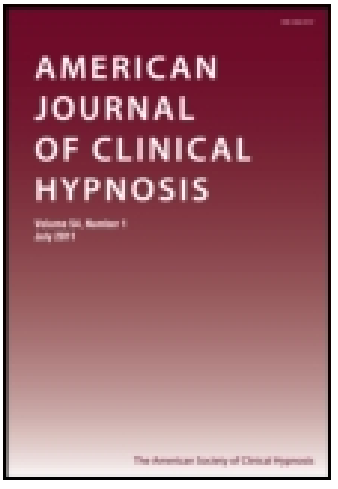

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Cardiological Applications of the Control of the Autonomic Nervous System by Hypnosis[1]

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The use of hypnosis in the treatment of various arrhythmias and in cardiac catheterisation is discussed and illustrated with case histories. Research in this area is also briefly discussed.

The visceral activities of man are regulated to a large extent by the Autonomic Nervous System (A.N.S.). These functions are essential to life, and at the same time are unconscious and involuntary. Why nature divorced the vegetative functions from volition is not known. It is reasonable to accept that the mind, being occupied with the discriminative and aesthetic activities of life, could not very well turn aside to regulate the heart beat. Claude Bernard, writing on this subject said "Nature thought it prudent to remove these important phenomena from the caprice of an ignorant will."

The functions of the A.N.S. can be studied by the use of drugs which mimic its action or which selectively block its effects. It is also possible to influence the activity of the A.N.S. by means of hypnosis. The anatomy of the A.N.S. has been described (Best and Taylor, 1955); and it is relevant to note that these anatomical parts are functionally linked, not only to each other, but also to the rest of the nervous system. The heart receives a rich supply of sympathetic and parasympathetic fibers and their action, together with the circulating humoral agents, is interrelated to give the existing "tone" of the heart at any one time which can be expressed by the various measures of rate, rhythmicity, and contractility.

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ARRHYTHMIAS

The first cardiological application of the effects that can be achieved by suggestions given in the hypnotic state is in the field of arrhythmias.

Ventricular Ectopic Beats

Avicenna, in the tenth century, made one of the earliest observations of emotionally induced tachycardia (Whitehall 1936), and it is well accepted in this 20th century that the heart is particularly susceptible to emotional stimuli. Palpitations are commonly attributed to increased awareness of the heart, to sensations produced by sinus tachycardia, or to increased stroke volume; but in a significant number of cases a cardiac arrhythmia is present at the time of the palpitation. Ectopic rhythms in normal hearts as well as in those with structural disease may be psychogenic in origin. Arrhythmias associated with psychosomatic disorders result from the interaction of many factors. Emotional stimuli from the central nervous system affect both the sympathetic and para-

sympathetic systems and the endocrine glands. That exogenous epinephrine gives the same effect as endogenously released epinephrine or nor-epinephrine under circumstances of acute anxiety confirms the importance of the endocrine system. It is generally agreed that there is rarely a healthy individual who has never exhibited premature systoles (Dreifus and Wanatabe, 1965). Although an acute stress is frequently the final precipitating factor in the ectopic beats in these normal hearts, there is often an underlying (and often unrecognized) chronic stress state, or possibly other well accepted factors such as nicotine, caffeine, etc. Patients with cardiac abnormalities are more vulnerable to the development of an arrhythmia when the above outlined factors are operative.

Hypnosis can be used to control or prevent the occurrence of ventricular ectopic beats (V.E.B.) in normal subjects.

Case histories

A 16 year old, asymptomatic, healthy male was referred because of frequent V.E.B. These had been known to be present for 4 years, and, in the months prior to being seen, an electrocardiograph (E.C.G.) on two occasions (when trying for entrance to the Navy and then the Army) had confirmed their presence. There was no subject awareness of this arrhythmia. Figure 1A shows a typical strip of E.C.G. taken at rest and after exercise. He had received no specific drug therapy for the condition but had stopped drinking tea and coffee. He did not smoke and took no alcohol. This patient readily entered a deep trance in hypnosis as shown by his ability to have positive and negative hallucinations and to age regress. Suggestions of relaxation and ability to cope were given, as well as ones aimed at removing feelings of inadequacy and inferiority. This gave him complete freedom from the ectopic beats (Figure 1B) which have not recurred during a follow up period of 3 years.

Three similar cases have also been treated. All were under the age of 26 years and two were females. One presented with palpitation due to V.E.B. and was treated as above with the same result. The other two had a psychosomatic problem for which they were receiving hypnotherapy (one with asthma of recent onset and the other with long-standing neurodermatitis). Both these patients were medium trance subjects (Cooke and van Vogt, 1956), and the V.E.B. settled completely during the treatment of the other condition.

Sinus Tachycardia

Sinus tachycardia (normal sinus rhythm with a resting rate of 100 beats per minute or more) can occur as part of a chronic anxiety state and, if persistent, can raise the possibility of an underlying disease such as thyrotoxicosis. Eight such patients have been treated after an organic cause had been excluded. Suggestions of relaxation, and tranquillity of the body and heart were given. Visual imagery and ideomotor responses were also employed. In each patient the pulse rate slowed during the hypnotic session. That the heart rate may slow during hypnosis is well recognized, but there are conflicting reports as to the ability to alter the rate by direct suggestion. (Crasilneck and Hall, 1959). A possible explanation for the response in the above patients (other than the direct results of suggestion) is the release from the anxiety state afforded by the hypnotic trance, with the sustained improvement in the heart rate in the post hypnotic period as a direct result of the positive effects of treatment for the underlying psychological problems.

Paroxysmal Atrial Tachycardia

Other arrhythmias, such as paroxysmal atrial or nodal tachycardia and atrial

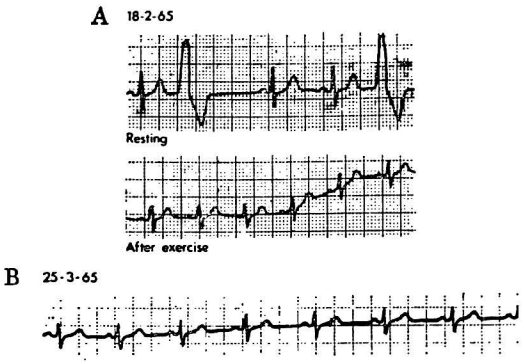

FIG. 1. Typical E.C.G. of a 16 year old male before (A) and after (B) hypnotic treatment.

fibrillation with or without underlying structural heart disease, may cause significant symptoms in the patient and be more of a worry to the physician. These can be precipitated or aggravated by emotional states or periods of tension. Strong, unexpressed emotions prior to exacerbations of atrial arrhythmias in adults may be present. These strong emotions included long-standing anxiety, hostility, sensitivity to criticism and inability to alter compulsive patterns (Duncan *et al.*, 1950). Kenzler (1963) reported details of a patient who had a severe attack of true paroxysmal tachycardia resistant to various methods of increasing vagal tone and also to drugs. Under hypnosis a normal heart rhythm was established by direct suggestion.

Case histories

Three patients, all females, age range 22–35, with paroxysmal atrial tachycardia (P.A.T.) have received hypnotherapy for the frequent attacks experienced. In one of these patients the attack was always preceded by a recognizable emotional stress. Her response to treatment was immediate and excellent. It is of interest that only a light trance was obtained, and the suggestions given were those of relaxation aimed at helping the patient cope with the various life situations. The second patient showed some improvement as indicated by the decrease in frequency of the attacks of P.A.T. from several times weekly to once every 10–12 weeks. Although the third patient went into a deep trance, no change in the frequency of the attacks of P.A.T. resulted.

Paroxysmal Ventricular Tachycardia

Paroxysmal ventricular tachycardia (P.V.T.), in the absence of underlying heart disease, is a rare form of arrhythmia. A case of P.V.T. in an eleven year old boy with psychiatric and physiologic aspects has been described in detail (Rahe and Christ, 1966). There was only moderate response to medical management. It was shown that feelings of impatience, frustration and annoyance were associated with ventricular tachycardia and that post-exercise periods, achievement and contentedness were associated with normal sinus rhythm.

Case history

A 35 year old male with a 10-year history of palpitation was referred to the Cardiac unit at Royal Prince Alfred Hospital in May, 1964. The first attack came during physical exertion (felling a tree) and exertion continued to be a common precipitating factor in these attacks. During the two years before he was referred, these attacks were more frequent and more easily precipitated. At the time he first presented, he was unable to work, being completely incapacitated by the arrhythmia. The attacks of rapid irregular heart action were associated with retrosternal tightness, breathlessness and faintness. During the periods of normal rhythm he felt marked lethargy and fatigue. The attacks, as well as being brought on by exertion (contrasting with the case report of Rahe and Christ), were also precipitated by excitement and emotion. He was emotionally

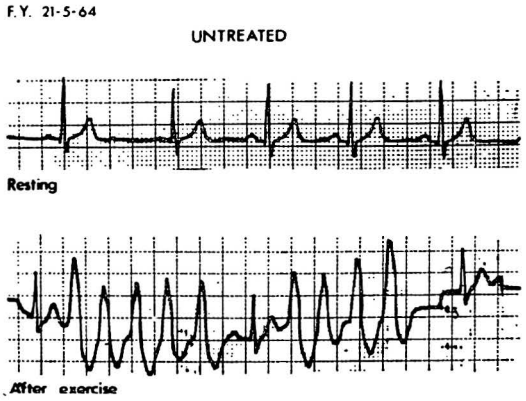

FIG. 2. Typical E.C.G. of a 35 year old male (F.Y.) with a history of paroxysmal ventricular tachycardia (untreated).

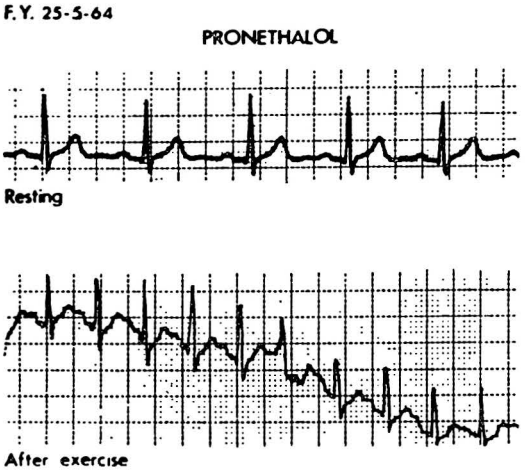

FIG. 3. Typical E.C.G. of F.Y. during pronethalol treatment (see text).

immature and over-reacted to stress situations. He also gave a 3 year history of occasional acute attacks of gouty arthritis. Physical examination revealed no abnormality—being normotensive with a normal cardio-vascular system apart from the arrhythmia, which was demonstrated to be paroxysmal ventricular tachycardia. Figure 2 shows the E.C.G. at rest with a wandering pace maker, and demonstrates the arrhythmia brought on by minimal exercise. Drug therapy up to that time included quinidine and sedatives, and the only change was a progressive increase in the frequency of the attacks.

He was given a beta adrenergic blocking drug (parenterally), which prevented the arrhythmia being precipitated by exercise. Figure 3 shows the E.C.G. at rest and after exercise following an injection of pronethalol. This drug was continued orally, and it effectively controlled the ventricular tachycardia thus allowing the patient to return to full activities. After 6 months treatment, the drug was stopped with a return of the arrhythmia within 24 hours. An earlier attempt had been made to stop the pronethalol and substitute reserpine without success. Full details and discussion of this case to this point have been presented elsewhere (Taylor and Halliday, 1965).

He was then hypnotized for the first time, readily going into a deep trance. Suggestions as set out above under the treatment of other arrhythmias were given. Following the first session, he was obviously more relaxed and tranquil. Initially he had daily sessions (as an in-patient) followed by weekly and then fortnightly sessions. During the treatment a great deal of hostility and insecurity were uncovered, as well as much repressed anxiety.

From the commencement of hypnother-

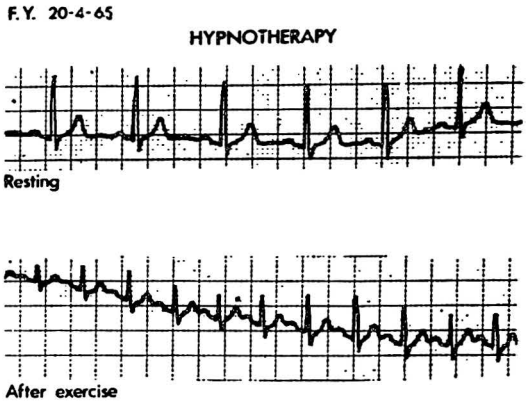

FIG. 4. Typical E. C. G. of F.Y during hypnotherapy (see text).

apy the arrhythmia, which had fully returned after the cessation of drug therapy, did not recur apart from a few sporadic short-lived attacks. Figure 4 shows the normal E.C.G. at rest and after severe exertion (running up 7 flights of stairs). Follow up has been for three years, during which time he has remained fully employed apart from a period off work following extensive injuries in a motor accident. There have been mild recurrences of the arrhythmia of short duration with no symptoms apart from palpitation. He received no hypnotherapy after the first 6 months.

Research

A second application of the use of hypnosis in cardiology is in the field of research. To illustrate, an experiment dealing with exercise will be described. It is well known that muscular exercise has a complex action on bodily function, especially on the cardio-vascular system. There are both physico-chemical and neurogenic effects, the latter, for the most part mediated via the A.N.S. In assessing myocardial function and the influence of exercise thereon, it would be helpful to be able to separate the nervous component from the physico-chemical.

Pharmacologically, it is possible to isolate the heart from its autonomic stimuli by means of specific blocking drugs (Jose and Collison), and thus to look at the remaining physico-chemical effects of exercise on circulation. By means of hypnosis, it is possible to look at the autonomic effects of exercise on the heart and circulation in the absence of physico-chemical stimuli.

Method

Two healthy young adult *S*s able to go into a deep trance (spontaneous amnesia, positive and negative hallucinations) at a given signal took part in this study. Intraarterial needle (in the brachial artery) and intravenous polythene tube (in the right atrium) were put in place under hypno-anesthesia, thus enabling arterial and central venous pressures to be monitored (by pressure transducer), and cardiac output to be measured (indocyanine green dye dilution). Respiratory function studies including the measurement of oxygen consumption were also carried out. While fully conscious (*i.e.*, not hypnotised), measurements of the various parameters were made at rest and during exercise (leg raising). Following a rest period of 20 minutes at the completion of the exericse, the *S* was put into a deep trance and the resting (while hypnotised) measurements were again made. Then, during age regression, the *S* relived the recent period of exercise while still lying at rest. A further series of measurements were made during this period of simulated exercise. Finally, while still hypnotised, measurements were made during rest and actual exercise. Sweating, cutaneous flushing, and facial movements, which were associated with the actual period of exercise, were also present to a similar degree during the simulated exercise period. Figure 6 sets out the reproducibility of four studies in the two *S*s (Figures are the percent increase over the resting value). It is difficult to draw conclusions from the limited data, but it is presented to demonstrate a possible use of hypnosis in the study of exercise and its effects on the cardio-vascular system.

Cardiac Catheterisation

The use of hypnosis is advocated in the fields of surgery and anaesthesia (Kroger, 1963; Schneck, 1963). A similar application in the field of cardiology is during cardiac catheterisation with haemodynamic studies. Anxiety, fear and apprehension all lead to changes in the cardio-vascular system. Raab (1948) has pointed out that

S.F.		H.R.		$\dot{V}_{O_2}$	
Awake:	Rest	80		166	
	Exercise	125	(1.56)	535	(3.22)
Hypnotised:	Rest	65		268	
	Simulated Exercise	100	(1.54)	281	(0.05)
Hypnotised:	Rest	65		244	
	Exercise	115	(1.77)	657	(2.69)

FIG. 5. Heart rate and oxygen consumption (and percentage changes) in two *Ss* under various conditions and activities (see text for detailed explanation).

	S.F.		MEAN S.F.		RANGE IN THOSE STUDIED	
	H.R.	$\dot{V}_{O_2}$	H.R.	$\dot{V}_{O_2}$	H.R.	$\dot{V}_{O_2}$
Awake:	1.56	3.22	1.53	3.26	1.44 - 1.84	2.99 - 4.19
Hypnotised -- (Simulated Exercise):	1.54	0.05	1.45	0.03	1.36 - 1.54	-0.24 -+0.09
Hypnotised -- (Exercise):	1.77	2.69	1.58	2.44	1.45 - 1.77	2.15 - 2.69

FIG. 6. Heart rate and oxygen consumption measures in four studies of two *Ss* (see text for detailed explanation).

the effects of emotional adreno-sympathetic strain on the heart could be so marked as to cause sudden deaths in the absence of significant heart disease. Less severe effects of the anxiety etc. often associated with cardiac catheterisation (tachycardia, rise in arterial blood pressure, alteration in cardiac output, changes in peripheral vessels) would still lead to a state which is not basal and adversely affect the measurements which should be made in the basal state.

Hypnosis can be used to allay these anxieties and fears and so prevent their effects on the circulation without the need to give sedatives or even a general anesthetic which would further alter the dynamic state of the circulation.

Case histories

Cardiac catheterisations were carried out on 15 patients (age range 8–27 years) in whom hypnosis was electively used to overcome the anxieties and tensions present. The patients were put into the trance at the commencement of the procedure, hypno-anaesthesia being used in place of local anaesthesia. Once the catheters were in position, the patients were brought out of hypnosis, being put back under when a further positioning of the catheters was necessary or measurements were being made. No premedication or sedation during the procedures was given. All patients were relaxed and co-operative during the studies and obviously in a resting and near basal state. It was possible to control the hypnotic state, and, at the same time, perform the catheterisation. This approach is not advocated for all cardiac catheterisations, but in selected cases hypno-relaxation would appear to have a definite application.

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