CHAPTER - II

HISTORICAL RESUME

In the experimental investigation of the relationship between personality and memory, the assessment of personality has usually been by means of paper-and-pencil, questionnaire techniques such as Cattell's Sixteen Personality factor (SPF) test and the Eysenck Personality Inventory (EPI). These tests attempt to measure personality traits, i.e. relatively stable and consistent dispositions. The usual experimental approach has involved the comparison on some learning task of extreme scores of a personality trait or dimension.

General intelligence as defined by the early mental testers in Britain and America, was distinguished from the concept of 'imagination' in that general intelligent reflected the ability to reproduce information according to predetermined 'right' and 'wrong' test response criteria. Spearman (1927) however, held the view that tests of imagination scored for originality of response defined a specific cognitive factor which was only one of many others and might be employed in a wide battery of tests to yield a comprehensive estimate of the general intelligence factor "g".

Hargreave (1927) experimental studies of verbal fluency upheld Spearman's views and demonstrated that
fluency, as measured by open-ended verbal tests, is a composite function of factors of general verbal ability, memory and motor speed of writing of speaking. Partial correlations among the fluency tests proved high enough to suggest that some further element remained to be accounted for (factor x) after removing the influence of the above factors. Hargreave concluded that factor x was probably related to the absence of inhibitions, possibly a lack of self-criticism, thus attributing a conative explanation to verbal fluency.

Cattell (1934) placed greater emphasis upon the conative correlate of verbal fluency and renamed the tests of imagination. 'Tests of Temperament'. In developing a battery of tests of perseveration and verbal fluency, Cattell found that a subtest of the latter factor, speed of cognitive output (SCO), proved to be the test predict of temperament. The test correlated 0.30 (n=62) with 'surgency' a personality trait denoting extraversion and measured by means of a self-rated questionnaire. The retest reliability of the SCO was 0.57 after one week.

The research to follow Cattell's lead continued to demonstrate the positive relationship of new verbal fluency tests to tests of temperament (Studmen 1935, Carroll, 1941, Notcutt 1943, Gewirtz 1948, Rim 1954, Rogera 1956,
Hofstaetter et al 1957, Gatzcls & Jackson 1962, Wallach & Kogan 1965, Ramsey 1966). Cattell's discription of the surgency correlate of fluency as being one of sociability and the early replications of his findings led Eysenck (1960) to conclude that verbal fluency was related to extraversion, a personality type which incorporated traits of sociability and impulsivity.

A note on the subject of personality correlates of divergent thinking is introduced by Rim (1953) in a study which attempted to establish a differential diagnostic criterian for hysterics (neurotic extraverts) and dysthymics (neurotic introverts) Rim did not find a significant difference between these clinical groups in verbal fluency.

Divergent thinking varies as a function of personality typology in normal individuals. Several aspects of intellectual capacity and sex differences which may be relevant in this area have not been accounted for in the design of many studies. Divergent thinking, as measured by word fluency and word originality is a function of personality vriable of extraversion-introversion and neuroticism-stability when the influence of general verbal intelligence has been accounted for extraverts are predicted to be more fluent and original then introverts. Measures of the relationship of Neuroticism-Stability to divergent thinking are included in order to assess further possible
interactions of personality types in modes of thinking.

A number of studies have been concerned with personality differences in learning (Howarth & Eysenck 1968, Howarth 1968). It appears from these studies that extraverts are superior to introverts in short-term recall—a finding which confirms an earlier finding of Howarth (1963). Who used a modified Wechsler digit-repetition task. Both Jensen (1964) and Shanmugan and Santhanam (1964) have provided correlational evidence for the superiority of extraverts in short-term recall tasks.

Much of the behavioural evidence suggesting that introverts are functionally more aroused than extraverts has been reviewed by H.J. Eysenck (1967). He reported supportive data from the fields of motivation, conditioning perception, psychopharmacology, vigilance, and learning. He interpreted the results as indicating that an intermediate level of arousal was both optimal for performance and was actively preferred by subjects. A relatively direct test of this hypothesis is to give subjects the opportunity to increase or decrease the amount of arousal—inducing stimulation which they receive. Since, theoretically introverts are more aroused than extraverts, it is more likely that introverts will want to decrease the level of
stimulation, whereas extraverts are more likely to seek increase in the level of stimulation.

Two major hypothesis relating the dimension of introversion - extraversion and verbal learning has been examined experimentally. The first hypothesis is that extraverts will show faster learning than introverts in tasks which are 'difficult' or which involve response competition, but that this disadvantage will be attenuated in tasks which are 'easy' or which involve little or no response competition. The second hypothesis is H.J. Eysenck's (1967) modification of Walker's (1958). The hypothesis states that the period of consolidation is larger for introverts than for extraverts, with the results that the short-term retention.

The hypothesis relating introversion-extraversion to task difficulty has been examined in several studies (Allsopp & H.J. Eysenck 1974, 1975, Bone 1971, M.W. Eysenck 1975c, Howarth 1969a, 1969b, Jensen 1964, McLaughlin & H.J. Eysenck 1967, Purohit 1966, Shanmugan & Santhanan 1964, Siegman 1957) of these eleven studies, only three failed to obtain the predicted findings (Allsopp & H.J. Eysenck 1975, M.W. Eysenck 1975c, Purohit 1966). However, inspite of the weight of evidence in
favour of the hypothesis, it is not clear exactly why introverts should be at a disadvantage on difficult tasks. Various possible interpretations have been suggested as follows.

Weiner (1966) and Weiner and Schneider (1973) have argued that experiments frequently involve a confounding of task difficulty level with subjective feelings of success and failure. It is possible that performance on a difficult task results in a feeling of failure due to the relatively slow rate of learning, whereas performance on an easy task produce success feelings because of the speed of mastery. In support of this hypothesis, Tennyson and Wooley (1971) found that the mean level of state anxiety was significantly higher following a difficult task than following an easy task. While Weiner and Schneider investigated the personality variable of anxiety rather than extraversion, they unconfounded the factors of task difficulty and success failure, and obtained evidence that the subjective feelings of success or failure were more related to the performance of different personality groups than was task difficulty.

The learning differences between introverts and extraverts may reflect differences in encoding processes.
One possibility is simply that introverts take longer than extroverts to discover suitable verbal and imaginal mediators, and that difficult tasks may increase this time difference. Farley and Kumar presented non-sense syllable-digit paired-associates to their subjects, and instructed them to write down the way in which they might remember each pair. While there were no differences as a function of personality in the types of transformation applied to the paired-associates, the introverts took nearly twice as long to write down their mediators. However, it is unclear whether this difference is due to faster information processing by the extraverts, or whether extraverts are simply less cautious in responding.

In general terms, the difference in the performance of introverts and extroverts on easy and difficult tasks can be interpreted in terms of the Yerkes-Dodson law (e.g. McLaughlin & H.J. Eysenck, 1967). However, although most of the findings support the prediction of the Yerkes-Dodson law that the optimal level of arousal should be inversely related to task difficulty, the 'law' provides no explanation of this relationship.

There is experimental evidence (e.g. Cameron & Myers, 1966) that extraverts are less cautious than
It is possible that the superior short-term retention of extraverts is attributable to their greater readiness to produce responses of whose correctness they are uncertain. The most obvious deduction from this hypothesis is that extraverts should produce more changes and errors than introverts. McLaughlin and Kary (1972) found that extraverts made more correct responses and more errors on a recognition test than introverts. Forrest (1963) asked subjects to recall a series of drawings, and described those who tended to produce exaggerated descriptions of the drawings as 'sharpeners'. He found that the sharpeners were highly significantly more extraverted than the 'levelers' (i.e. those who did not produce extraverted than the 'levelers' (i.e. those who did not produce exaggerated descriptions). Gauld and Stem Stephenson (1967) required their subjects to recall a story as accurately as possible, and obtained a significant negative correlation between conscientiousness (possibly related to introversion) and the number of errors introduced into the recall attempt.

M.W. Eysenck (1975c) argued that an important difference between introverts and extraverts might be in the speed of retrieval of to be remembered information.
He recorded the recall speed of subjects learning easy and difficult lists of paired associates, and noticed that those subjects having intermediate levels of arousal (high activation extraverts and low activation introverts) had faster response latencies than those of low (low activation extraverts) or high (high activation introverts) levels of arousal. He concluded that previous studies had confounded storage and retrieval effects. The generally superior performance of extraverts to introverts in other studies, usually involving short retrieval periods, may be due both to the slower speed of retrieval of introverts and to the better learning of extraverts.

H.J. Eysenck (1967, 1973) combined Walker's action decreement theory with the notion that introverts are chronically more aroused than extraverts, and deduced that the short-term retention of extraverts would exceed that of introverts, but that the position would be reversed for long-term retention. Modest support for this hypothesis derives from several of the studies already discussed, in which extraverts usually performed better than introverts at the short-retention intervals used.

In an interesting study, M.C. Eysenck investigated the incidental learning of attribute
information. The subjects were instructed to process the material either phonemically or semantically, and were then unexpectedly given a recognition test involving synonym pairs and homophone pairs. Incidental learning, in the sense of learning other than that specified in the instructions, is necessary to select the appropriate synonym after semantic instructions or to select the appropriate homophone after phonemic instructions. As expected, introverts showed less incidental learning than extraverts, presumably because they processed a smaller number of word attributes than extraverts. However, while this finding accords with Easterbrook's hypothesis, there is some question as to whether the results should be interpreted in arousal terms, since activation as measured by Thayer's ADACL was unrelated to performance. If subsequent work confirms the view that introverts process fewer attributes or features than extraverts, this would provide a potential explanation for the frequent superiority of extraverts in short-term recall.

Eysenck (1974) argued that there was a methodological problem in the studies of personality differences in semantic memory, since it is probable that subjects search through their previous emissions in
order to avoid repeating responses. The greater cautiousness of introverts (Carrieron and Myers, 1966) may mean that they perform more re-check than extraverts, and thus have less effective time available for retrieval from semantic memory. In order to obviate this difficulty, Eysenck (1974) used semantic memory tasks requiring only a single response on any given trial. On recall trials, subjects produced a word from a specified category beginning with a designated letter (e.g. article of furniture T) and on recognition trials they decided whether or not a word belonged to a specified category. Extraverts responded considerably faster than introverts on recall trials, but there was no difference between them on recognition trials. Fuller analysis of the results involved dividing both recall and recognition trials into those involving easy or high dominance items and those using difficult or low dominance items. The optimal level of subject arousal varied inversely with the difficulty of the retrieval task. In a subsequent study, using the same recall and recognition tasks, but manipulating arousal by means of general activation and while noise, Eysenck (1975) obtained comparable results.

Several alternative hypotheses can be proposed to account for various findings.

a) It is possible that introverts retrieve
information as rapidly as extraverts, but that they take longer to decide whether the retrieved information is correct, due to their greater cautiousness. However, the recognition memory task used by Eysenck (1974) revealed no difference in response latencies between introverts and extraverts, showing that undue cautiousness does not always slow the responding of introverts. Furthermore, analysis of the error scores on the recall and recognition tasks used by Eysenck (1974) indicated that, while introverts tended to produce fewer errors than extraverts, the difference was not significant.

b) The simplest hypothesis is that the frequent inferiority of introverts in retrieval from semantic memory is due to introverts searching more slowly than extraverts through semantic memory. However, this hypothesis would need elaboration to account for the significant three-way interaction of extraversion, activation, and item dominance on recall trials observed by Eysenck (1974) in which intermediate levels of arousal produced the greatest response speeds with high-dominance items, whereas subject arousal was negatively related to speed with low-dominance items. Furthermore, Eysenck (1974) used a long retrieval period in a fluency task (12 minutes) and subjects apparently recalled as many items as they could in view of the generally small
number of items recalled during the last two or three minutes of the retrieval period. Despite the sample time available for retrieval, extraverts recalled many more words than introverts. Finally, the rapid initial retrieval rate of introverts in that experiment suggested that they do not necessarily have a slower search rate than extraverts.

c) It has been suggested (e.g. Bieri, 1970) that cognitive complexity is greater in introverts than in extraverts, and this difference in complexity might be reflected in difference in semantic memory organisation. It might for example, be the case that it is more difficult to search for information that is organized complexly, and that introverts organize information in a more complex manner than extraverts. It is true that it is difficult to unconfound storage and retrieval factors in studies of semantic memory, since we have to infer the storage characteristics of semantic memory on the basis of retrieval measures. However, it seems improbable that storage differences could explain all the findings since the effects of white noise and of general activation on performance in semantic memory tasks are presumably on search and retrieval process.

d) A different hypothesis which may be applicable to the verbal fluency data is that introverts are more
likely man extroverts to experience problems associated with sampling with replacement when retrieving information from semantic memory. Several pieces of evidence indicate that retrieval of an item of information increases its strength, and enhances the probability of its subsequent recall (e.g. Roediger, 1973, 1974, Rundus, 1973). It retrieval increases the strength of retrieved information more for introverts than extraverts, then introverts would be more susceptible to re-retrieval of items. An alternative mechanism by which introverts might experience repeated retrievals of items is through their relative failure to discriminate between previously retrieved and non-retrieved items. In the verbal fluency situation, the rapid initial recall rate of introverts followed by their marked reduction in recall rate follows from the hypotheses, since problems of sampling with replacement will increase during the course of the retrieval period. The finding that introverts had recalled half of what they would finally recall earlier in the retrieval period than extraverts is also consistent with the hypothesis.

Elliott (1971a) suggested that each individual has an optimal or preferred level of stimulation, and there are individual reactions to sensory stimulation.
Gakhar and Luthera (1973) found intelligence and extraversion scores but not neuroticism related to paired associate learning.

Eysenck (1975a) discovered that the poor performance of introverts on paired associate lists involving response competition was largely attributable to their slow retrieval of the relevant information. He argued that high arousal increased the tendency to retrieve readily accessible information, which is counter-productive when there are very assessible but incorrect responses available (e.g. in conditions of response competition).


Most robust findings in the research on arousal and memory is that high arousal impairs short-term retention (upto approximately 20 minutes after acquisition) but facilitates long-term retention. (Kleinsmith and Kaplan, 1963). This pattern of performance has been found several times when arousal has been manipulated by means of white noise or time of day (Eysenck, 1981). It has also been obtained when the
effects of retention interval on the memory of introverts and extraverts have been assessed. The model finding is that the extraverts have a better short-term recall than the introverts but that this is reversed at longer retention intervals. This crossover in recall occurred after five minutes (Howorth and Eysenck, 1968, Mclean 1968, Opollot 1970; Skantha Kumari 1965). It is worth noting, however, that there are some studies in which there was no introversion-extroversion and retention interval was obtained (Berlyne and Carey, 1968; McLaughin and Kary, 1972, Nurmi and Von Wright, 1983, Schneller and Garske, 1976). But in a study of memory for information in prose, it was found that short-term memory performance was not related to extraversion-introversion, but long-term memory performance declined as extraversion increased (Wilding, 1984).

Eysenck (1973) accounted for this interaction by extending the action-decrement theory of Walker (1958). According to Walker's theory, high arousal produces a longer lasting active memory trace, leading to enhanced consolidation in long-term memory. However, during the consolidation period there is a temporary inhibition of retrieval (called 'action-decrement') which protects the trace from disruption. Since there is more pronounced action-decrement at high levels of arousal, short-term
retention is inversely related to the level of arousal on the assumption that introverts are more cortically aroused than extraverts (Eysenck 1973) it follows that extraverts should out perform introverts at short retention intervals but that there should be a reversal at longer retention intervals.

Walker's theory is unsatisfactory for a number of reasons, the main one being that some of the available data are inconsistent with it. For example, while high aroused does typically impair short-term retention impaired associated learning, it actually must be concluded that no satisfactory explanation of interaction between introversion-extraversion and the length of the retention has yet been offered (cf. Eysenck 1982). Some research in this regard shows that high arousal typically impairs immediate retention in paired associate learning, other findings indicate that high arousal enhances immediate free-recall and recognition.

There is an interpretative problem with much of the literature on introversion-extraversion and memory, since it is usually unclear whether the observed differences in retention are due to effects at the time of initial perception, attention, rehearsal consolidation, retrieval and response emission, (Eysenck, 1982) emphasizes conducting research with the single aspect of processing.
It was consistently found in a variety of paradigms that introverts were primarily inferior to extraverts when retrieving relatively inaccessible information had to be retrieved. (Eysenck, 1976) concludes that high arousal biases the person's search process information more than is the case with lower levels of arousal. He demonstrated that high activation introverts produced the lowest amount of correct recall and the greatest amount of distortion. A part of the reason for this may be that high arousal causes cognitive masking and reduces parallel or shared processing (Walley and Weiden, 1973).

Schwartz (1975) claimed that arousal facilitates recall based on the actual physical properties of the stimuli but adversely affects memory for semantic features. Eysenck and Eysenck (1979) claimed that the introverts experience greater difficulty in retrieving deep or semantic information from long-term stores, but there is no effect of introversion-extraversion on the retrieval of shallow physical information.

Retrieval concerns the response criterion or cautiousness of responding. Mc Langhlin and Kary (1972) found that the extraverts made more correct responses and more errors or false alarms than the introverts in a
recognition test. Gillespie and Eysenck, M.W. (1980) found in a continuous recognition memory task that the introverts adopted a significantly more stringent response criterion than the extraverts. However, there was no effect of introversion-extroversion on sensitivity end.

Regarding neuroticism, Eysenck (1967) concluded that it is not likely to play a significant role in performance until the experimental situation is not perceived as anxiety provoking by the subject. Recently, Gabrys (1983), has also concluded that cortical arousal features (which is related to introversion-extroversion) are more important in understanding memory processes that the autonomic responsivity (which is related to neuroticism). Eysenck, in his recent book, 'A model for personality' (1981) also suggests that the extraversion-introversion dimension may serve as a model for personality in many experimental tasks, since it has a better theoretical substructure and more links with genetics and physiology.

In this chapter the investigator so far mentioned only some of the important research studies pertaining the personality type and memory. Now in the
following section studies related with intelligence and memory are summarised.

Chiang and Atkinson (1976) reported the relationship between high memory scanning rate and verbal intelligence. In a earlier study of Brunner (1969) found that high intelligent subjects were able to recall those syllables which make up a word.

Cohen and Sandberg (1977), observed that the correlation between I.Q. and STM depends on differences in encoding or rehearsal strategies. Low I.Q. subjects use less effective strategies than high I.Q. subjects. During the same year Robinson and Kingsley reported a positive corelation between intelligence and memory.

Kello et a. (1978) conducted a study to see the relationship between the STM and different levels of intellectual ability. They observed a significant correlation between the two. However, on the other hand some studies failed to observe this high correlation between STM and intelligence (Libb and Coleman, 1975, Prashad, 1971).

Mezera, Antonin (1983), compared 120 subjects of 7th grade's scores on the Raven's standard
progressive matrices with scores on the Junior EPI. Results showed high correlation between good performance on the SPM and high scores on Extraversion and Neuroticism. However as items become more difficult on SPM, the achievement of those scoring high in introversion improved significantly. This study also conclude that personality variable affect individual performance.

Another study was conducted by Benbow et al. (1983) 12 females and 60 males (mean age 13.5 and 15.1 years, respectively) who represented top 1% of the extremely bright students identified by the study of mathematically precocious youth were tested along with their parents, using a battery of specifically designed cognitive tests. These students represented the top 0.30% of their age group in intellectual ability. Results showed that the parents were extremely able and resembled one another significantly more than parents, in the general population. In addition, the intellectually precocious children resembled their parents to a lesser extent than children of average ability resemble their parents. These data suggest that considerable assortive mating has occurred among the parents of these extremely gifted youth, but that extreme giftedness cannot be predicted reliably solely
as a result of mating of bright parent.

Tanwar and Kumar (1985), conducted a study entitled, "An experimental study of distractor and probe techniques in short-term memory as a function of extraversion and levels of intelligence". In this study the children of 8th and 9th grade were selected on the basis of these scores on Junior personality inventory and general mental ability test. In this way four groups i.e. introverted high intelligent, introverted average intelligent, extroverted high intelligent and extroverted average intelligent subjects were tested on Distractor and Probe technique of STM. To find out the effect of personality and intelligence on STM a 2x2x6 repeated measure analysis of variance for distractor technique and 2x2 experimental design for probe technique were used. Results of this study indicate that in distractor technique the F-ratios for personality and intelligence were non-significant but significant on sets and interactions. While in probe technique performance between introvert and extravert were found significantly different. Extraverts performed better than introverts.

With this much background, we may now pass on to the next chapter dealing with the problem and hypotheses of present investigation.

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