cognitive abilities (thought and memory) and even their own motivation (Krist, 1981).

Limits of Manipulation

Although the subjects in the course of their training became more able to control intentionally their lucid dreams, they were nevertheless unable to form them exactly according to their desires. There are presumably several physiological as well as psychological reasons for this. It has been known since the beginning of empirical dream research that peripheral physiological processes exercise an influence on the content of dreams. The author has found that these influences are especially strong in hypnagogic lucid dreams. For example, various movement phenomena in these dreams are related to certain retinal processes (Tholey, 1981). Presumably central nervous system processes which are removed from intentional control have an influence on dream life. In our view, for instance, the fact that eye fixation causes the dream panorama to dissolve is attributable to saturation processes in the central nervous system.

The fact that it is impossible in a lucid dream to brighten the dream panorama by 'switch on an electric light' (as described by Hearne, 1982) presumably also has some physiological cause. Hearne tries to explain this by positing a varying ceiling-level of imagery 'brightness'. Hearne's findings agree completely with ours. In our research with 8 normal subjects it was mainly the subjects who used a body technique to induce a lucid dream who tried to illuminate a dark dream scenery by switching on a light. In not a single case was a sudden, strong brightening observed. It was possible, however, gradually to illuminate the scenery by using, e.g., a flashlight with variable intensity or by slowly approaching a distant light source. These findings show that the level of brightness in a dream panorama can indeed be increased by an exercise of will, but that physiological reasons prohibit a sudden increase in brightness.

The psychological causes that make it difficult to influence willfully lucid dreams can be separated into cognitive and affective factors. Cognitive reasons were presumably responsible for the fact that inexperienced subjects found it difficult to experience something widely contrary to their experiences in the real world. With practice, however, it was possible to exclude essentially the effect of such factors. Their influence is also not as powerful as that of the physiological factors mentioned earlier. This is supported by the finding that it was not possible in a lucid dream to raise the brightness level suddenly by switching on a light, although this should certainly be expected from experiences while awake.

A much stronger influence than that of the cognitive factors is exercised by certain autonomous affective factors which are essentially beyond intentional control. Being hindered in various ways from carrying out certain activities in lucid dreams was frequently experienced. Subjects especially encountered obstacles when they wanted to perform acts which were socially taboo, or when they wanted to go to a place in a period of time (usually much

earlier) where they could learn something about themselves. The dreamers sometimes found their way barred by dream figures who used threats or physical violence to cause them to give up their quest. In other cases invisible forces blocked the path.

From a psychoanalytical point of view one could interpret the threatening dream figures and invisible forces as defense or resistance. Our research to date has shown that such phenomena do indeed represent inner emotional conflicts and that appropriate contact with dream figures can contribute to the resolution of the conflicts (Tholey, 1981, 1982; Tholey & Krist, in press). Much more extensive experimental research is necessary to clarify this point.

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VISUAL EXPLORATORY ACTIVITY OF HEMIPLEGIC PATIENTS VIEWING THE MOTOR-FREE VISUAL PERCEPTION TEST¹

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Summary.—Eye movements of adult hemiplegics (11 right- and 9 left-brain-damaged patients) and 11 nonimpaired controls were recorded as they viewed selected cards of the Motor-free Visual Perception Test. The major finding was that neither group of patients exhibited an asymmetry of visual exploration (unilateral visual neglect) as they viewed the cards. Their scanning strategies were, however, unsystematic and irregular. In addition, both groups of patients scanned the cards longer and made more errors than controls. Use of the Motor-free Visual Perception Test as an appropriate measure for the general assessment of visual-perceptual processing abilities of adult brain-damaged patients who lack severe clinical manifestations of neglect is discussed.

Patients with acquired brain damage (i.e., hemiplegia) frequently exhibit visual-perceptual deficits which result from a combination of anatomical and functional losses. Unilateral visual neglect is seen by some researchers as the primary deficit underlying perceptual problems in hemiplegics, especially those with right-brain damage (Weinberg, Diller, Gordon, Gerstman, Lieberman, Lakin, Hodges, & Ezrachi, 1977). This syndrome is characterized by the lack of exploration of stimuli on the side opposite the patient's lesion and is manifest in behaviors such as ignoring people, utensils, and furnishings on one side of space, responding to one side of a picture or a printed page, or the non-utilization and even denial in some cases of half of the body.

Neglect is one of the most frequent and disabling deficits exhibited by hemiplegics. If the visual-perceptual problems of the brain-damaged patient are to be completely and adequately diagnosed and correctly managed, assessment techniques must be able to identify and rule out deficits in test performance resulting from neglect from those due to specific perceptual disorders. This task is made difficult because the incidence and severity of neglect in brain-damaged patients are a function of the type of task and performance required of them (Colombo, DeRenzi, & Faglioni, 1976; Cremonini, DeRenzi, & Faglioni, 1980; DeRenzi, Faglioni, Previdi, Sorgato, & Vescovini, 1981). Arena and Gainotti (1978) note that some researchers have used complex tasks designed to obtain measures of general intelligence to study visual-perceptual disabilities of brain-damaged patients. These authors point out that

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INSULIN, EXERCISE, AND DIETARY EFFECTS UPON BEHAVIORAL THERMOREGULATION IN ALBINO RATS^{1,2}

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Summary.—The objectives of this exploratory research were to assess the effects of insulin preparations (Humulin-regular and NPH) on operant behavior reinforced by schedules of microwave radiation in a cold environment and to measure changes in this thermoregulatory behavior as a function of exercise and food deprivation. Eight albino rats were conditioned to regulate their thermal environment with 6-sec. exposures of microwave (MW) radiation (SAR = 0.34 Watts/kg/(mW/cm²) under FR-1 and FR-10 schedules. Regular-insulin and NPH-insulin sessions were administered alternately with saline-control sessions for 8-hr. durations. Exercise in an activity wheel and 48 hr. of food deprivation (diet) were additional independent variables used to alter thermoregulation. Three randomized-block analysis of variance designs with repeated measures showed that insulin preparations resulted in a *suppression* of operant responding for heat, yet food deprivation *increased* rates of microwave responding. These data are interpreted in terms of functional relationships between ambient temperature changes, core body temperature, blood glucose fluctuations, and operant behavior.

Effective treatment of diabetes mellitus involves a "delicate balance" between diet, exercise, and stress management (Grant, 1988). Changes of the body's overt responses to heat and cold, however, have not received a great deal of attention in the light of insulin injections aimed at controlling blood glucose. According to Berne and Fagius (1986), "during insulin-induced hypoglycemia, sweating, changes of cutaneous blood flow, and reduction of body temperature occur, strongly suggesting activation of sympathetic mechanisms for thermoregulation" (p. 855).

Behavioral effects of insulin preparations and doses have been studied in rats and in squirrel monkeys in operant conditioning situations by Vitulli (1971) and by Vitulli, Phillips, and McCrory (1972). These studies utilized a variety of sucrose concentrations as food reinforcers. Functional relationships between insulin doses and preparations on the one hand, and rate of operant behavior on the other were observed in both rats and squirrel monkeys.

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