Amnesia: Its Detection by Psychophysiological Measures

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Introduction

The term amnesia encompasses many varied examples and causes of memory loss. In an edited text on amnesia, Whitty and Zangwill explore the subject in terms of cerebral disease, trauma, electroconvulsive therapy and psychogenesis.[1] It becomes obvious from the various causative factors involved in amnesia that such a multi-factorial problem requires an eclectic approach in answering. At present, one area being investigated in some detail is alcohol/drug-induced memory loss. The focus of the present study is the exploration of memory dysfunction resulting from alcohol/drug abuse.

In any discussion of alcohol/drug-induced amnesia certain features of the dysfunction become important for consideration. Before the amnesia can be examined it must be determined to be either a legitimate loss or a feigned amnesia state. The basis of feigned versus genuine amnesia rests with an individual's biological and psychological resources. Expediency suggests that genuine amnesia tends toward an organic base and feigned toward a psychogenic base. That is to say, the probability of a genuine amnesia is greatly increased when found in concert with organicity. Likewise, feigned memory loss is more likely to be found in individuals suffering from a psychogenic disorder.

In addition to the issue of genuine versus feigned amnesia, the type of memory loss is important in any clinical assessment of the disorder. The present study utilizes a clinical breakdown of amnesia type in accordance with characteristics outlined by Bradford and Smith.[2] The amnesia states are discussed in relation to the following category types: (A) hazy amnesia: no absolute amnesia either in circumscribed periods or in one complete period; (B) partial (patchy) amnesia: segments of memory loss with no complete period of amnesia; (C) complete amnesia: total

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memory loss for one circumscribed period.

The clinical evaluation of amnesia is for the most part a very subjective undertaking. Lynch has suggested that conventional clinical assessment techniques are limited in determining the above mentioned amnesia characteristics.[3] In essence, the problem stems from the relative unreliability of subjective assessment of memory dysfunction as compared to the objective evaluation of the state by polygraphic measures. Furthermore, both Bradford and Smith, and Lynch have suggested that polygraphic measures when utilized with a standardized detection of deception technique can effectively assist in psychiatric assessments.[4,5] Additionally, they describe polygraph's important role in determining the legitimacy of the amnesia and the type and extent of memory loss if found to be genuine.[6,7]

The use of psychophysiological measures (polygraphy) to detect amnesia is a relatively new psychiatric technique. Although the science of polygraphy is a burgeoning field, only recently has it found its way into the field of psychiatry and in particular forensic psychiatry.[8] Although polygraphic detection of amnesia appears to be a more objective approach than clinical assessment, Gudjonsson points out that detecting information in amnesia patients by such measures is still dependent on a complex of potentially confounding factors such as recognition, malingering and target stimuli relevance.[9] To date, there has not been a study that systematically investigated the potential of psychophysiological measures with amnesia states and particularly those induced by alcohol/drugs.

The literature on polygraphy and memory loss is both sparse and diverse in its purpose and methodology. The majority of the amnesia and polygraphy literature suggests there are no particular problems inherent in testing for memory.[10,11,12,13] However, Weinstein *et al.* suggest that hypnotically induced amnesia can be very effective in misleading the polygraphic determination.[14] This finding was of particular interest to the present study as it might prove to be a confounding variable. Although it can be argued that hypnotic amnesia and alcohol/drug-induced amnesia have little in common, it must still be considered a potential error source when examining the results. Additionally, Wiggins suggests that visceral or autonomic responsivity is not a sufficiently sensitive measurement modality to detect information in an amnesia state.[15] Both these concerns highlighted the necessity of studying memory loss measurement by polygraphic means.

In an interesting discussion paper on possible implications of drug-induced memory loss for lie detection, Barland suggests that state dependent learning may be an essential factor in utilizing polygraphy with amnesia. Paradoxically however, he concludes the paper by stating that state dependent learning may be purely an academic concern since his practical experience with polygraphy and memory dysfunction did not support any necessity for concern.[16]

In view of the differences apparent in the literature, the present study was designed to investigate the role that polygraphic measures can play in the detection of alcohol/drug-induced memory loss.

Method

The study consisted of a series of detection of deception examinations on 22 patients, 20 males and 2 females, all of whom were charged with varied offences and referred for psychiatric evaluation at the Royal Ottawa Hospital, Department of Forensic Psychiatry. Additionally, all patients claimed some degree of alcohol/drug-induced amnesia for the offences charged. The patients ranged in age from 18 to 58 years, with a mean age of 32 years. Unless pertinent to the study, there will be no further breakdown of subjects by sex, such that "patients" will refer to both males and females combined.

In addition to the polygraph examination all patients were administered a clinical assessment battery consisting of a psychiatric evaluation, a psychological assessment, a social work assessment and in some cases a neurological assessment. The specific purpose of the polygraph examination was to delineate the type and extent of the purported amnesia — in brief, to assess whether the memory loss was genuine, and if so, for what circumscribed period.

All examinations followed the Backster Zone Comparison Technique (control question technique).[17] This technique employed a three stage examination procedure. The first stage, employed the pretest interview wherein all information relevant to the offence was gathered from the patient and combined with the information already available prior to testing such as psycho-medical data, family history, police brief *etc.* As much information as possible was gathered, in order that a clear, concise picture of the critical issue or issues could be identified. This clarity of issue facilitated the formation and ultimate review of the test questions during the pretest stage.

The second stage of the examination consisted of administering the reviewed test questions while the patient was monitored psycho-physiologically. The instrument used to monitor the autonomic functioning was a four-channel polygraph consisting of two channels measuring respiration and electrodermal activity (skin conductance) and two channels measuring cardiac functioning (relative blood pressure and peripheral blood flow). During this stage the question sequence was administered twice to allow for partial adaptation and habituation.

The third stage or post-test interview was primarily designed for the individual who was evaluated as "deceptive." Regardless of determination, all patients were informed of the results and the deceptive patients were given an opportunity to clarify and explain if possible the deceptive response patterns during this stage. Polygraphic interpretation was accomplished by numerically evaluating the polygrams in accordance with the rating rules outlined in the Backster Zone Comparison

Technique.[18]

The only modification of the conventional control question technique was in the question formulation. One must always be cognizant of the fact that amnesia is rarely a discrete, concise state of mind. Therefore, in an effort to circumvent some of the problems inherent in the testing of memory loss, the critical questions were worded as follows: "Do you remember distinctly . . ." rather than the traditional format of "Did you . . .". This modification was suggested by Barland to allow the subject an opportunity to differentiate between what he genuinely remembers of the offence and what he was told about the offence.[19]

Results

The polygraph examination decisions, patients' charges, alcohol/drug histories, psychiatric diagnoses, and types of amnesia are all outlined in Table 1. To facilitate discussion and analysis certain liberties were taken in grouping the data. That is, had the numbers been of a greater magnitude it would not have been necessary to mass the data as was done here.

Twenty-three percent of the patients were charged with theft (armed and unarmed), 18% were charged with rape/indecent assault, 13% with murder/manslaughter, 13% with assault causing bodily harm, 13% with arson, 10% with dangerous use of a firearm, 5% with issuing a threat and 5% with impaired driving.

TABLE 1
BREAKDOWN OF POLYGRAPH EXAMINATIONS ON AMNESIACS

Patient	Sex	Age	Charge	Alcohol/Drug History	Psychiatric Diagnosis	Type of Amnesia	Polygraphy Decision
1	Female	18	Manslaughter	None	Person. Dis.	Patchy	Deceptive
2	Male	18	Imp. Driving	Alc. Abuse/2 yrs	Person. Dis.	Patchy	Indefinite
3	Male	19	Ind. Assault	Alc./Drug/1 yr	No Maj. Psy. Ill	Patchy	Deceptive
4	Male	19	Armed Robbery	Alc. Abuse/1 yr	Person. Dis.	Patchy	Deceptive
5	Male	20	Iss. Threat	Alc. Abuse/7 yrs	Person. Dis.	Patchy	Deceptive
6	Male	23	Rob. Viol.	Drug Abuse/2 yrs	No Maj. Psy. Ill	Patchy	Deceptive
7	Male	23	Assault	None	Person. Dis.	Complete	Deceptive
8	Male	24	2nd Deg. Murd.	None	Schizo.	Hazy	Deceptive
9	Male	27	Dang. Use of Firearm	Alc./Drug/10 yrs	Person. Dis.	Hazy	Indefinite
10	Male	27	Arson	Alc. Abuse/3 yrs	No Maj. Psy. Ill	Patchy	Indefinite
11	Male	28	Arm. Robbery	Alc./Drug/13 yrs	No Maj. Psy. Ill	Patchy	Truthful
12	Male	29	Rape	Alc. Abuse/10 yrs	No Maj. Psy. Ill	Complete	Truthful
13	Male	30	Assault	Alc. Abuse/10 yrs	Person. Dis.	Patchy	Truthful
14	Male	35	Assault	Alc. Abuse/16 yrs	No Maj. Psy. Ill	Patchy	Truthful
15	Male	36	2nd Deg. Murd.	Alc. Abuse./10 yrs	No Maj. Psy. Ill	Patchy	Truthful
16	Male	39	Att. Murder	Alc. Abuse/23 yrs	No Maj. Psy. Ill	Hazy	Truthful
17	Male	41	Arson	Alc. Abuse/20 yrs	Person. Dis.	Patchy	Deceptive
18	Male	42	Ind. Assault	None	Depression	Patchy	Truthful
19	Male	46	Ind. Assault	Alc. Abuse/15 yrs	Depression	Patchy	Truthful
20	Male	53	Att. Murder	Alc.Abuse/10 yrs	No Maj. Psy. Ill	Hazy	Deceptive
21	Female	55	Shoplifting	None	No Maj. Psy. Ill	Hazy	Indefinite
22	Male	58	Theft	Alc. Abuse/38 yrs	Depression	Patchy	Truthful

It should be noted that all polygraphic tracings were relatively distortion free with the exception of the patients evaluated "indefinite."

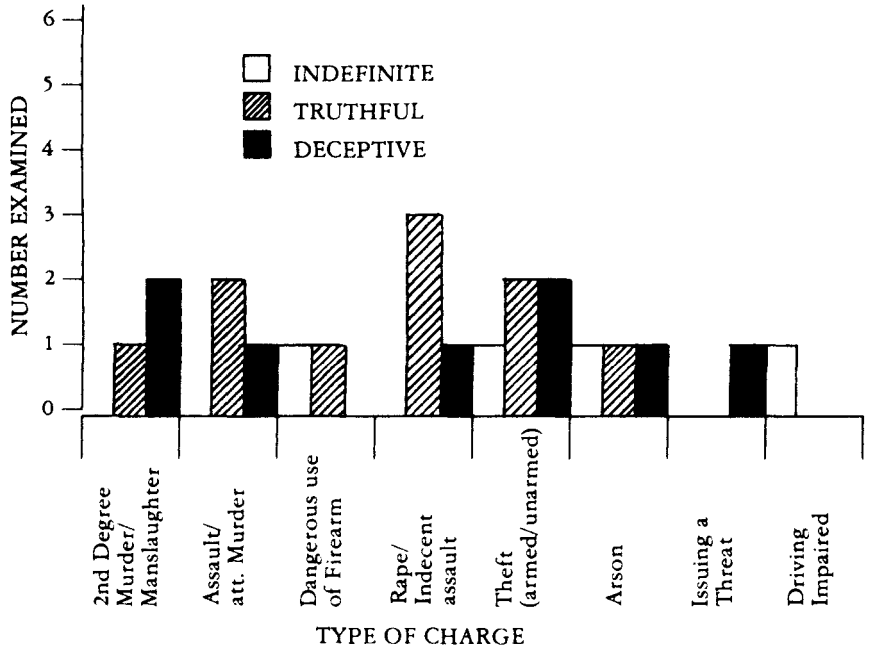
This point will be further elaborated on in the discussion. In addition, Wiggins' suggestion that amnesia is difficult to detect by autonomic functioning did not hold up in the present study.

In the history of alcohol/drug abuse column, patients were classified strictly as to the duration of abuse without breaking down the specifics of drugs used. The range of usage was from 0 to 38 years with a mean alcohol/drug abuse usage period of 9 years. It can be seen from the table that 59% of the patients abused alcohol alone, 13% abused alcohol and drugs, 5% abused solely drugs and 23% did not abuse either alcohol or drugs.

In the column entitled "psychiatric diagnosis," 45% of the patients were diagnosed as having no major psychiatric illness while 36% were diagnosed as personality disorders. Thirteen percent showed some depressive symptoms with only 5% diagnosed as schizophrenic. All diagnoses were at the time of trial so that some potential diagnostic change may have taken place between the polygraph test and the court appearance.

The entire sample fell into the average range of intelligence with the exception of patient 22 who fell in the bright normal range. Furthermore all laboratory investigations which included EEGs, brain scans and blood analyses were within normal limits with few exceptions. These exceptions were patients 6 and 16 who were investigated further following EEG and neuropsychological indications of epilepsy. Additionally, patients 11 and 22 were further diagnosed as having some degree of organic brain syndrome.

FIGURE 1
BREAKDOWN OF DETERMINATIONS BY CHARGE

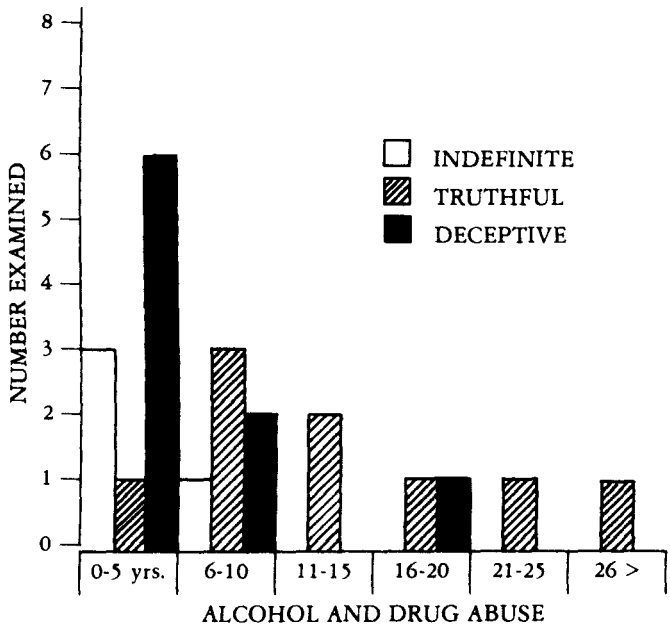


The classification of types of amnesia broke down as follows: 68% with patchy amnesia, 23% with hazy amnesia and 9% with complete.

In order that the function of the polygraph in these assessments might be better understood, further analyses by cross-tabulation were undertaken. In Figure 1, final polygraphic determinations were compared with type of charge. It should be noted that determinations of "truthful" or "deceptive" were fairly evenly spread out across charges, such that no particular type of charge resulted in a preponderance of one decision over another. Unfortunately, due to the nature of the forensic psychiatric assessment process and policies, verification of determinations was not possible from such sources as confessions, external evidence or court proceedings. Therefore, the determinations either rightly or wrongly must stand on their own merit.

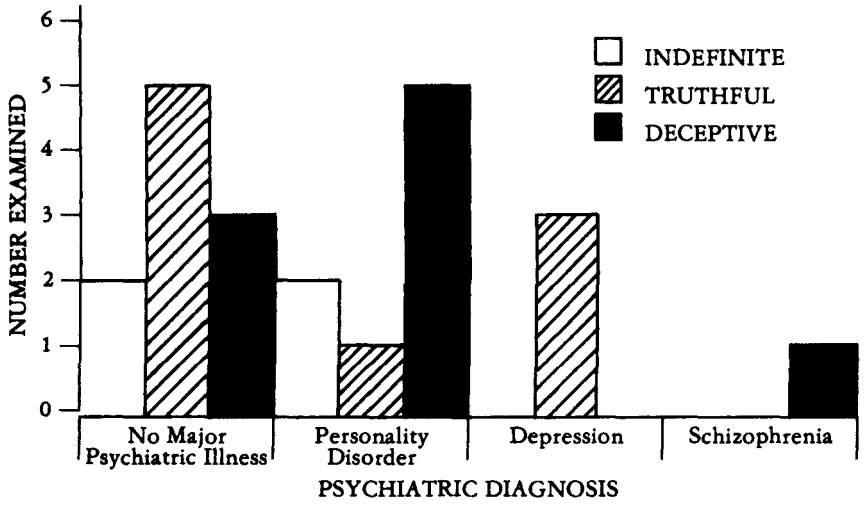
Figure 2 outlines the effect of cross-tabulating final decisions with history of alcohol and drug abuse. The most outstanding feature of this analysis is the preponderance of deceptive individuals in the range of 0 to 10 years of usage. Additionally, 36% of all final decisions fell into the deceptive classification in this range. The remaining decisions tended to equalize across the various ranges. This trend suggests that as the number of years of alcohol/drug abuse increased so too did the decision of truthfulness as to memory. Consequently, as the number of years of misuse decreased the determination of deception increased.

FIGURE 2
BREAKDOWN OF DETERMINATIONS BY ALCOHOL AND DRUG ABUSE



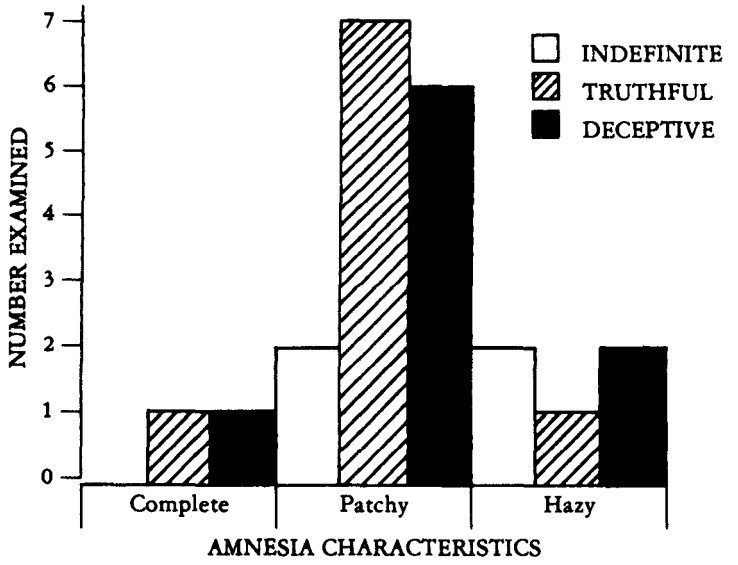
The results of comparing psychiatric diagnosis with the polygraph are outlined in Figure 3. Of interest here, is the breakdown of personality

FIGURE 3
BREAKDOWN OF DETERMINATIONS BY PSYCHIATRIC DIAGNOSIS



disorder and no major psychiatric illness (NMPI). In the NMPI category 50% of the patients were found truthful, with 30% deceptive and 20% indefinite. In contrast, the personality disorder group has 13% truthful, 63% deceptive and 24% indefinite. This result suggests that the personality disordered group, as might be expected clinically, were feigning amnesia as a possible manipulative technique.

FIGURE 4
BREAKDOWN OF DETERMINATION BY AMNESIA CHARACTERISTICS



The last figure outlines the breakdown of type of amnesia by determination. The patchy category which made up 68% of the decision was fairly evenly split, 47% truthful, 40% deceptive with 13% indefinite. The 23% hazy group was split 40% deceptive, 20% truthful and 40% indefinite. The main feature in this figure is that the rate of indefinites decreased somewhat with the severity of amnesia. That is to say, the less discrete or clear the amnesia period, the more potential for an indefinite decision.

Discussion

The purpose of the study was to research the phenomenon of amnesia using psychophysiological measures. As earlier discussed, polygraph has proved a beneficial psychometric technique in various applications of psychiatric assessment.[20] The results of this study suggest that polygraphy is also a very useful technique in exploring and delineating stages of alcohol/drug-induced amnesia.

The data suggest that the type of charge has little effect on the polygraph determinations. That is, decisions of truthful, deceptive or indefinite were fairly evenly spread across the various offences.

In contrast, polygraphic determinations when compared with alcohol/drug history present some interesting results. If we consider the purported amnesia in the light of abuse history, it becomes apparent that the longer an individual abuses drugs the greater are the chances of organic brain syndrome and therefore the greater the probability that he/she is being truthful when he/she recounts memory loss during periods of drug induction. A corollary of this statement might be, in light of the data, that the less one abuses drugs the less the chance of organic brain syndrome; therefore, the greater the probability that the purported memory loss is feigned. This finding correlates very highly with the Barland study on state dependent learning.[21] In addition, like the Barland study, there appears to be no foundation to the concern that state dependent learning is a mitigating factor in polygraph examinations of memory loss.

The result that 63% of personality disordered patients were found deceptive is an interesting finding. Firstly, many personality disordered patients exhibit psychopathic behaviours; psychopaths are quite often manipulative and resort to mendacity as an escape mechanism. The present finding suggests that they are in fact not capable of "duping" the polygraph as they might a clinical assessment.

Secondly, as they do quite often resort to deceptive tactics, the finding of 63% deceptive in this category lends support to the assumption that psychopaths utilize deceptive behaviour as a personality coping mechanism.

The data further outline that individuals with no major psychiatric illness were fairly evenly sorted into the three decision categories. Of singular note, is the finding of deception in the case of schizophrenia. According to Abrams, schizophrenia is a potentially distortive disorder

in terms of physiological responding and therefore in terms of determination.[22] In contrast, this particular case did not prove to be a problem in terms of clarity of autonomic tracings.

The data from the comparison with type of amnesia suggest that type is a factor of decision-making. In the "patchy" category, the decisions were split 40% deceptive, 47% truthful, with 13% indefinite. In contrast, the hazy group was 40% deceptive, 20% truthful and 40% indefinite. This dramatic increase in indefinites may reflect several features of lie detection in general. It has been proposed that, in the control question technique, it is easier to elicit a response from a deceptive relevant question than it is from a deceptive control question. In other words, numerical evaluation is dependent upon differential responsivity between critical crime questions and control (probable lie) questions. The theory, in essence, is that the control question is designed to elicit a response from a truthful individual which can be compared to the critical question.

It is logical to expect that an autonomic response to a critical question answered deceptively will be of greater magnitude than a control or probable lie question answering deceptively. Therefore, when we assign a determination, it is easier, due to the reasons previously outlined, to call an individual deceptive than it is to call one truthful. Furthermore, since hazy amnesia, by definition is not a discrete memory loss, the probabilities of a truthful person being classified as indefinite due to insufficient magnitude of responsivity is greatly increased. Additionally, since both patchy and complete amnesia have a more discrete cutoff point in terms of onset and offset, polygraphic determinaton of those types is more easily accomplished.

The present study attempted to demonstrate the usefulness of psychophysiologic measurement in determining drug-induced states of amnesia. The study also attempted to answer, in part, the question of whether or not state dependent learning is of real concern in studying memory loss. Both of these purposes were answered to some degree. Alcohol/drug-induced amnesia was shown to be a multi-faceted problem, particularly in reference to duration of abuse. That is, the number of years of abuse were found to be inversely related to probability of genuineness of amnesia. It was further suggested that type of offence did not play a significant role. Psychiatric diagnoses, in particular, personality disorder, played a significant role in the decision-making.

Finally, it was suggested that type of amnesia was a major factor in either decreasing or increasing the indefinite rate. In essence then, the clearer the period of memory loss, the greater is the probability of arriving at a definite decision of truthfulness or deception. It is apparent that the question of amnesia states and their assessment is far from answered. It is suggested that psychophysiological measurement can be very useful in detecting and delineating alcohol/drug-induced memory loss.

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