ALCOHOL, ALCOHOLISM AND CONDITIONING:
A REVIEW OF THE LITERATURE AND SOME
THEORETICAL CONSIDERATIONS

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INTRODUCTION

ALCOHOLISM is a grave social, economic and psychiatric problem which has
attracted the attention of countless research workers and theorists. From a
survey of the recent literature two conclusions emerge. Firstly, that there is at
present no general agreement as to the aetiology, dynamics and treatment of
alcoholism (1). Secondly, that the inadequacies of the majority of the experi-
ments reported are such that the findings are often difficult to interpret and
highly limited in their value (2, 3). In many cases the conclusions do not follow
from the data; in others they are impossible to evaluate because insufficient
procedural details are given; other studies attempt to answer a large number of
questions and answer none adequately; some findings are based upon extremely
small or atypical samples while others are based upon experiments open to
such obvious criticisms that serious consideration is unwarranted. Many of
these studies are apparently the by-product of the busy clinician’s experiences
and consequently lacking in rigour of any description. Remarkably few are
predictive in their techniques or based upon any clearly formulated and testable
theory. It is hardly surprising that so many fail to satisfy the usual criteria of
acceptable scientific research (4).

In the present article emphasis will be largely on those studies and tech-
niques relating to conditioning and learning. It is proposed to review the
existing literature and to indicate where, in the author’s opinion, more research
is needed. Whenever appropriate an attempt will be made to provide a rationale
within a specific framework of conditioning and personality theory. The
relationship between conditioning and personality has been the subject of much
recent controversy and it is essential that this issue be clarified before proceeding
any further.

It is usual to differentiate between Pavlovian or classical conditioning (in
which the only essential criterion is that the conditioned stimulus and the
unconditioned, or reinforcing, stimulus are associated by contiguity in some
way) and instrumental conditioning (in which the subject receives the reward or
avoids the punishment only if he makes the correct, i.e. the conditioned
response). Furthermore, classical conditioning may itself be regarded in two
ways; if association by contiguity is considered as sufficient then any two
stimuli may theoretically become associated with each other so that the occur-
rence of one evokes the response to the other; if, however, a reinforcement
theory of classical conditioning is adopted then the performance of the con-
ditioned response must reduce some learned or acquired drive. It is by no
means universally agreed that these categories can be subsumed under the

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heading of conditioning. Thus eminent workers such as Kanorski (5) and Thorpe (6) hold diametrically opposed views.

The many parameters involved in all kinds of conditioning are discussed briefly by Guthrie (7) and in detail by Hilgard and Marquis (8). There is ample evidence to suggest that the apparent ease in formation of classical conditioned responses, the nature of these conditioned responses once formed, and their resistance to extinction depend in part upon variables such as the reflex under investigation, the modality, duration and intensity of the conditioned and unconditioned stimuli, the nature of the temporal overlap between these two stimuli, the intertrial interval, the conditioning procedure used (e.g. partial or 100 per cent. reinforcement) and the method of measuring the conditioning (e.g. amplitude, frequency, latency or resistance to extinction). However, it is not these secondary or external variables that are of primary concern here, for they only partially decide the nature of the conditioned response. According to Pavlov (9, 10, 11) all forms of conditioning are the direct consequences of two cortical processes, excitation and inhibition, and the nature of the conditioned response is a manifestation of the laws of cortical functioning as well as being dependent upon the external parameters listed above. It is not relevant to speculate about the physiological property of these hypothetical processes; it is sufficient to consider both as positive molar constructs by means of which it is possible to make predictions about personality and conditioning.

If all forms of conditioning are largely dependent upon certain properties of the central nervous system, then the general concept of "conditionability" becomes a meaningful one. It is then possible to speak of a person as being relatively good or bad at forming and retaining conditioned responses irrespective of the reflex used and the technique used to produce and measure the response. If, however, the nature of the conditioned response is largely dependent upon such variables as mood, attention, volition, motivation, conditioning technique and reflex studied, etc., then the concept of general conditionability becomes of little practical value and all predictions must be made in terms of a specific reflex and a specific conditioning situation. This problem has never been adequately investigated; it is unknown whether a general factor of conditionability exists and, if so, how much it contributes to the variance of any particular conditioning data.

There are other problems which limit the applicability of conditioning techniques and which require clarification at some stage. For example, the relationships between the various forms of classical conditioning and instrumental conditioning are unknown and the same problem of a general factor arises. It is also necessary to know more about the relationships between age, sex, intelligence and conditioning, the existing evidence being conflicting (7, 8, 12, 13). Much of the confusion is a result of the multiplicity of techniques used to obtain the data and the diversity of species studied. Bearing in mind the difficulties associated with the concept of conditionability, it is possible from the experiments of the writer to draw several tentative conclusions about conditioning in man. These experiments were carried out under rigorously controlled conditions in a sound-proof conditioning laboratory specially constructed for this purpose (14). The major reflex studied was the conditioned eyeblink to a tone, although in some cases a psychogalvanic skin response was also recorded.

The evidence suggests that:

1. Introverted normals condition better than extraverted normals (15);
2. Introverted neurotics (anxiety states, obsessives, reactive depressives) condition better than extraverted neurotics (hysters and psychopaths) (12, 16);

3. In both normal and neurotic subjects there is no apparent relationship between conditionability and amount of neuroticism (12, 15, 16);

4. Contrary to predictions based on a Hullian-Spence learning theory, irrelevant drives, such as hunger in an eyelid conditioning situation, apparently have no influence on conditionability (17);

5. Both amylo-barbitone (sodium amytal) and methyl-pentynol (oblivon) (central depressants) make it more difficult to establish conditioned responses and more easy to extinguish them once formed; dexamphetamine (a central stimulant) has the opposite effects (18, 19, 20);

6. In accordance with the Pavlovian concept of excessive excitation setting up a protective inhibition, it has been found that the first effects of a large dose of dexamphetamine tend to be opposite to later effects (19).

In the above studies the personality framework used is that developed by Eysenck (21), in which introversion-extraversion and neuroticism are conceived of as orthogonal dimensions, these dimensions being measured by means of personality questionnaires. It should be noted that in general these results apply equally to both sexes and, within the ranges studied, are dependent neither upon age nor intelligence.

Pavlov originally associated neurasthenia in humans with excessive cortical excitation and hysteria with cortical inhibition, but gave little attention to normal personality types (9). However, since it has also been shown that introverts condition well and extraverts condition poorly, it is possible to discuss the personality patterns and psychopathology of both normals and neurotics in terms of Pavlov's variables. For example, the sufferer from an anxiety state, the obsessive, and (to a lesser extent) the introverted normal, tend to be agitated, hyperactive, tense, reflective, highly sensitive to their environment, over-cautious, hesitant, etc. All these characteristics are consistent with a presumed state of excessive cortical excitation and a readiness to form conditioned responses. Similarly, the hysteric, certain psychopaths and the extraverted normal (to a lesser extent) tend to develop fugues, amnesias, gross conversion symptoms and to be unreliable, impulsive and less responsive and sensitive to their environment. All these characteristics are consistent with a presumed state of excessive cortical inhibition and a relative difficulty in forming conditioned responses (16, 22). In the inhibitory group may also be included certain post-leucotomized and certain brain damaged individuals. There is evidence to show that brain-damaged patients condition poorly (23, 24) and some tentative evidence to suggest that leucotomy may have a similar effect on conditioning. It has been pointed out several times that hysterical and psychopathic reactions are not uncommon following prefrontal leucotomy and certain other forms of brain damage (22, 25) and Kennedy has also stressed the resemblance between these categories, postulating a constitutional similarity between these abnormalities (26). The reported finding that depressant drugs decrease conditionability whereas stimulant drugs increase conditionability may now be viewed in terms of changes in the processes of excitation and inhibition. With this background in mind it is possible to consider the specific problems of alcohol and alcoholism in terms of conditioning and personality.
As far as the present writer is aware remarkably few experiments have been carried out on the effects of alcohol on any form of conditioning in humans. Gantt (27) found that doses of 0.5 to 1.5 c.c. of alcohol per kg. body weight increased the latency of salivary and motor-conditioned responses in five dogs and that larger doses decreased the intensity of the conditioned responses. Mead (28) studied simple finger-withdrawal conditioning to light and shock in six men under the influence of 30 c.c. of alcohol in a 20 per cent. solution, but his results are inconsistent. Although the present writer has shown that a higher amount of alcohol depresses conditioning in man (20) there is clearly a need for well-designed experiments on the influence of various doses of ethyl alcohol on both the learning of new reflexes in humans and the performance (or extinction) of existing reflexes which have been learned prior to the introduction of the alcohol. Control groups would have to be used and the alcohol administered disguised in some way, such as being given in capsule form or by injection through a stomach tube. It is quite possible, since we have preconceived notions of what alcohol should do to us, that suggestion would modify its effects (29). It would also be of interest, both from the point of view of suggestion and direct conditioning, to compare beer and spirits, in varying concentrations. In general it seems that the function of the central nervous system is less affected by beer than by spirits; however, under certain circumstances, the disturbance caused by beer may tend to persist longer (3). In view of the Newmans' recent finding that dexamphetamine and caffeine in ordinary therapeutic doses were ineffective in combating the depressant effects of alcohol (30), it would be of interest and importance to determine just how much of these stimulants are required to restore conditioned reflexes reduced or abolished by alcohol and under what circumstances.

Settlage failed to produce a conditioned response in cats while they were under the influence of sodium amytal (31). When the effects of the drug wore off, the conditioned response was easily evoked with no further training. It is possible that sodium amytal depresses the peripheral performance of conditioned responses as well as or perhaps instead of the central learning of these responses. A similar possibility exists with respect to alcohol and remains to be tested. Pavlov was forced to infer the existence of properties of his hypothetical central processes of excitation and inhibition by observation of the behaviour of peripheral organs such as the salivary glands and skeletal musculature. Settlage's findings indicate the hazards of such an inference. The invention of the EEG now makes it possible to observe central changes more directly during the conditioning of any reflex. The Popovs (32, 33) established a conditioned EEG "after image" to sound in humans, then gave their subjects alcohol. They found that the conditioned "after images" consistently appeared much later and much less frequently, from which they concluded that alcohol has a true central action. This is consistent with the finding that alcohol depresses learning in both animals (34, 35) and man (36). However, although the main effect of alcohol is apparently cortical (37), there is ample evidence to show that, unlike the barbiturates, which appear to have a selective action on specific structures, alcohol is a general depressant acting both peripherally and centrally (38). For example, alcohol impairs maze running efficiency in rats (39, 40, 41, 42, 43, 44).

* Because of language and other difficulties it is probable that a considerable number of communications from Eastern Europe have been overlooked.
although it may be, since the animals were in most cases given intensive doses of alcohol over an extended period, that the impairment in learning is not a temporary effect of the alcohol directly but—as with brain damaged individuals—a result of some permanent damage originated by the alcohol. This is one reason why studies of conditioning in alcoholics may be of limited value; it is only by studying the effects of controlled doses of alcohol on normal humans that the properties of alcohol may be discovered. It has been suggested that chronic alcoholism is rarely responsible for felonies or major delinquencies whereas acute alcoholic intoxication precipitates many crimes (45, 46). It may be that alcohol reduces those conditioned responses we term socialization by means of which we have learned to obey the rules of the society in which we live. In addition, alcohol may help by reducing or abolishing those conditioned fear or anxiety responses which prevent many of us from carrying out crimes.

In human instrumental learning alcohol has been shown to have a deleterious effect, e.g. driving skill (47, 48, 49, 50) and Link Trainer performance (51). It depresses sexual responses in dogs (52, 53, 54) and reaction times in dogs and man (35, 53). The early German experiments (55) which purported to demonstrate a decrease in reaction time under certain conditions have since been refuted and the original findings shown to be a consequence of faulty treatment of small sample data (2). The only reputable worker to report that alcohol has a stimulant effect is Masserman (56, 57). He found that alcohol depresses specific tasks in cats, but in small doses may act as a mild stimulant of both cortex and hypothalamus, as shown by the increased responses obtained from direct faradic stimulation of these regions. The work of Santessen (58) also tends to support the possibility that under certain conditions alcohol may not always act as a cerebral depressant. This, if correct, suggests that research on the size of dose in relation to its effects on conditioning and extinction in humans needs to be investigated. The atypical findings of these two workers may be explicable in terms of some concept of positive and negative induction or in terms of Pavlov’s complex paradoxical phases (9, 10, 11, 59). However, in the absence of more evidence, any further speculations are premature.

In view of the already discussed relationships between personality and conditioning, any experiments on conditioning under the effects of alcohol should take into account individual differences in personality, particularly in relation to introversion-extraversion. If Shagass’ finding is confirmed (60, 61), namely that the sedation threshold of hysteric under sodium amytal is much lower than that of anxiety states, then clear predictions relating this threshold to the effects of alcohol on conditioning may be made. The well-known individual differences in alcohol tolerance of normal subjects (e.g. 62) may be related to all the above effects, particularly to their degree of extraversion and conditionability. This, however, fails to solve the problem of which personality type is more likely to become alcoholic for, as has been often pointed out (63, 64), there is no good evidence in favour of the existence of an alcoholic personality prior to alcoholism. A related problem is that of temporary personality changes while under the influence of alcohol; there are very many studies of the personality of chronic alcoholics, but remarkably few studies of changes produced by experimental intoxication, despite the fact that the latter has all the advantages of controlled laboratory conditions. Another partially resolved problem is that of the permanence of these changes. It was once believed that acquired degeneracy in rats due to alcohol could be inherited (39, 65, 66, 41, 40). However, much of these data are unreliable and of dubious statistical significance and better designed studies have failed to confirm this
belief (67, 68, 69). There would seem to be no evidence of genetic transmission of acquired degeneracy, although it may be that the changes incurred are permanent as far as the individual organism is concerned.

**Conditioned Response Therapy**

Much of the treatment of alcoholics lacks a clearly formulated rationale (68, 70, 71) and, with a few notable exceptions such as the work of Voegtlin and his associates (71, 72, 73, 74, 75, 76, 77, 78, 79, 80), this comment is applicable to conditioned aversion therapy even when the therapy purports to be in accord with Pavlovian principles (81, 82, 83). Numerous workers have pointed out the need for rigorous procedures (84, 74, 72, 85) but few have taken this advice. One clinician (86) carefully stresses adherence to the laws governing the acquisition of conditioned responses and then asserts that alcohol should be given after the patient feels nauseated. Of the many possible procedures there is no doubt that this form of conditioning (backward conditioning) is the least easy to develop and the most readily extinguished. In addition to such theoretical errors there is a lack of uniformity of procedure and a dearth of technical details in the published reports. It is consequently difficult to evaluate the potentialities of conditioned response therapy and it is hardly surprising that reviewers such as Lévy-Valensi (87) conclude that the value of conditioned response therapy so far is fairly limited. The reports range from long lasting and widespread success (88, 89, 90) through qualified approval (91) to complete rejection (92). Feldman (93) concludes that conditioned response therapies offer no better results than treatment by the more dynamic forms of psychotherapy. Numerous clinicians, usually with no supporting evidence, stress the inadequacies of conditioned response therapy unaccompanied by psychotherapy (94, 95, 96, 97, 84, 98, 99). It is often asserted (100, 101, 102, 103, 104) that training the patient to become abstinent is no cure and Edlin (105) prefers to regard aversion treatment merely as a method of rendering the addict abstinent while psychotherapy and other means of support are being instituted. A frequent conclusion is that conditioning therapy is merely "symptomatic treatment" which fails to eliminate the underlying cause (106, 107). However, such critics merely present acceptable evidence in support of their assertions and ignore the possibility that a symptom may itself be as harmful as the disease (108). Conditioning therapy may help the alcoholic to break his habit of drinking and thus enable him to find more socially acceptable ways of solving his problems. In any case there would seem to be no reason why treatment of both symptoms and the underlying disorder should not proceed along conditioning and learning theory lines. It would also seem reasonable to control the motivational factors by such techniques. If the desire to stop drinking is essential to the success of any kind of therapy then this desire may itself be learned. There is much evidence to suggest that attitudinal factors towards alcohol and alcoholism, including the patient's willingness to seek help, are themselves learned and vary from one culture to another (109, 110).

Apomorphine, and more recently, emetine, are the usual drugs used as the unconditioned stimuli in conditioned aversion therapy. It is sometimes erroneously assumed that the conditioned response established is absolutely specific so that the subject may be in the happy state of having an aversion to spirits, but be able to enjoy the pleasures of drinking wine (111). A related erroneous assumption is that the subject has to be separately conditioned against all alcoholic beverages (112).
Apomorphine conditioning is undoubtedly more time consuming for the experimenter than is antabuse therapy. It has the added disadvantage of requiring rigorous procedural techniques. However, it seems that antabuse presents certain hazards as a therapeutic agent. It may cause acneiform eruptions, allergic dermatitis and urticaria. In some patients it may cause fatigue, tremor, headaches, dizziness, gastro-intestinal disturbances, reduced sexual potency and even death (37, 113, 114, 115, 116). For these reasons it may be preferable to use apomorphine, which is agreed by most workers to produce an aversion directly in accord with the conditioning paradigm. (Should the patient become addicted to apomorphine it is always possible to change to another noxious unconditioned stimulus such as emetine.) There is one notable exception to this general agreement. Dent considers that apomorphine is effective in the treatment of alcoholism because of its action on the medulla cells of the brain in suppressing the need for alcohol. Unfortunately, he has never explained this mechanism in print, except to propound a tentative theory in terms of stimulation of the lower centres of the brain (117). Elsewhere he argues that apomorphine is merely a sedative which reduces the anxiety which is at the root of the addiction (118). Vencovsky believes in using emetine (or apomorphine) to establish a direct conditioned reaction, followed by the continued administration of antabuse to ensure the reappearance of the reaction symptoms whenever drinking is resumed (119). This is perfectly consistent, since in the widest sense antabuse therapy must also be regarded as a form of conditioning in which, after the effect of the drug has worn off, the thought, sight, smell or taste of alcohol presumably sets up a conditioned aversion response.

Although the most usual way of producing a conditioned aversion is by the application of some nausea inducing drug, this is by no means essential. Bachet (120) was able to produce conditioned nausea to the sight or taste of alcohol without using any drugs, and as far back as the last century it had been suggested that alcoholism should be treated by associating a painful stimulus with the taking of the alcohol (121). More recently there has been an accumulation of evidence to show that all kinds of conditioned aversions may be readily produced in both animals and man by the application of electric shock as the unconditioned stimulus (122, 123). Using this technique, Kantorovich (124) was remarkably successful in producing a conditioned aversion not only to the taste of alcohol but also to its smell and sight and even to a photograph of the bottles. There is clearly a need for research into methods other than drugs of producing a conditioned aversion to alcohol.

If drugs are used as unconditioned stimuli, then other problems, totally uninvestigated as far as the present writer is aware, present themselves. For example, apomorphine is supposed to stimulate the so-called "vomiting centre" in the brain. Now although the precise location of the centre is in dispute (125, 126) and hence the specific stimulant action of apomorphine not clear, there is good evidence to suggest that the drug has a cerebral depressant action, especially if large doses are taken. According to Goodman and Gilman (37, p. 1004) even small non-emetic doses of apomorphine may at times be hypnotic. It may be that apomorphine, like sodium amytal (18, 19) and oblivon (20), decreases the ease with which conditioned responses of any description are formed. If this is correct then, although apomorphine is successful in producing the unconditioned response of nausea, it will render the formation of the conditioned aversion responses to alcohol considerably more difficult. Such an experiment, using varying sub-emetic doses, needs to be carried out for various
conditioned responses under laboratory conditions. If it should be found that apomorphine does hinder the formation of conditioned responses then two possibilities arise. Either a suitable drug should be found which produces the required unconditioned response and at the same time has a facilitating effect on the formation of conditioned responses or, prior to each session, the patient could be given a stimulant drug such as caffeine or benzedrine which is known to enhance conditioning. The concept of combining apomorphine with some other drug for various reasons is no new one. For example, Lemere and O'Hollaren (127) suggest that sodium thiopentone (pentothal) should immediately precede any conditioning treatment in order to reduce tension. If sodium pentothal acts as a typical depressant and makes it more difficult for conditioning to take place then this combination of drugs is an unwise one.

The above considerations apply to all forms of conditioned aversion therapy in which drugs are used to produce the unconditioned response. Thus Raymond (128) successfully used this technique to treat a fetishist. Furthermore, if it be conceded that all kinds of psychotherapy may be profitably conceptualized as processes in learning or conditioning (e.g. 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140) then the use of stimulant and depressant drugs during therapy may also be considered in terms of this rationale. It might be advisable to combine psychotherapy with a depressant drug when it is desired to extinguish a certain learned pattern of behaviour and to combine psychotherapy with a stimulant drug when new learning is being initiated. A preliminary attempt to make use of similar principles has been reported by Agoston (141).

**Predicting Success in Conditioned Aversion Therapy**

It follows from the discussion presented in the first part of this paper that a prediction of success may possibly be made by giving the alcoholic various laboratory tests of conditioning and questionnaire measures of introversion-extraversion. There is some empirical evidence to support this suggestion. Thus it has often been observed that psychopathy (here regarded as a form of neuroticism appearing only in extraverted individuals and related to poor conditioning) contraindicates success (e.g. 96, 84). However these techniques require experimental validation. Should a direct relationship be demonstrated between laboratory conditioning and responses to conditioned aversion therapy using (say) apomorphine it would seriously weaken the arguments of those who assume (118, 142) that the effectiveness of these aversion techniques is in no way based upon conditioning. It may be observed that a similar exposition might be developed for the prediction of success in any form of psychotherapy.

Before discussing what personality type is more likely to respond successfully to conditioning therapy it may be helpful to formulate two related and often confused problems. These are (a) is there such a thing as an alcoholic personality, once the person has become an alcoholic? and (b) what sort of person is most likely to become an alcoholic, i.e. is there such a thing as a predisposing alcoholic personality?

It has often been concluded that alcoholics tend to be introverted (143, 144); it has also often been concluded that alcoholic groups tend to have a high psychopathic (presumably extraverted) element (145, 167, 147). Others have reported such phenomena as "compulsive" drinkers, presumably introverted (148). Numerous workers have attempted to rate alcoholics in terms of introversion-extraversion, but their findings are of little value since the personality
criteria used were based largely on subjective impressions and unvalidated concepts (149, 150, 151, 152). It is hardly surprising that their findings vary widely as to the ratio of introverts to extraverts. There have been many attempts to classify alcoholics (e.g. 101, 153) but they have all met with little success and there is considerable disagreement as to the personality structure of the alcoholic. In most cases it is impossible to decide whether the obtained personality picture is related to the chronic effects of the alcohol or whether it is an accurate description of the pre-morbid personality of alcoholics (154, 155, 156). It is consequently difficult to evaluate many of these studies (e.g. 145, 157, 158, 147). Hansen and Teilmann (159) examined a group of convicted criminal alcoholics. They split them up into those who were abnormal psychologically and were long term detainees and those who were under short term detention and soon released on parole. They found that the former group tended to come from a materially and emotionally undesirable childhood environment, to have a poorer physique and to have a substantial number of subjects with head injuries among its numbers. Despite therapy, only 13 per cent. of this group improved, whereas 35 per cent. of the other group improved even though untreated. It would be interesting to repeat this investigation predicting success and long-term prognosis for both groups by means of conditioning and personality tests and then to give them both similar forms of treatment. Davies et al. (160) used the Strauss and Bacon Stability Scale (161) and other criteria to establish a prognostic profile but their measures are multi-dimensional and consequently difficult to interpret.

Other studies have found no differences between alcoholic groups and normal controls. Thus Vogel (162) found no differences in suggestibility as measured by the body sway test and Sutherland et al. (64) found no evidence that their alcoholics had abnormal electroencephalograms. Wittman compared 100 alcoholics with 100 matched normals and failed to find any significant differences with respect to personality or background development (163, 164, 165, 166). The general conclusion seems to be that as yet alcoholic and normal groups have not been shown to differ significantly in personality as indicated by a variety of tests and other measures (167, 168, 64, 84, 169, 170). This conclusion is limited since, with remarkably few exceptions (e.g. 3, 171), the measures of personality used have been subjective or complex in their factorial composition. Although, there is as yet no methodologically sound dimensional system of personality which is widely accepted, it is still possible to use personality tests which have high factor loadings on only one factor in some generally recognized dimensional system. There is a need for research into the effects of alcohol on factorially pure measures of personality. Such research could easily be extended to the effects of the widespread addictions, such as morphine, barbiturates, marihuana and even to the much rarer addictions such as paraldehyde, ether, cocaine and chloroform on measures of personality. The problem of what sort of person is most likely to become an alcoholic is considered in the concluding section of this paper.

**ALCOHOL AS A THERAPEUTIC AGENT**

In the social sense alcohol is widely used as a therapeutic agent to relieve anxiety and tension. Unlike the barbiturates, alcohol is rarely prescribed for this purpose clinically, even on an empirical basis. Unlike the barbiturates almost nothing has been established concerning the effects of various alcoholic beverages on the formation and retention of conditioned responses, although it
would seem highly probable that the general effect is to depress them. There is, however, some evidence concerning the effects of alcohol on unconditioned responses, especially the sexual ones. It has been established that alcohol raises the threshold of the erectile and ejaculatory reflexes in animals, so that more than normal stimulation is required to arouse these reactions. In large doses the sexual response is completely inhibited (53, 54, 172). Gantt also found that alcohol depresses unconditioned sexual responses far more than any other responses such as the desire for food (52). The widespread popular belief that alcohol is a sexual stimulant seems to be incorrect. The reason for this belief may be that alcohol inhibits already formed conditioned responses, hence reducing or abolishing those learned patterns of socially accepted behaviour which restrict the normal expression or following through of sexual desires. Thus these desires are possibly unaltered but the conditioned restrictions which prevent their implementation are reduced. If, at the same time, unconditioned sexual responses are depressed and a state of near impotence is produced it seems hardly surprising that a conflict situation may be established. There is some experimental support; thus Andreyev (173) found that alcohol given to dogs daily for two weeks resulted in the breaking down of a stable well-established conditioned response pattern and at the same time produced an experimental neurosis. On the other hand, under certain conditions alcohol considerably reduces the behavioural symptoms of an already established experimental neurosis (174). According to Gantt (27) alcohol produces these effects by disturbing the central excitation-inhibition balance. It seems that the result depends both on the conditions of administration of the alcohol and on the personality of the recipients.

The above provides a possible explanation for certain problems resulting from alcoholization in normal individuals and attempts to place on a rational basis such generalizations as that of Seliger and Crawford (175) who conclude that alcohol acts as a depressant on the central nervous system and so enables the underlying forces in the personality to find a more direct expression. It also provides a possible—if at present speculative—rational basis for the alcoholic treatment of certain sexual disorders.* Thus the anxious introverted patient who suffers from ejaculatio praecox may have excessive socially conditioned responses greatly reduced by alcohol and at the same time the latency period of ejaculation would be considerably increased. Barbiturates are sometimes prescribed on an empirical basis for the treatment of disorders of a similar nature, but alcohol, given under controlled conditions, may have certain advantages and may be less likely to produce drug dependence or withdrawal symptoms. Certainly the vast majority of people who imbibe alcohol are not alcoholics.

Many problems require investigation, such as the correct dosage and method of administration in relation to the subject’s personality. Furthermore, the sexual behaviour pattern and desires of the chronic alcoholic cannot be inferred from a study of the effects of alcohol upon the sexual pattern of normal subjects. Thus Levine (179) found a diminished interest in heterosexual relationships in alcoholics. The possibility of permanent physiological changes in the chronic alcoholic provides yet another variable to be taken into account.

* The consideration of sexual abnormalities in terms of conditioning is not new. Over twenty years ago Meignant discussed sexual impotence in this manner (176) and Max (177) successfully treated a case of homosexual fixation by these means. More recently Salter (178) attempted to explain how masochism may arise as a conditioned response and be treated accordingly, and Raymond successfully applied this method to the treatment of a fetishist (128).
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ALCOHOLISM AS A LEARNED RESPONSE

If alcoholism can be successfully treated by a conditioning process then it may be that alcoholism itself is a learned symptom. It is possible to discuss alcoholism as a conditioned response either in terms of a reinforcement theory or otherwise. Many psychologists have emphasized that need reduction is not essential for learning (e.g. 180, 181, 182) and it is reasonable to build up a classical conditioning paradigm based strictly upon association by contiguity. However, the majority of learning theorists adopt some form of reinforcement theory in which the basic assumption is that the learning of an association between a stimulus and a response requires the presence of some sort of reward or reinforcement, even if this be only in the form of a drive reduction. Even if alcoholism is regarded as a serious symptom in a psychiatric disorder it seems advisable to apply a learning theory rationale and to enquire what drive or need the taking of alcohol reduces.

Welch (183) analyses the concept of "needs" at some length and splits them up into two general groups—pain reduction and enjoyment augmentation. Within these groups needs may be physiological or acquired, they may be known to the subject or he may be unaware of them, the reduction may be accompanied immediately by pleasure or followed eventually by pleasure. Wilkins (184) probably has a similar system in mind when he says that theories of alcohol motivation may be divided into psychological and pathophysiological kinds. It is possible to hypothesize numerous needs or drives of various categories which alcohol drinking may conceivably reduce. Thus Royer (185) has shown a relationship between thirst and alcohol drinking, but it would hardly seem widely applicable to postulate thirst as the primary drive which alcohol reduces. For Peabody (186) and Strecker (144) alcohol satisfies the need to avoid reality by screening unsatisfactory external and internal existences. McFarland and Borach (187) believe that there is a relationship between a physiological need for more oxygen and alcoholic intoxication. They found that satisfaction of this need by the inhalation of a suitable oxygen mixture produced a permanent improvement in the alcoholic, presumably because he no longer had to satisfy his need for oxygen by absorbing large quantities of alcohol. Westerfield and Lawrow (188) found that the restriction of food intake in rats results in a marked increase of alcohol consumption, so that it may conceivably be the need for food that alcohol satisfies. However, as with thirst, it would not seem reasonable to postulate a hunger drive as the primary need which motivates people to drink alcohol (especially as Conger (189) found that alcohol does not affect hunger motivating approach responses). According to Lolli (190) alcoholism might be an attempt to satisfy the need for love and tenderness. It could be argued that alcohol reduces the strong oral and narcissistic drives which alcoholics are supposed to possess (191).

The most tenable and frequently proposed drive that alcohol is considered to reduce is anxiety. It has been noted that alcohol is taken especially in times of stress (108, 192) and theories of alcohol drinking as a tension reducing activity have often been proposed (e.g. 193, 194). Horton, in a cross cultural study of certain primitive communities, has shown that there is more drinking in "anxious" societies (195). Certainly it seems true that anxiety in some form, like alcoholism, is universal. Dynamic psychiatrists, e.g. Freud (196), Horney (197), and Sullivan (198) agree that anxiety is encountered to some extent in all communities and in all societies. When Strecker, Peabody and others say that alcohol provides an escape from reality, this may presumably be because reality sets up undesirable tensions or stresses which alcohol reduces.
There are many ways of reducing tension or anxiety such as smoking, masturbatong, sexual intercourse, gum chewing, sucking sweets. Specific food addiction (199) or general excessive eating may be learned responses which are reinforced by their anxiety-reducing actions. Thus Ullman (200, 201) found that compulsive and vigorous eating was positively related to tension-provoking situations. It is also known that certain individuals and certain ethnic groups react to stress by eating (202). Ferenczi (203) points out that work itself can be effective in reducing anxiety, and Bird (204) describes the case of an "addictive" worker who reacted to stress by continuous work. Why the alcoholic turns to alcohol in preference to these other tension-reducing activities must remain an open question.

Miller (205) was the first person to show that the decrease in the acquired drive of fear or anxiety can serve as the reinforcing agent in the learning of a habit. More specifically, Conger (189, 206) has provided data which support the hypothesis that the habit of drinking alcohol when rats are placed in a conflict situation is reinforced by the fear-reducing effects of the alcohol. He found that alcohol decreases learned fear-motivating avoidance responses in rats, but does not affect primary hunger-motivating approach responses. Although it seems acceptable that alcohol reduces the learned drive of anxiety, Conger is forced to consider several possibilities. It could be that alcohol tends to reduce the strength of all learned drives but does not affect primary ones; it could also be that the effects of alcohol are specific to certain drives, whether learned or primary. For example, Gantt has provided good evidence that alcohol reduces the primary physiological responses to stimulation of genital areas. It does, however, seem reasonably established that alcohol reduces fear or anxiety. The work of Masserman and his associates with animals confirms this (56, 57, 207, 208). It has also been shown that, in rats, alcohol reduces general activity, which may be a measure of general tension (209, 210). The cross cultural studies of Horton (195) suggest that this conclusion is applicable to man also.*

Conger (212) suggests that conflict itself is tension producing and the work of Liddell and his associates (213) supports this view. According to Dworkin (214) alcohol, as well as other hypnotics, such as amytal, nembutal and hyoscine, considerably reduces the behavioural symptoms of tension resulting during the establishment of an experimental neurosis based on a conflict situation. Thus, whether anxiety is regarded as a learned response and discussed in terms of excessive and widely generalized conditioned responses or as a product of conflict situations, it seems that alcohol reduces this anxiety and so provides the reinforcement which a drive-reducing theory of learning postulates.† Thus the act of drinking to reduce tension becomes a learned habit. By a process of stimulus generalization (in much the same way as anxiety itself is a learned generalized response) drinking alcohol in specific tension-provoking situations becomes generalized to drinking alcohol in most situations, whether tension provoking or not. The habit is maintained by those few situations which provide tension and so the learned pattern becomes reinforced.

* There is experimental evidence to show that other depressants have a similar effect. Thus Bailey and Miller (211) found that the barbiturates abolished conditioned fear responses in cats and Bartholomew, Franks and Marly (20) found that oblivon reduces manifest anxiety in humans.

† If anxiety itself is regarded as a learned response then it is to be expected that alcohol would have the effect of reducing already formed conditioned responses as well as the formation of new ones. As has already been stated, this has never been adequately demonstrated. Since it has been demonstrated that oblivon, amytal and other depressants behave in this manner, it would seem not unlikely that alcohol behaves likewise.
The question now arises as to why some people become addicts almost immediately and others not at all, even though they also drink to relieve tension. A possible, if speculative, answer is that addiction is related to the conditionability and personality of the individual concerned. If it is true that introverted subjects condition more readily than extraverts then the introvert will develop more conditioned anxiety. Therefore there will be more situations where the need to reduce this drive exists; furthermore, fewer reinforcements will be required for the habit to be learned successfully and the generalization to numerous situations and alcoholic beverages would be greater. No experiments have investigated both the conditionability and the personality of alcoholics. Many practical and theoretical difficulties arise, such as the elimination of subjects with brain damage or other physiological changes resulting from the excessive drinking of alcohol. Furthermore, it is logically unwise to assume that the conditionability and personality of the well-established alcoholic is the same as in his pre-morbid state. The existing evidence is inadequate and relates largely to the present personality of the alcoholic. Apart from the finding that Korsakov psychotics condition poorly (24, 215) nothing is known about the conditionability of alcoholics in relation to personality or otherwise. The relationship between alcoholism and conditionability may well be a complex one. Thus in the early stages alcoholism may be positively related to conditionability but, in view of the findings that many chronic alcoholics are brain damaged (216, 217) and that certain brain damaged patients condition poorly, the chronic alcoholic may condition very poorly. The inability to control their drinking that is characteristic of alcoholics may thus be attributable in the early stages to excessive drive and conditioning and in the later stages to an inability to condition.

If the aetiology and treatment of alcoholism is considered in terms of conditioning, several interesting possibilities arise. Is it possible, for example, to produce relief of tension and other pleasurable feelings associated with alcohol by conditioning techniques, so that an originally neutral and innocuous stimulus is just as effective? This might be of benefit in counteracting the physiological withdrawal symptoms of alcoholism during the earlier stages of treatment. Thus Rubenstein (218) successfully treated morphine addiction along these lines. If Wileczkowski's conclusions are correct (he used no control group nor adequate statistical precautions) then it is even possible to condition the physiological effect of alcohol (219). There is much evidence that the sedative effects of sodium amytal can be conditioned (220) and Metalnikov and Chorine (221) succeeded in producing conditioned serological reactions in animals to a social stimulus. Razran (222) criticized their findings on methodological grounds, but a better controlled experiment by Smith and Dalinger (223) produced similar results. Kleitman and Crisler (224) conditioned the retching behaviour originally evoked by morphine to a sound stimulus. Eagle (225) reports that Bykov was able to condition urinary secretions and even leukocytosis.* On the other hand, Gantt, Katzenelbogen and Loucks (226) failed to condition the rise in blood sugar after an adrenalin injection was paired with either a buzzer or the "preparations for the injection". However these authors note that hyperglycaemia can be produced under hypnosis merely by the suggestion "you have drunk a glass of sugared water". Furthermore the behavioural effects of alcohol have been produced by suggestion under hypnotism in the theatre on many occasions. After animal experiments in the conditioning of various drug

* Which, as many studies have since confirmed, refutes Pavlov's claim that the cortex is essential to conditioning.
effects, numerous authors have independently come to the conclusion that conditioning can only be achieved if the drug concerned produces experiences “meaningful” to the animal (207, 227, 228, 229). Thus it would have to be the whole configuration of feelings associated with drinking alcoholic beverages which would have to be conditioned. There would seem to be two not incompatible lines of approach. (1) To provide the general pleasurable effects of alcohol, including well-being and the reduction of tension by an innocuous conditioned stimulus. (2) To condition or teach the subject to use other stimuli to reduce his anxiety, stimuli which are less harmful than alcohol, e.g. sweets or gum. A novel possibility in this respect may be that suggested by Richter (230). He found that thyroid extract greatly increased the experimental rats’ appetite for sugar, so he attempted to induce a craving for alcohol in this way. To his surprise, just the opposite result was produced, the rats either greatly reduced or completely stopped their intake of alcoholic beverages. Since hyperthyroid patients are very rarely alcoholics Richter thinks that a small daily dose of thyroid extract might stop the craving for alcohol, although he presents no rationale for this belief. It might well be, however, that the thyroid functions as a substitute for alcohol in reducing the patient’s needs. This hardly commends itself as an effective substitute, but does suggest the need for an investigation of thyroid function in alcoholics.

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