Chapter 2

Literature Review
Forensic psychology, often called “the study of criminal minds” deals with the scientific study of abnormal behaviour of the criminals. It studies the relationship between the victim and the criminal and the reason behind the act of crime. The behaviour assessed and reported by forensic expert provides the lead to the investigation to arrest the criminal (Brent Turvey, 1998). The forensic expert recommends suggestion for further investigation, clinical treatment, if required and/or any other information by the court. i.e. assessment of future risk of crime or evaluation of witness credibility (David Canter, 1986). Thus, it has become an important source of information in variety of legal context including criminal court, correctional settings, juvenile, family and civil courts. It is used to assist the investigators to unfold the crime and thereby get justice to fight against the crime.

The forensic psychological profile is based upon the study of crime scene, suspect’s observation, interview and psychological tests. The police investigators adhere to this technique, which is an important area in the discipline of forensic psychology.

Various theories like biological theory, learning theory, conditioning theory, motivation theory, analytical theory, behavioural theory have strived to understand the behaviour pattern of the criminal during the crime. Early research has tried to understand the criminal behaviour in relation to genetics. Lombrosso (1836-1909); the criminal anthropologist stated that some people are genetically predisposed to criminality and anti-social behaviour. Sheldon and Hevens, (1942) studied that the body type and delinquency has a strong link between the mesomorphic body type (hard and muscular) and crime. Pearson and Roberts (1972) found that delinquents tend to be smaller shorter and reach puberty at later age; whereas West and Farrington (1973) found no relationship between height, weight, physical strength and crime.
Osborn and West (1979) compared criminal families with non criminal families in which they observed that 40% of sons of criminal families became criminals whereas in non criminal families only 13% of son became criminals. A study done by Robbins (1966) and Bowbly (1946) showed that the children coming from disturbed families and maternal deprivation are vulnerable to criminality. Wells and Rankin (1988) suggested that very strong or very weak paternal involvement can increase the likelihood of criminal behaviour.

Hans Eysenck (1973) suggested that criminal behaviour is an interaction of body with the environment. How and what does the individual learn from the environment is important in development of personality. Marx and Engles have given theory of conflict to understand criminal behaviour. The consensus of crime believes that crime is an act which is disapproved by society. Therefore, the definition of crime changes as per the need of society. The classical theory states that certain people commit crime at their own wish. They make choice and break the law, as they feel satisfied in taking the risk of crime, while some people commit crime to fulfil their deprived need.

**Evolution of Psychological profiling:**

Various psychological theories are roped in to understand criminal and the criminal act. In early 1800s, the informal profiling was done by medical fraternity. Dr. George Philips and Dr. Thomas Bond, two physicians did the profiling of Jack – The Ripper who had raped and murdered prostitutes near White Chapel. Dr. Walter Langer, a psychiatrist (1943) during World War II did psychological study of Adolf Hitler for Office of Strategic Services. Dr. Walter’s profiling was based upon the interview of close associates of Hitler who were available to United States
Intelligence agencies. Dr. Walter profiled Hitler as “Probably a neurotic psychopath bordering on schizophrenia and would commit suicide”. This analysis of Hitler was published as “The Mind of Adolf Hitler” in 1972 and became best seller. The profile of President J.F. Kennedy was done by Kruschev. Thereafter a lot of profiling work done was which mainly relied upon intuition and formal studies.

In 1956, Dr James Brussel, a Psychiatrist was asked to study the case of “Mad Bomber” in which he profiled George Metesky as “unmarried, foreign, self-educated, in mid 50s, living in Connecticut, paranoid and with vendetta against Cod - Edison power company who was alleged to plant 30 bombs in 16 years in New York. This helped the New York Police to identify George Metesky and solve the case.

The definition of profiling given by Howard Teten, the “father of profiling” is:

“It is a method of identifying the perpetrator of a crime based on an analysis of the nature of the offense and the manner in which it was committed. Various aspects of the criminal’s personality make up are determined from his or her choice of actions before, during and after the crime. This information is combined with other pertinent details and physical evidence, and then compared with the characteristics of known personality types and mental abnormalities to develop a practical working description of the offender.”

In 1972, FBI formed Behavioural Science Unit (BSU) to investigate the serial murder and rape cases. From 1976 to 1979 BSU and FBI team members along with the prominent profilers; John Douglas and Robert Resseler interviewed 36 serial murderers and rapists to develop theory and categories of different types of offenders. The FBI has given the theory of organized crime v/s disorganized crime (Douglas, J, 1980; Douglas, J, 1986)
Organized Crime:

An organized criminal engages in a great deal of planning before executing the crime. He chooses victim who is at a low risk for being apprehended. He controls crime scene and does clever manipulation before and after crime. He typically leaves behind the exculpatory evidence at the crime scene. The organized criminal is usually methodological, manipulative and cunning with an amiable façade, typical like psychopath, sociopath or antisocial personality. (Cleckley, 1976; Hare,1993; Schlesinger, 1980)

Disorganized Crime:

The disorganized criminal is mentally unstable and suffering from personality disorder like schizoid, borderline and sometimes major mental illness like schizophrenia. Generally, he is physically unattractive, unkempt, disheveled and quite putting-off for a woman. He is a loner and has limited interaction with females. He has poor self image and verbal skills. He picks up victim impulsively because of which he is usually caught after one or two criminal attempts.

The personality characteristics are broadly classified as under:-

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<tr>
<th>S.N</th>
<th>Organized criminal</th>
<th>Disorganized criminal</th>
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<tbody>
<tr>
<td>1</td>
<td>Psychopath, Antisocial, Narcissistic personality</td>
<td>Borderline, Schizoid, Schizophrenia</td>
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<td>2</td>
<td>Pleasant looking and physically attractive</td>
<td>Strange looking often odd, unkempt and disheveled</td>
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<td>3</td>
<td>Will have wife, girlfriend(s) and interactive with females</td>
<td>Minimal interaction with females</td>
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<td>4</td>
<td>Has family life</td>
<td>Lives alone or with older family members</td>
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<td>5</td>
<td>Good communication skills</td>
<td>Poor communication skills</td>
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<td>6</td>
<td>Conflict with authority figure</td>
<td>History of psychiatric treatment and suicide attempts</td>
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John Douglas developed a systematic way to detect and classify major personality and behavioural characteristics of a criminal based upon the analysis of the crime(s) he has committed. He has given the steps to follow while developing the profile of the criminal.

1. **Data Assimilation**: It involves the collection of all available information at the place of offence, victim and witness from as many sources as possible. (police reports, victim profile, autopsy report, photographs of crime scene and statements)

2. **Crime Classification**: It integrates the information into a framework which classifies offender into “organized” or “disorganized”.

3. **Crime Scene Reconstruction**: The expert reconstructs the crime scene to generate hypotheses about the behavioural sequence of the crime, i.e. behaviour of victim, Modus Operandi and sequence of act.

4. **Identify the offender’s Signature**: On observing the crime scene, the expert makes an attempt to understand the behaviour of the criminal at the time of crime to satisfy his psychological needs.

5. **Generating a Profile**: It includes hypotheses about geographical location of the criminal and his reason for selection of the victim. The criminal’s physical characteristics, behavioural habits and abnormal behaviour at the time of committing crime.

The profile generated gives specific information about criminal such as:

a. Demographic information such as age, race, occupational skills, marital and socio-economic status

b. Educational level and estimates of intellectual functioning.

c. Legal and arrest history

d. Military background

e. Family characteristics

f. Habits and social interest

g. Evidence in relation to the crime scene

h. Age and type of vehicle
i. Personality characteristics including possible form of psychotherapy and
j. Suggested interview techniques

6. Apprehension: The profile developed is thereby cross checked with the suspect(s) to establish his/her association with the crime.

According to the FBI agents, the cases involving destruction of the property, assault or murder, during the commission of robbery, are generally unsuitable for profiling since the personality of the criminal is not revealed at such crime scenes. Likewise, drug induced crime are not suitable for profiling because the true personality of the criminal is altered in the drug induced state. Therefore, not all types of crime are suitable for profiling.

David Canter, a psychologist from Britain, was called by the police in 1985 in “Railway rapist” case. He analysed the 100 serial homicides to test the FBI model of disorganized /organised crime. David Canter developed “Investigative Psychology (1990) as an independent suspect in the field of Psychology. Brent Turvey (2001) in his Behaviour Evidence Analysis theory gave two approaches for profiling namely: Inductive and Deductive profiling.

**Inductive Profiling:**

It is a technique which generalizes criminal by its behavioural and demographic characteristics shared by other established criminals who are arrested. It assesses the similar characteristics and common personality traits of the crime committed by different criminals involved in a similar kind of crime. The profile focuses on the psychological trait, modus operandi, victimology and crime scene characteristics observed at the crime scene. It is based upon an expert’s practical experience, logical reasoning ability and formal knowledge about the criminal
investigation and psychology. It is only effective if some similarities is established between them. (Holmes, 2009). Advantages: 1) It is very easy tool to use, in which no specialized forensic knowledge, education, or training in the study of the criminal behaviour or criminal investigation is required. 2) The generalized profiles can be assembled in a relatively short period of time without much effort. 3) These generalized behaviour can accurately predict some of the non-distinguishing elements of criminal behaviour. (Brent Turvey, 2005). Disadvantages: 1) The information obtained is from limited population sample and not specifically related to any one case. 2) Inductive profile is an average of limited data collected of known offenders. 3) It does not consider those criminals who are at large intelligent or skillful in enacting crime, because of which such criminals successfully are ruled out by investigating agency. 3) It contains certain inaccuracies which are used often used to implicate innocent individuals.

**Deductive Profiling:**

The expert constructs the personality make up of the criminal solely based upon the knowledge and application of psychology, sociology, criminology, psychiatry, crime scene and physical evidence which gives the root cause of crime (love, hate, jealousy, etc). An emphasis is given after the study and analysis of post mortem report, forensic report and relation with the victim. This technique is time consuming as it minutely looks in various aspects of crime. It is observed that a single offenders are quite capable of multiple motives over the commission of multiple crimes or even during the commission of single offence (Turvey; 2005)

Another FBI Agent and active member of Criminal Investigative Analysis, subunit of National Center for the Analysis of Violent crime (NCAVC, 1985), Gregg O McCrery, have given four phases of profiling:-
1) Antecedent: The murderer’s plan, fantasy and drive prior to committing the crime

2) Method and manner: The selection of the victim and method used to commit crime

3) Body Disposal: Whether murder and the body disposal took place at one place or different places.

4) Post Offence behaviour: Whether the murderer tries to publicize himelf by reaching the media or contacting investigators.

McCrary mentioned that profiling relies upon the suspect’s cultural and ethical background, as culture and race varies from society to society. He believed that evolution of human racial and physical features reveals about their inherited behaviour due to specific environment and way of adaptation. (Jackson J, et al; 1995)

Today's profiling process takes two approaches: prospective and retrospective. Prospective profiling attempts to create a “template” of a specific type of offender (for example, a terrorist, a child molester, or a serial murderer) based on the characteristics of previous offender(s). These prospective profiles are exposed to public to narrow down and predict the criminal. The prospective profiling have received criticism because of its technique to include the public at large, which invites suspiciousness and trouble for innocent people. The retrospective profiling is mostly used by investigating agency as it works on “case specific” and concentrates on the criminal act. It picks up the clues left at the crime scene to develop a specific description of the culprit. The idea is to link a particular individual’s personality and behavioural characteristics which has already occurred. Based on personality and behavioural characteristics which has been identified through analysis of the crime scene and the facts of the case.
According to Federal Bureau of Investigation, the cases involving destruction of the property, assault or murder during robbery are generally unsuitable for profiling since the personality of the killer is not revealed in such crime scenes. Likewise, drug induced crimes are not suitable for profiling because the true personality of the criminal is altered in that stage. Therefore, not all types of crimes are suitable for criminal profiling. The psychological profiling is effectively done in cases of serial killers, rapists, arsonists and terrorists.

**Psychological profile of serial killer**:

The serial killer is profiled to have tendency to lie and manipulate, he takes pleasure in animal cruelty, takes the feedback about his crime through newspaper or revisit crime scene. The serial killer usually targets the lonely persons or prostitutes. His method of committing crime usually involves humiliating and degrading the victim, tying and torturing for his sexual arousal and pleasure. Victim uses ligature to tie the deceased, humiliate and degrade the victim, tortures the deceased for his sexual arousal and pleasure. He depicts his sadistic behaviour by showing his cruelty towards animals, remains socially withdrawn and aloof from family and friends. His method of killing the victim involves tying and prolonging the torture for his sexual excitement and sadistic pleasure. The onset of his psychopathology is exhibited in early childhood, by watching excessive pornography and child sexual abuse. The serial killer is meticulous in planning and execution of his act of crime. He leaves an idiosyncratic behaviour, “signature marks” as an outgrowth of fantasies which helps in the detection (Schlesinger, 2000).
Psychological profile of serial rapist:

Sexual offenders target victims who are vulnerable; passive, needy, easily trusts people and are lonely or lacking supervision (especially in family) (Conte et al., 1989). These victims are made emotionally weak who are threatened to not to disclose the offence. The Rapists are broadly divided into the following categories:

1. Power- Reassurance Rapists:
   This category of rapist have the sole purpose to resolve their self-doubt by reassuring the offender about his masculinity. These rapists are suffering from feeling of inadequacy and are incompetent to handle emotionally charged situation. They are quiet and passive in their behaviour. They tend to approach their victims by surprise and force, although the level of force tends to be minimum to control the victim. They engage their victim in conversation during the attack. They are also referred to as “polite rapist”.

2. Power- Assertion Rapists
   This group of offenders are preoccupied with their body, self image and muscular power. They are known for their self-centeredness and their ‘macho’ image. They are over social and organized compared to power-reassured rapist. They are egoistic, dominating and suffer from superiority complex. An characteristic of this group is to boast and gain admiration for his act of rape from his fellow members and friends.

3. Anger Retaliatory Rapists:
   This group have disturbed domestic lives. The offender is married and does not have crucial role or importance in the family. The loss of power in his married life is substituted by forcing his power on the victim (the weak
person) to satisfy his masculine need. These offenders abuses and physically harm the victim during and after the sexual assault.

4. Anger-Excitation Rapists:

This group of offenders are sexually incompetent, unable to father a child, or satisfy the female physical needs. They can have successful sexual experience only through use of control over the victim and use of violence in the act. The rapist gives a detail explanation about the act to the victim, makes use of prolong assaults and thereby gain sexual satisfaction.

Psychological profile of child sexual abusers:

Clinically, the offenders who are sexually abusing child are suffering from mental illness called “Pedophilia”. They are passive, manipulative, aggressive and lacking in social skills. They look for victims who are financially under privileged, lack paternal care and are under the influence of drugs. They are pursued into the sexual activities and are made a part of sex racket. It is observed that female are prone to molest the child in the day care centers while male are prone to abuse the child at the workplace. In a study conducted, it was observed that the offenders abused 13% of female child while 17% of male children were abused females as well as males (Tingle et al, 1986). These offenders threaten the child to harm his/her family members or spoil his/her social image. The victim of this act remain aloof and project a stereotypical behaviour in social interaction. Thus, the use of psychological test becomes important technique in understanding the offender as well as victim.
The Use of Psychological Tests in Crime Investigation:

The objective of the psychological test is to measure the underlying psychopathology as well as the personality of the suspect who is alleged of crime. It gives an indication of the suspect’s antisocial personality, deviant behaviour and other factors of personality which can instigate the criminal towards crime. Various types of psychological tests which are objective, valid and reliable are developed to identify the criminal.

Psychological tests like Wechsler Adult Intelligence test (Weschler.D,1939; Weschler-Bellevue, 1955; Indian adaption, 2008), Standard Progressive Matrices (J.C. Raven, 1938,1972,2004), Minnesota Multiphasic Personality test; MMPI (1942, 1989, 1992), MMPI; Indian adaptation (B. Singh, 1965) test for malingering, Beck Depression inventory (1961,1978,1996), Cognitive Symptom Checklist, Sentence completion test, Miller forensic assessment of symptom test, Miller forensic Structured Inventory ( Miller.H.O, 1995,2001) Roger’s criminal responsibility assessment scale, Multiphasic personality questionnaire; MPQ (Hellegen. A, 1982), Temperament character inventory; TCI are used in the field of forensic psychology. The intelligence test is applied to measure the verbal and performance intelligence of the individual. It measures individual’s capacity to plan, organise and execute the thought. It also evaluates the level of abstract thinking and logical ability. In a study conducted on intelligence of arsonist, it was observed that 8% of arsonists had superior intelligence (IQ > 115), 43% had normal intelligence (IQ 86–114), 38% had subnormal IQs (IQ 68–85) and 11% had mental retardation (IQ < 68) (Pirkko Räsänen et.al; 2008). The arsonist had scored better on performance test compared to the verbal test. A study concluded that psychopaths have higher intelligence level
compared to the normal suspects (Cleckley, 1976). The probability of suspects with higher IQ, particularly in verbal intelligence were observed to indulge in violent crime at the later stage of their life. (Johansson, et.al., 2005).

Neuropsychological assessment battery, (NAB), involves the comprehensive assessment of cognitive abilities, including general intelligence, academic achievement, attention-concentration, memory, language, visuo-spatial and constructional skills, sensory and motor skills, and executive functioning. The assessment of personality, cognitive, emotional and psycho-neurological functioning are the integral parts of forensic neuro-psychological examination. (Robert. A.S & Travis. W; 1959, 2003) It is observed that the prefrontal brain damage and temporal lobe dysfunction plays an important role in aggression among the group of batters, juvenile delinquents, adult criminals, sexual offenders, psychopaths and schizophrenics (Golden C.G, Jackson, M.L, et.al ; 1996). The study conducted on the risk of violent criminal behaviour among the two groups of schizophrenic patients who have neuropsychological impairment and who do not have neuropsychological impairment observed that specific neuropsychological deficits increased the likelihood of schizophrenic men to murder the family members due to impaired capacity to inhibit impulsive violent aggression. (Hanlon R.E, Coda.J.J, et.al; 2012)

Projective tests; like Rorschach (Rorschach. H, 1960), Thematic Apperception test (Murray, H.A., Morgan, C.D.; 1930), Bender Gestalt test (1934; Hutt,1945) and Draw a person (Goodenough. F, 1926,1963, 1976), Draw a person test, an Indian Adaptation (Phatak. P, 1987) etc. are designed for suspects to respond to unstructured, semi-structured or ambiguous stimuli, which reveals hidden emotions, desires and internal conflicts. The experts believe that, more freely the suspect responds, the
better is his/ her psychological interpretation. The paper- pencil test does not give complete freedom of choice of expression and therefore, some researchers and clinicians prefer to use projective tests. In projective tests, a person is shown ambiguous stimuli (ie. unstructured shapes or pictures) and is asked to respond to it in an elaborate way. Such stimuli allow complete freedom in projecting his/her own interests, needs and feelings on test. Projective tests are believed to be sensitive to unconscious dimensions of personality. The use of defense mechanisms, latent impulses, fear, insecurities and anxieties are inferred from data gathered on test and observation made during testing situation. It also depicts early signs of psychiatric illness. In forensic field, the projective test is not only used as personality assessment but it is corroborated with established forensic techniques like Polygraph (C. Lombroso, 1895; V. Benussi, W. Marston; 1904, 1915; J. Augustus, 1921), Computerized polygraph test (1993) Brain Electrical Oscillation Signature Profiling (2003) and Narco analysis test (Dr. W. Bleckwenn; 1930). The correlation between the psychological test and other forensic tests (Polygraph, Brain electrical oscillation signature profiling and Narco analysis test) makes the forensic psychological report, a scientific and objective report.

Art is a natural way of exploring creative ideas, expressing desires, needs, conflicts and exercise control over perceived realities (Kramer; 1979). The Draw-A-Person test depicts not only the intellectual capacity but also the hidden/ unexpressed desires and conflicts of personality through the drawing. The suspect is asked to draw a human being, in doing so, he/she expresses his/her self which reveals deep rooted thoughts and emotions. In a study conducted on 57 students, it was observed that there is a significant difference between “stressful” and “non-stressful” conditions for the male and female drawings, respectively. It gave the analysis of individual’s present
frame of mind, personality type and other unique characteristics. Dr. Florence Goodenough, a psychologist developed Draw - A- Person (1062) test to measure the intelligence quotient (IQ) of the children through drawings. The book “Measurement of intelligence by drawing” gives a detail description, procedure, scoring and interpretation of drawings (Goodenough; 1926). Although, used extensively in clinical area, it has been an area of interest for the research in forensic area.

As a test procedure, the suspect is given a A4 size white paper, pencil and eraser and asked to draw a man, a woman and him/herself. No further instructions or time limit is given to the child. The fourteen different aspects of the drawings like body, body parts, body proportion and clothing are included to score the test results. Dr. D.B. Harris, (1963) in his book on “Children’s drawing as a measure of Intellectual maturity” mentioned that the use of non-verbal and non-threatening situation reduces the variables like communication skills, organizational ability and test anxiety in children. The Draw-A-Person: Screening procedure for emotional disturbance; (DAP:SPED) is the recent and psychometrically advanced test for assessment of emotional disturbance in children. (Naglierie.al 1991)

The drawing seems to be effective in identifying liars because they have poor knowledge in working out the details of the crime incident. Someone who is telling the truth; already has a visual image of where he was and what happened, but liars will have to manufacture the details regarding the crime incident. It's easier to fabricate something verbally than to visualize and then reproduce it on paper. To maintain the uniformity and universality, the word “person” was chosen rather than house which has variability across the culture. A free-hand is given to the suspect to draw male or female which makes the test objective in nature. The projection on DAP
test will give the information about the self, the suspect’s perception towards environment and influential person in suspect’s life.

The Indian adaptation of Draw-A-Person test was developed by Dr.P. Phatak. P (1956, 1966). The scientific application of Draw-A-Person test is done on Indian children to measure the intelligence quotient. The children at different developmental stages were studied on D-A-P test which showed that children’s drawings are best indicators for expression of emotions, self-esteem and social competence as well as other aspects of personality (Malchiodi;1998). The drawings imply the problems which are personal and emotionally significant (Thomas; 1990). It is used as a part of procedure in psychotherapy for children with emotional and impulsive disorder. (Miller & Veltkamp; 1986). The administration and interpretation of human figure drawings reveals the unconscious motives and needs (Miller & Veltkamp; 1986). A study of projective drawings by sexually abused victims of minor age reported that, each child focused on genitalia and private body parts in their drawings (Sturner & Rothbaum; 1980). Drawings of the children who were victims of incestual relations tend to minimize or maximize sexual features (Yates, Beutier & Cargo; 1985).

Researchers hypothesized that several tendencies are evident in the scribbles and drawings of “liars” which are otherwise not found in “non-liars”. The liars and non-liars were asked to draw the details of a location where they have not gone or met anyone. It was observed that “non-liars” used a "shoulder-camera" perspective to draw the situation in a direct, line-of-sight view which indicated factual information or truth. The “liars” group used an "overhead-camera" perspective, indicating a sense of detachment from the situation. The plausibility of truthful drawings is more significant than the non truthful drawings (Johansson, et.al., 2005).
In another study conducted the suspects were asked questions about their experience, and thereby draw the particulars of that experience. The results of the verbal responses were compared to the drawing responses to determine which method was more effective in identifying liars. It was observed that the verbal suspects (19%) who were truthful kept “agents” while narrating the whole experience than the truthful suspects (53%). There was no significant difference in the content of detail but there was difference in the mode of delivering the details about the experience (Peter.O; 1984).

**Forensic Psychological Profiling:**

The Forensic psychological profiling is a combination of inductive and deductive profiling, a technique given by Federal Bureau of Investigation. The forensic expert understands the crime scene, inquest of place of offence & dead body, post mortem report, forensic reports, maps/photographs and the role of the suspect who is brought for the forensic psychological examination by investigating agency. When the suspect is brought to the forensic psychology laboratory, the forensic psychologist through the psychological acumen observes and interview the suspect and administers the requested psychological test and techniques (Polygraph, BEOS test and Narco analysis test). Thereafter, the expert corroborates the facts of the case with the psychological tests report to prepare forensic psychological profile. In short, it is the application of knowledge derived through forensic psychological tests in corroboration with available information in the form of police records and medical records in understanding crime and criminal.
The Polygraph test:

In 1895, an Italian physician, psychiatrist and criminologist, Cesare Lombroso invented an instrument, hydro-sphygmograph which measured the physiological changes in blood pressure and pulse rate in the suspect during police investigation. Thereafter, Dr. William Marston (1915) developed a technique which measured continuous blood pressure which detecting deception. In 1917, Psychologist Marston found that systolic blood pressure had a strong correlation to lying. This led him to design modern Polygraph detector which is considered as one of the scientific tool in the detecting the deception through the changes in parasympathetic nervous system. When a person lies, the lying causes certain amount of stress that produces changes in the involuntary physiological reactions i.e heart rate, pulse rate, respiration and skin conductance. The suspect is asked to answer the questions pertaining to the crime while sitting on the polygraph test. The deception is measured during the changes in the involuntary reactions at the time of answering the questions. The changes are measured on three parameters i.e, respiration, heart beat, pulse rate and skin conductance. Although extensively used in India, a debate on the application and the objectivity of the polygraph test is a concern the amongst experts in western countries.

Brain Electrical Oscillation Signature Profiling (BEOS) test

The Brain finger printing is a computer based technology to identify the perpetrator of a crime. In 1995, Lawrence Farewell had discovered scientific brain-wave response called a MERMER which elicited the details of the crime when the words or picture regarding the crime were shown to him suspect. A computer analyses of the brain response to detect the MERMER and thus determines scientifically whether the specific crime- relevant information stored in the brain of the suspect.
Prof C. R. Mukundan (2003) introduced Brain Electrical Oscillation Signature test, which is a computer based technology to identify the presence of Experiential Knowledge in the mind of perpetrator. THE BEOS test is the technique which is based on the principles of cued remembrance of experiences. It reserves the right of the suspect to remain silent under the article 20 (3) of the constitution of India. The suspect hears the audio/sees the visuals related to the events and the system measures the experiences of his/her involvement in the crime.

**Narco Analysis test**

In 1929, Bleckwena orally gave the sodium amytal by mouth to suspects who were reluctant to hypnosis. A study conducted by Lindemann (1932) observed that small doses of sodium amytal when injected slowly produced a marked effect in normal and psychiatric patients which was sufficient to alter their mental status and give relaxation. Narco analysis technique is used for investigative purpose as it is perceived as humane approach to investigation (1940). Narco analysis widely known as “Truth Serum” is a drug induced hypnosis, a technique for recovery of memory. It is technique that makes human thoughts and communication manageable, an art of eliciting intimate details by facilitating the recall of suppressed memory through an interview and persuasive manner. Narco analysis test was started in 1989 at Directorate of Forensic Science, Gandhinagar as a forensic investigative technique. Not much of literature regarding its forensic application is reported. Thereafter, the Narco analysis test is used in which the suspect is interviewed into trance state (relaxed state) to extract the information related to crime.