BRIEF RETROGRADE AMNESIA.

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THIS study of retrograde amnesia of brief duration is based upon information furnished by 117 persons who had undergone, according to their statements, one or more terrifying incidents. All were men on full military duty, with the exception of three civilians, included as being of particular interest. In many investigations the information has been obtained from patients in whom motives other than accuracy could have taken a part in their descriptions. A patient may invent, distort or exaggerate his amnesia for psychological, or material and pecuniary, aggrandisement. In this series 99 of the cases were voluntary applicants for officer-training.

Each subject was aware that he was being interviewed by a psychiatrist, but in spite of the importance to the candidates of appearing normal, 47 gave a history of amnesia. This is, no doubt, a minimal figure, as some would not refer to any matter they considered abnormal or detrimental to their applications. A tendency to minimize effects of terrifying incidents would be probable.

In this article the term "retrograde amnesia" will be used in the sense described by Guttmann (1944)—that is, when a sufficient length of time has elapsed for the function of recall to have "settled down again." This may be after a period of some months to many years since the incidents occurred. Russell (1935) stated that the memory of distant events usually returns before that of those more recent and that, in the post-concussional confusion period, incidents may be recalled which are forgotten after the return of full consciousness. The process appears similar, psychologically, to that which occurs under semi-anaesthesia or mild hypnotics, when repression is reduced, but may be re-accentuated when the patient has emerged from the semi-conscious state, unless he is compelled to face the subject-material previously repressed. Case 1 demonstrates the necessity of allowing sufficient time to elapse for the amnesia to be reduced to its minimum without treatment (Rudolf, 1944).

CASE 1.—Bomb exploded about 7 yards distant. For a few days after this event, the sound of the explosion, the pause while he thought "must get down," the blast on the back and the concrete falling around was all that could be recalled. Amnesia for from one-half to one minute previous to explosion. Gradually, over about 10 days, and at first indistinctly, the whole of the amnesic gap was filled in without any conscious active process by self or others.

In this paper, brief amnesia preceding an injury and amnesia associated with a terrifying incident without concomitant physical trauma will be discussed. Hysterical amnesia with a prolonged duration will be excluded.

The knowledge of amnesia depends upon the account given by the patient.

Consequently, paramnesia or retrospective falsification might possibly occur, especially as considerable periods elapsed before the subjects were interviewed. Nevertheless, previous authors, such as Somerville (1931) and Russell (1932), believe that the account given by the subject is usually accurate, although Somerville describes an exceptional, personal incident in which the patient believed, for at least 17 years, that Somerville had knocked him down, whereas another cyclist had done so. The subject on recovering from unconsciousness saw Somerville standing beside him, and associated Somerville, the first person seen after regaining consciousness, with the last event before being knocked down.

Russell (1932) reported that of 96 cases of head injury showing retrograde amnesia, in no case was memory of the blow recollected if unconsciousness had occurred. In the present series 34 cases reported unconsciousness, but not necessarily with head injuries. Of these 34, eight recollected, without receiving psychotherapy, the blow that immediately preceded the loss of consciousness.

If a subject gives a coherent, continuous and reasonable account, and if he gains nothing by denying it, a history of unconsciousness in association with an incident will probably be reliable. However, the so-called unconsciousness may, in reality, be an amnesia, the subject having been fully conscious at the time of the incident. The unconsciousness may have been a dazed feeling, which was interpreted as unconsciousness. The subject may have been informed that he had been concussed and assumed that unconsciousness had developed. Perhaps, when dazed, he may have been given drugs or an injection which sent him, immediately, to sleep (Case 2). Consequently, a statement by a patient that he has been unconscious does not necessarily imply that he has been concussed.

CASE 2.—Sergeant recalled being led to first-aid post and being in a lorry. Recalled going in ambulance to a church and being in a ship. Under hypno-analysis, recalled going to a second aid post, where he was given bromide. If analysis had not been carried out, the administration of the bromide would have been unknown, and all amnesia subsequent to this N.C.O. being in the lorry would have been considered to have been psychological. In reality it was, possibly, partly chemical in origin (Rudolf, 1944).

To obtain reliable information about the presence of unconsciousness, trained witnesses would be required, but accurate decisions of the duration of unconsciousness may be impossible to make. Consciousness may return intermittently; it may be broken by periods of sleep or unconsciousness. The subject may have carried on his activities, apparently normally, for minutes or hours after a severe blow before losing consciousness (Case 3).

CASE 3.—Recalls being struck by hockey stick, following which was conscious for about 1½ hours. Then unconscious for a day.

In view of the difficulties inherent in the assessment of unconsciousness, the statements made by subjects quoted in this article should not be, necessarily, regarded as reliable. As statements with regard to amnesia are the conscious beliefs of the subjects, such statements can be accepted, especially, as in the cases described here, a tendency to hide rather than to expose amnesia would be more likely.

Psychopathy.

According to Schaller (1939), the presence of amnesia for the injury is one of the diagnostic points between post-traumatic concussion state and post-traumatic psychoneurotic state, amnesia being present in the first.

Table I shows the percentage of psychopathic symptoms and signs found in the present series. All the cases were interviewed by the same psychiatrist for the purpose of judging their suitability for appointments, so that approximately equal investigations were made in each case. The table shows that equal proportions of those who recalled their injuries and of those who showed amnesia for the injury gave evidence of psychopathy.

Table I.—*Psychopathic Signs in Cases who had Received Physical Injury.*

	Recalling injury.	Amnesia.	Total.
With psychopathic signs	18 (58·1%)	13 (41·9%)	31 (33·0%)
Without psychopathic signs	37 (58·8%)	26 (41·3%)	63 (67·1%)
	55	39	94

Table I shows that one-third showed psychopathic signs. That this proportion is not confined to cases who have received injury is demonstrated by Table II, in which 250 men who had not passed through terrifying experiences, and who were interviewed for the same reasons and by the same psychiatrist as those of Table I, gave a similar proportion.

Table II.—*Cases not Involved in Terrifying Experiences.*

With psychopathic signs	83 (33·2%)
Without psychopathic signs	167 (66·8%)
	250

Tables I and II suggest that men with psychopathic signs do not appear to be more liable to pass through alarming incidents due, for example, to their own emotions, to accident-proneness or to exaggeration of events, in reality trivial, than do others without these signs. The tables give no indication of the true proportion of psychopathy amongst the adult male population of this country, as selection of the men had been made, firstly for the Army and secondly for promotion. A further selection had taken place, for many men had been referred by combatant officers because they were considered "queer" or unusual.

The criteria of psychopathy were taken to be evidence of abnormal emotional conditions, even though these were not of sufficient intensity to affect appreciably the efficiency of the sufferer. Evidence of psychopathic symptoms at a early age only, e.g. childhood fears of the dark, were not used as criteria, although those who had suffered from marked childhood fears were still, possibly, affected emotionally by these earlier disturbances.

Cases.

The cases described briefly below have been selected as being representative of different aspects of the subject, They can be divided into :

A. Full recall of injury with, or without, unconsciousness.
B. Amnesia for injury with, or without, unconsciousness.
C. Amnesia antecedent to injury.
D. Amnesia without injury.
E. Repeated terrifying incidents.
F. Indefinite retrograde amnesia.
G. Recoverable memory.
H. Non-recovered memory.
I. Fear without injury.
J. Post-traumatic unconsciousness.

A. *Full Recall of Injury.*

Case 4.—Struck by lorry. Recalls head hitting vehicle. Unconscious.

Case 5.—Bicycle wheel struck curb. Recalls being thrown off and nose striking pavement. Unconscious.

Case 6.—Car struck a mine. Hit on chin by Bren gun. Recalls movement of car and blow on chin. Unconscious.

Case 7.—Recalls seeing flying bomb approaching, running from it and hearing its explosion. Unconscious.

Case 8.—Recalls sound of explosion, being carried along through the air and hitting wall of hut, which collapsed. Not unconscious.

Case 9.—Heard explosion, saw flash, felt his bicycle slide from under him and recalls falling on to ground. Not unconscious.

Case 10.—Recalls being lifted off bicycle by blast and hitting the ground. Not unconscious. Cannot recall hearing the sound of the explosion that produced the blast. This does not necessarily mean that an amnesia for the explosion occurred. Cases 11 and 12 demonstrate this point.

Case 11.—Recalls walking, carrying pail of water in each hand, when heard sound of the bomb falling. Felt push in the back from the blast and fell to the ground. As recalled sound of the bomb falling and feeling the blast, repression of the intermediate event, namely, the explosion, is improbable. Both the sound of the bomb approaching and the anticipation of death or injury as he was being pushed to the ground would be alarming. Not unconscious.

Case 12.—Recalls standing, seeing flash of explosion, feeling the blast, being carried about one yard and sitting down on the ground. Not unconscious. Here, also, repression of the sound of the explosion, when both the flash and the blast were remembered, is improbable.

B. *Amnesia for Injury.*

The cases immediately following demonstrate that amnesia is not related to the type of accident.

Case 13.—Recalls crashing of falling building and of his being in the air, but not of falling and striking the ground.

Case 14.—Recalls whistle of falling bomb and picking himself up about 4 yards away from his first situation. Amnesia for the sound of the explosion, for travelling through the air and for striking the ground. Not unconscious. If this subject had been travelling at an acceleration of from 300 to 400 g, the acceleration which is required to produce concussion without being struck by blast or other agent (de Haven, 1942), he would have been destroyed on striking the ground.

Case 15.—Recalls saddle slipping and his coming off his horse, but amnesia for flying through the air and striking iron fence about 3 yards distant. Unconscious.

CASE 16.—Recalls, when on motor-cycle, seeing cyclist ahead, thinking must turn to right, putting on breaks and shutting off petrol about 15 yards from the cyclist. Amnesia for striking cyclist. Unconscious.

CASE 17.—Was passenger in car struck by another car. Amnesia for about one mile before reaching scene of accident. Unconscious.

CASE 18.—Drove motor-cycle into lorry. Amnesia for about 1½ miles preceding accident. Unconscious.

CASE 19.—Recalls seeing knee coming towards him about 6 inches distant, when playing Rugby football, but amnesia for the blow. Unconscious.

CASE 20.—Recalls beginning of dive to tackle at Rugby football, but amnesia for finish of dive and for kick on head. Unconscious.

CASE 21.—Recalls walking across road and placing foot on opposite kerb. Cannot recall seeing bicycle approach and feeling it strike him. Unconscious.

CASE 22.—Recalls walking on edge of swimming-bath, but amnesia for foot slipping, head striking floor and falling into the water. Unconscious.

CASE 23.—When walking along breakwater fell on to shingle below. Amnesia for walking on breakwater and for falling. Unconscious.

C. *Amnesia Antecedent to Injury.*

CASE 24.—Woman knocked down. Amnesia for posting letter on a country 'bus until in her house on opposite side of road. Hypno-analysis carried out in sessions spread over several days. Memory regained for crossing road after 'bus had begun to move, for seeing cyclist coming round towards her from front of 'bus, for seeing his hat fall off and his front wheel skid towards 'bus, for taking step towards 'bus, for being struck in back, finding herself on the ground lying on face and towards right shoulder, hearing sound of bicycle and man falling on her and feeling back of her head struck. The sensation of feeling the head struck was recalled one visit before that in which she recalled the feeling of her back being struck, and two visits before the memory of falling on the ground was regained. Apparently the most repressed part of the amnesic period was not in direct connection with the injury, i.e. the blow on the head. If the retrograde amnesia had been due to the physical injury, the most difficult part of the memory to recover would have been that immediately preceding the injury. The most difficult part, i.e. the last to be regained, was the passage through the air while the woman was falling to the ground.

Once safely on the ground, the fear of serious injury or death was less great than when falling to the ground, the falling being of greater emotional significance than the injury to the head.

CASE 25.—Man could jump easily over rope or solid log 3 ft. in height, but unable to make himself jump over solid wall of equal height. Wished to be trained as paratrooper, but when ordered to jump wall about 2 ft. 6 in. in height and about 1 ft. 6 in. in width, ran up to it, put his foot on it, but was unable to jump over it. About half-a-dozen unsuccessful attempts. Consequently unable to become paratrooper.

At 14 years of age, when jumping over wall 2 or 3 ft. in height caught foot on it, fell forward and broke wrist. Recalled jumping and hitting ground, but amnesia for striking wall with foot, although informed by observers had done so. Not unconscious.

Presumably, the moment of greatest fear was as the foot struck the wall and so previous to the possibility of greater injury due on striking the ground.

D. *Amnesia Without Injury.*

The brief period of amnesia preceding an injury is often thought to be due to organic disturbance. The fact that it is possible to recover the memory up to, and including, the moment of physical impact, even many years after the incident, points to a psychological rather than to a physical cause. Amnesia similar to that preceding injury may occur without any physical trauma, as is shown by the following cases:

CASE 26.—Amnesia, often known as " black-out " amongst paratroops, for first and second jumps when training. It commenced, as is usual, as jump began and, on first occasion, terminated as the parachute made the usual sound when coming out of its haversack. The amnesia, therefore, ceased before the occurrence of the jerk due to the 'chute opening, but as soon as the man knew safety was assured. In many cases the amnesia ceases when the tug of the 'chute opening is felt.

CASE 27.—An experienced paratroop major, with 27 jumps to his credit, stated that " black-outs " occurred in each of his first few jumps until the 'chute opened. The lengths of the periods of amnesia became progressively less until they ceased at the tenth jump, when, so he said, he " had gained complete confidence in the equipment." No further amnesia, although, as is usual with all paratroops, suffered from marked fear until the light in the aircraft was turned on.

CASE 28.—An instructor who had jumped from aircraft between 30 and 40 times in controlled jumps, i.e. automatic opening of 'chute, carried out a free jump, i.e. in which he himself opened the 'chute by pulling the rip-cord. From the moment of jumping at 3,000 ft. until he pulled the rip-cord at about 600 ft., he was unable to recall his sensations. Amnesia, therefore, occurred when this officer was unable to rely on an automatic process for his own safety but was compelled to rely on himself. He pulled the rip-cord considerably later than did three others who jumped with him.

The amnesia is not likely to be due to falling through the air or to somersaulting, as amnesia is not only not constant, but comparatively rare amongst paratroops. Case 29 demonstrates that memory can be retained when upside-down. Paratroopers and acrobats are aware when they are somersaulting.

CASE 29.—Baled out at 26,000 ft., but did not pull rip-cord until below cloud at 20,000 ft. During this fall recalls seeing feet higher than head. Saw one knee boot coming off, bent to it and pulled it on. Felt as if in easy chair with feet raised. When pulled rip-cord must have been travelling at about 120 m.p.h. (*Brit. Med. J.*, 1945). The maximum velocity that can be tolerated, without discomfort, providing jaw movements or swallowing are carried out to clear the ears, is stated to be 114 m.p.h. (Matthews, 1945.)

E. *Repeated Terrifying Incidents.*

Although the fear of imminent injury or death is nearly universal, its intensity varies from person to person, and in the same individual from incident to incident. Of 18 subjects who had undergone more than one alarming experience, 10 recalled the whole of their multiple experiences, including the moment of impact; 7 showed amnesia for one experience only, and 1 individual amnesia for more than one. In the seven, the amnesia was for the first incident in each case, and not for the second.

Of four cases with three experiences each, one recalled all details in all three experiences, one showed amnesia for the first and third experience, the third for the second experience only, and the fourth for the third experience only.

The following cases are illustrative:

CASE 30.—*First experience:* Holding hose-branch, when heard bomb explode and was blown sideways.

Second experience: Lying down, two days later, when heard bomb falling and was rolled over by blast.

Third experience: On following day, standing, when heard explosion of land-mine and was blown about 5 ft. and over.

No amnesia for any incidents.

CASE 31.—*First experience:* Passenger in car when it was struck by a second car. Recalls car being pushed across road, but amnesia for its striking a wall and for his head being struck. Unconscious.

Second experience: Recalls seeing flash of explosion, feeling blast hit him, being carried along about 12 ft. and being thrown over.

Third experience : Walking when found himself lying down. Amnesia for cause of this action.

CASE 32.—*First experience :* Recalls standing, being blown over, and rolling over and over until fell into trench.

Second experience : Recalls sound of explosion when in truck. Amnesia until found himself getting up from grass. Probably unconscious for short period.

Third experience : Recalls sound of other, more distant, bombs falling and exploding, but not the sound of the nearest bomb exploding, but only of its fall. (See Cases 11 and 12.)

CASE 33.—*First experience :* When cycling, in dazzling sunlight, rode into van. Recalls striking van and falling on to road. Not unconscious.

Second experience : Recalls, when cycling, motor-cycle approaching about 10 yards away. His front wheel was struck by motor-cycle, but amnesia for impact. Unconscious.

Third experience : Recalls engine of flying bomb stopping, bomb exploding, ceiling shaking and coming down on to him. Not unconscious.

CASE 34.—*First experience :* Recalls stone coming towards him, attempting to dodge it and it striking him on the bridge of his nose. Unconscious.

Second experience : Recalls sound of explosion and being pushed to ground. Not unconscious.

CASE 35.—*First experience :* Recalls shell exploding, going flat and being wounded in neck.

Second experience : Recalls explosion of shell on wall of trench and his going flat. Not unconscious.

CASE 36.—*First experience :* Recalls flash of explosion, travelling through the air and falling down on to path. Not unconscious.

Second experience : Recalls sudden orange glow and being pushed on to ground. When sitting on the ground, heard the explosion. Not unconscious.

CASE 37.—*First experience :* Recalled sound of explosion and feeling the blast.

Second experience : Knocked out when boxing. Recalls the blow.

CASE 38.—*First experience :* Recalls explosion of a flask in a laboratory and of burning methylated spirit being thrown on to his face and hands.

Second experience : Recalls explosion of bomb and his falling on to ground.

CASE 39.—*First experiente :* When cycling, his front wheel struck by car from the left. Recalls nothing after about 100 yards before scene of accident. Unconscious.

Second experience : Recalls sound of explosion, smoke, flying bricks and the blast blowing him over.

CASE 40.—*First experience :* Recalls being lifted off ground and flying through the air, but amnesia for striking wall, furniture and floor. Unconscious.

Second experience : Recalls explosion of bomb, travelling through the air and coming down on to the ground.

CASE 41.—*First experience :* When climbing wall, grasped stone flower-bowl, which broke. Amnesia for falling, striking ground and raising himself on hands and knees. Unable to recall flower-bowl falling on his chest or the cause of a bruise on back.

Second experience : Recalls hearing bomb falling, feeling blast strike him as he was dismounting from his bicycle, and hearing the explosion. Not unconscious.

CASE 42.—*First experience :* Recalls falling, but not striking a boot with his right temple. Unconscious.

Second experience : Recalls that, when crouching down, heard explosion and went over on to floor. Not unconscious.

CASE 43.—*First experience :* Saddle of cycle fell off. Recalls coming off bicycle, feet hitting ground, falling towards ground, but amnesia for head striking ground although chin injured.

Second experience : Recalls bomb exploding and windows and ceiling falling.

F. *Indefinite Retrograde Amnesia.*

In some cases, such as the following, where the subject was in bed and, perhaps, sleeping, doubt exists as to whether retrograde amnesia occurred. Sleep may have been sufficiently deep for repression to be unnecessary. That

sleep may not be affected by an explosion, although other effects are disturbing, is shown by an experience in which the author awoke feeling the bed vibrating. A few minutes later an explosion was heard followed by vibration of the bed equal in extent and duration to the first. Presumably, as equal vibration occurred on both occasions, the sounds reaching him would have been equal.

CASE 44.—Asleep in bed. Woke up on the floor without recollection of an explosion or of being lifted out of bed.

CASES 45 and 46 demonstrate the awareness of the situation. Both cases recall sounds of the explosions, being lifted out of their beds and dropped on to the floor.

G. *Recoverable Memory.*

Usually with treatment, as for example, hypnosis, full memory can be regained up to, and including, the moment of impact, as shown by Cases 47 and 48, described as exemplifying widely different types of trauma:

CASE 47.—Tram-driver showed amnesia from a passenger entering his tram, about 50 yards before the tram-car crashed into a 'bus, until he woke in hospital. Under hypnosis, memory regained up to the caving-in of the metal front of tram striking him in the chest and knocking his head on door behind him.

CASE 48.—Clergyman possessed amnesia for room in house in which he had lived for 10 years. Under hypnosis, regained memory of room, and of a friend of his father losing his temper, rising, coming towards him, placing his hands on his throat and nearly strangling him, about 30 years previously.

H. *Non-recovered Memory.*

In some cases the brief period of amnesia immediately preceding the impact, whether or not unconsciousness occurs, appears to possess particular significance. In these cases the final fraction of a second may not be filled in, as exemplified by Cases 49 and 50:

CASE 49.—Amnesia for getting into lorry until in hospital. Under hypnosis, memory regained for entering lorry, sitting on a box, lorry turning a corner, box swaying, going over side of lorry, falling head-first towards road until eyes level with wheel-hub. The final part of the fall of one or two feet and striking the ground was not recovered.

CASE 50.—Adjutant showed amnesia for stopping one of his lorries and riding in it until awoke in hospital. Under hypnosis, memory recovered for riding in lorry, standing looking over roof of cab, lorry striking stationary car, his leaving the lorry and travelling through the air upwards. Falling and striking the ground was not recovered.

Similar incomplete results were obtained by Sargant and Slater (1941) in neurotics, who dated their amnesic disturbances from concussion or from being blown over. These authors considered that these very brief periods of amnesia remaining after treatment were presumably organic in nature.

This view is supported by the evidence from Cases 51 and 52, in which no possibility of the knowledge of an impending accident existed. In both cases the blow causing concussion fell on the back of the head whilst the soldier was performing work unassociated with danger. Neither man could have been aware of the approaching object. In one case no retrograde amnesia occurred; in the other all events up to, but excluding, the blow were recollected.

CASE 51.—As clearing undergrowth was struck on back of head by a tree felled by another man. Was unaware that tree would strike him. Recalls blow; no retrograde amnesia; concussed.

CASE 52.—As bent down, plank struck him on back of head. Concussed and cannot recall blow. Was unaware plank was falling, and man working on scaffolding above him was unaware plank had fallen. No other man in neighbourhood who could have warned him of the danger.

In neither case did retrograde amnesia, other than for a fraction of a second, occur.

1. *Fear Without Injury.*

Feelings of fear were well described by—

CASE 53.—Captain who had made 13 parachute jumps and who was accustomed to running in flat races in which physical injury was improbable. Stated that feelings of fear, e.g. in stomach, were identical whilst waiting to start in a race and waiting to jump from aircraft. In the first, the condition was of possible psychological trauma, i.e. loss of prestige, whilst in the second it was of possible physical trauma, i.e. death.

The possibility that the whole, or a part, of the fear while waiting to jump was due to a possible loss of prestige due to showing fear or refusing to jump is unlikely for two reasons. First, it is common knowledge among paratroopers that fear is always felt before jumping, although it may stop when the light goes on. The regularity of this fear was reported by a man who had made 40 jumps. Second, fear of refusing to jump cannot be of great intensity when a man has jumped many times and has complete confidence in his equipment. In addition, he knows that if he hesitates and the R.A.F. man does not push him out of the aircraft, the man behind him in the stick will do so. In consequence, he is unlikely to fear that he will not leave the plane.

Amnesia can, of course, be due to guilt. This cause is unlikely in paratroops, as the men are carrying out their acknowledged duty.

An instructor, who had carried out between 60 and 70 jumps, found that the men, although always feeling fear, do not invariably consciously attach their fear to the possibility of becoming a "Roman Candle." Some may fix their fear upon going through the door of the aircraft and others on the landing. On operations the men are usually more anxious about the operations than the jump, although when on non-operational jumps the same men would be consciously afraid of the jump itself.

Although these "black-outs" are normally unconscious protective devices, one officer stated that he was terrified so greatly during his first two or three jumps that he compelled himself to make his mind blank. This officer did not appear to be a coward, since later he volunteered for, and was engaged in, special individual work in Greece of a highly dangerous nature.

The "black-outs" of parachute jumping are causally dissimilar to those occurring in air-crew when an aircraft goes into a tight turn. The last occur constantly, being related to the magnitude and duration of g, and not to the subject having confidence in his aircraft. The tight turn, by increasing g considerably, increases the weight of the body-tissues. The writer has no information as to whether the retrograde amnesia and disorientation found after unconsciousness due to complete "black-out" in air-crew are physical or psychological in origin.

J. *Post-traumatic Unconsciousness.*

The length of the post-traumatic unconsciousness is commonly used as a gauge to the severity of the physical injury. If the pre-traumatic amnesia were also produced by the physical injury, a relationship between the length of the retrograde amnesia and the post-traumatic unconsciousness might be expected. As far as the subjects' statements are reliable, Table III shows that no direct relationship exists. The divergences are so great, e.g. retrograde amnesia of one or two seconds with post-traumatic unconsciousness of 15 minutes in one case and of 24 hours in another, that some significance may, perhaps, be attached to them. Russell (1932) believes that the patient's "subsequent memory of when he woke up provides a not inaccurate indication of when consciousness returned," so that "the duration of unconsciousness can be estimated with fair accuracy even when the patient is seen for the first time long after the accident."

TABLE III.—*Length of Retrograde Amnesia and of Post-traumatic Unconsciousness.*

A=Duration of retrograde amnesia.
B=Duration of post-traumatic unconsciousness.

Number of cases.	A.	Number of cases.	B.
13	Under 1 sec.	2	Few secs.
		1	2 mins.
		2	Few ,,
		2	10 ,,
		1	15 ,,
		1	1 hr.
		1	2 hrs.
		1	Few ,,
		1	7 ,,
		1	3 days.
2	1 sec.	1	4 hrs.
		1	6 ,,
4	1–2 secs.	1	15 mins.
		1	3 hrs.
		1	8 ,,
		1	1 day
1	5 secs.	1	15 mins.
1	2 mins.	1	6 hrs.
1	Few mins.	1	1 min.
1	20 mins.	1	2 days

DISCUSSION.

Mayer-Gross (1943) examined the brief retrograde amnesia occurring in patients undergoing electric convulsive therapy. As he found that, in more than 100 experiments in over 40 psychologically abnormal persons, amnesia occurred for subjects with, apparently, no emotional value, he considered that retrograde amnesia could not be due to guilt or the unpleasantness of the situation.

The view that retrograde amnesia is due to cerebral injury destroying the traces, or engrams, of the immediately preceding impressions cannot be accurate in paratroopers, since no cerebral injury occurs.

Mayer-Gross (1943) advances the view that retro-active inhibition may occur. In this inhibition the latest memory traces, which are still in process of consolidation, are prevented by the cerebral disturbance from being properly formed and organized. Mental or physical effort immediately following learning disturbs recollection. Neither cerebral disturbance nor effort takes place during a controlled parachute jump. The 'chute opens without the man taking any action, and the sensation of floating down to the earth is pleasant and, frequently, so exhilarating that the man sings as he descends, even below the level of 18,000 to 22,000 ft., at which euphoria due to decrease of oxygen may occur (Matthews, 1945).

Since, with appropriate methods, memory can be recalled, retro-active inhibition cannot have prevented the latest memory traces from being formed, or, if formed, they cannot have been destroyed.

The dread of electric convulsive therapy which, although less than that of chemical convulsive therapy, may cause the patient to refuse further treatments, may possibly produce the retrograde amnesia examined by Mayer-Gross. The fact that the subjects forgot non-emotional objects shown to them during the period immediately preceding the treatment is to be expected, for all objects, whether with or without emotional value, are consciously forgotten during a period of complete amnesia.

Whether or no the retrograde amnesia associated with electric convulsive therapy is causally similar to that preceding terrifying incidents, that of the parachute jump appears similar in origin to the retrograde amnesia associated with physical injury.

Parfitt and Gall (1944) stress mental preoccupation as a cause of prolonged amnesia. In brief retrograde amnesia of a psychological type a strong preoccupation with the fear of death is, presumably, present, although consciously there may be no knowledge of this. During hypnosis, the abreaction may be exceedingly marked as the terrifying incidents are brought into consciousness. In addition to the major events, minor sensations, unconnected with the danger, e.g. colour of the surroundings, may be described. If the mind had been entirely preoccupied with the intense fear, matters not directly connected with the cause of the fear would have been ignored.

Once repression has been initiated by fear, a time-mechanism rather than a subject-mechanism is in force. The beginning of the repression is preceded by conscious thought, either pleasant or unpleasant, but its end appears to be determined by an unconscious process appreciating that danger is past.

Conclusions.

From a study of 117 cases the following conclusions were reached :

1. Brief retrograde amnesia may occur—

   (*a*) Preceding injury with or without unconsciousness.

   (*b*) Preceding anticipated, but not actual, injury.

2. Duration of retrograde amnesia is not related to the duration of post-traumatic unconsciousness, as given by the patient.

3. Period of greatest repression may be immediately before physical trauma or may be a fraction of a second before the trauma occurs.

4. Of cases undergoing injury, equal proportions of those recalling injuries and of those with retrograde amnesia gave evidence of psychopathy, as assessed by the same observer.

5. Either similar or dissimilar reactions may occur in an individual undergoing more than one terrifying experience.

6. Retrograde amnesia is not due, necessarily, to cerebral injury destroying traces of impressions, to retro-active inhibition, to mental preoccupation or to organic causes. The hypothesis is supported that retrograde amnesia connected with actual or possible physical injury is, in large numbers of cases, due to repression caused by fear, with the exception of a period of less than a second in duration, which may be due to organic disturbance as from a blow to the head.

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