CHAPTER - V

DISCUSSION
Construct validation was done by factor analysis. Principal component extracted ten major independent factors (nine in restricted sample).

The most significant factor, 'Bipolar Arousal', revealed loadings on subjective mood states of arousal and extraversion. Hedonic tone and extraversion relate negatively with tense and general arousal. It has been shown that extraversion correlates positively with hedonic tone (positive mood) (e.g. Williams, 1989, Watson, Clark, McIntyre and Hamaker, 1992). Matthews et al. (1990) report that hedonic tone is negatively correlated with tension while measures of general arousal are likely to be quite strongly correlated with both energy and tension but independent of hedonic tone. Hedonic tone is also shown to be moderately positively correlated with energy.

These factor loadings reveal robustness of mood as a distinct construct which does not mix with other constructs. These findings add to the external validity of Matthews’ UMACL.
If taken into common variance, the mood dimensions can be seen to be bipolarly arranged on a single continuum. This factor reduced three mood dimensions and one general arousal dimension to one bipolar dimension. By putting extraversion on the same end as hedonic tone and at the other pole from tense arousal, this factor has also proved one of the strongest predictions of Eysenck's (1967) personality theory which is that extraverts tend to be less cortically aroused than introverts.

Earlier also, bipolar models for mood assessment have been proposed. Thayer (1978) gave two dimensions of subjective arousal – energetic arousal and tense arousal. A similar two dimensional model has been proposed by Watson and Tellegen (1985), who distinguish Positive Affect (PA) and Negative Affect (NA). Attempts along similar lines have been made by others also (e.g. Cox and Mackay, 1985; Russell, 1979; Diener, Larsen, Levine and Emmons, 1985).

Viewed from the bipolarity angle of subjective moods, it seems that arousability is a desirable trait. Mood is a subjective, cognitive, conscious appraisal of one's being. High arousability
represents feeling energetic, feeling good, showing less general arousal and less tension. This point was again reinforced by another factor of Mehrabian’s Arousability (Mehrabian, 1994) where it simultaneously revealed energetic arousal to be a corresponding state.

Independently also, EA emerged as a more common variable showing its presence along with biological measures separately e.g. EA and Blood pressure and EA with Pulse rate. Many empirical studies have shown mood change resulting from biological manipulations (e.g. Thayer, 1989; Mason, 1984; Panksepp, 1986, etc.). But in the present study, mood change has been found to be related to peripheral and electrophysiological measures e.g., pulse rate & BP. Studies have suggested heightened cardiac output to correspond with a heightened arousal level (e.g. Kagan, Reznick and Snidman, 1988). Duffy (1962) was of the view that highly aroused subjects would show a characteristic electroencephalogram, with a predominance of high frequency beta waves. Besides this, they would also show symptoms of autonomic nervous system activation, such as
increased heart rate and skin conductance. Thayer (1989) related energetic arousal to a general appetitive or action system, whereas tension is associated with a preparatory emergency system.

In the present study, tense arousal state was not substantiated by correlating with bodily states. It seems from this that tense arousal state might be more of a reflection of psychological factors, not necessarily accompanied by underlying physiological changes.

This factor structure also suggests that at least energetic aspect of arousability can hold only with energy supply; else it is likely to dissipate fast and change into negative mood. In two studies (Hepburn, Deary, Munoz and Frier, 1995; Gold, MacLeod, Frier and Deary, 1995) it has been shown that energetic arousal is lowered by reduced glucose availability in the cerebral cortex, and that tense arousal may be caused by the effect of hypoglycaemia on central autonomic function and the resultant release of adrenalin.
Over and above all this, the super factor of arousability in the study is virtually very restrictive. One of the notable facts is its relative independence from Pavlovian/Russian temperamental models having sound arousability based notions. Though the factor structure adhered to the basic notions of Pavlovian Temperament Survey (PTS) and Rusalov's Structure of Temperament Questionnaire (STQ), Eysenckian personality dimensions revealed good association with these temperamental models (e.g. Neuroticism (N) with Strength of Excitation (SE) and Mobility of Nervous Processes (MO), N again with SE, MO, Strength of Inhibition (SI) and Ergonicity, Extraversion with Social Tempo, Social Ergonicity and Tempo, Extraversion with SI and Psychoticism with Ergonicity and Tempo.)

These dimensions of PTS and STQ emphasize excitation, intensity, speed, lability aspects, etc. of the nervous processes. These aspects themselves are so strong that they maintain their independent identity.
Energetic Arousal and Hedonic Tone definitely emerge as components of arousability, but this arousability might be mobile or inert, show or fast, endure longer or endure less.

Time, intensity & extensity related issues of prevalent/general moods are theoretically not to be incorporated due to its temporary or unstable stateness. Nor such components are represented in the indirect measurement technique such as scaling of adjectives (e.g. Thayer (1967) -, Matthews et al. (1990). Thus, now convergence of mood arousal with nervous system properties or formal characteristics of behavior may be attributed both to the nature & measures of mood.

It is to be emphasized specifically that arousability expressed under energetic arousal and hedonic tone are traits rather than subjective states. Thus, a high arousability person can be characterized with high energy levels and positive affect (cheerfulness). Such a person would be generally energetic and have a general feeling of well being. Rather than being a fleeting state, it would be a kind of chronic mood. It is to be emphasized
that high arousability is a desirable trait. At the same time, high general arousal is antagonistic to it.

Thus, arousability which is a pervasive mood has two components which are energy and affect. A similar theorization and clinical evidences for it exist elsewhere too. [e.g. Williams, Watts, Macleod and Matthews (1988), Williams (1989), Williams and Nulty (1986)].

The next important factor of 'Somatic Arousal' loaded positively on the biological variables of pulse rate and muscle tension. This factor knits together two discrete responses—heightened heart rate and heightened muscle tension are related positively. Although the mechanisms for regulating these are different, yet their correlation proves that arousal affects the body as a whole and not just an isolated organ. Duffy (1957) showed that arousal presents a composite picture which includes changes in skin conductance, muscle tension, EEG, pulse rate, blood pressure, etc.

The loadings on this factor are a precursor to arousability. This factor might or might not account for arousability, but it
accounts for a reliable variance. People differ in somatic arousal. Lacey (1967) introduced the important notion of response specificity: there are individual differences in the sensitivity of peripheral systems to arousal level.

The next factor - 'Nervous System Arousal' does the job of bringing together temperamental factors from PTS, STQ and also from Eysenckian personality system. All the three variables of Pavlovian Temperamental Survey i.e. Strength of Excitation (SE), Strength of Inhibition (SI) and Mobility of Nervous Processes (MO) exhibit high positive loadings. Strelau et al. (1990) have shown consistently high correlations in these three components. In a study by Newberry, Clark, Crawford and Strelau (1997), the most salient features that emerged was a relatively high SE-MO correlation. San-Martini, Alessi and Borgogni (1989) reported that SE was positively related to MO and to SI. In their study, two significant factors emerged from factor analysis: an SI factor and a mixed SE and MO factor. High positive loadings of neuroticism on this factor denote a
greater autonomic lability i.e. the capacity of the person to get aroused is high. This factor loads negatively on ergonicity.

The basic behavior pattern that emerges out of these positive leadings is of a person who gets aroused easily, to a higher degree, for a longer period of time and to a wide variety of situations.

The concept of optimal activation (Hebb, 1955; Eliasz, 1974) tells that an individual supplies him or herself with stimuli until attaining an optimal level of arousal. When stimulation and arousal are above optimum, the individual does not strive for more physical or mental activities which will enhance arousal.

This concept explains why an individual who already displays a greater degree of intrinsic arousal will not strive for further environmental manipulation.

The emergence of an independent factor reveals the independence of PTS as a construct from bodily states and mood. The convergence with Eysenckian Personality System may be due to the common underlying theoretical model. However, within the model, supposedly independent dimensions emerging
within a component (SE, SI and MO) reveals the obliqueness in the model. It may be due to statistical artefacts that the scores which were correlated represent the overall dimension scores.

The 'Social Arousability' factor displays relationship between the structure of temperament and extraversion. Extraversion is characterized by assertiveness, gregariousness, cheerfulness and energy. Social behaviour also is a primary defining characteristic of extraversion. Social ergonicity is concerned with acquiring social forms of activity, about the striving for leadership, sociability and involvement in social activity, while social tempo is directed at the speed component of social activity. So, whether it is social ergonicity, tempo or social tempo, they all point to the same core patterns of behaviour as displayed in extraversion. Brebner and Stough (1993) found high correlations between extraversion and social ergonicity. They also detected a slight effect of extraversion in all four of the social scales of Rusalov's questionnaire. It can be characterized as sociability - social striving or social arousability - lowered social arousal, therefore, seeking social stimulation.
The factors - 'Sympathetic Arousal' and 'Specific Autonomic - Sweat Gland' load purely on physiological factors. These factors display loadings on blood pressure and skin conductance. When more energy is being mobilized, the defense reaction (cardiovascular component only) consists of increased heart rate, elevated systolic and diastolic blood pressures and an increase in cardiac output (pulse rate) (Folkow, 1979; Lisander, 1979). Sebej, Mullner and Farkas (1984) also discuss an additional point regarding blood pressure. They showed that although both measures of blood pressure register an increase during arousal, diastolic blood pressure is more sensitive to experimental manipulation and evidences a greater increase.

Duffy (1962) reported that as a organism prepares for 'fight or flight', one of the arousal patterns exhibited is an elevated skin conductance level. Tonic arousal may be reflected in both increased skin conductance level (SCL) or in a higher rate of 'spontaneous' skin conductance responses (SCRs). Fowles, Roberts and Nagel (1977) reported that extraverts tended to show greater SCL as compared to introverts (since extraverts are less
cortically aroused than introverts). Similar results have been reported by Smith (1983) following caffeine ingestion.

The 'Inhibitory Arousal' factor loads positively on E and PTS' Strength of Inhibition. Traditionally SI has been measured when equilibrium of nervous processes i.e. SE/SI ratio was to be diagnosed (e.g. Pavlov, 1952, Teplov, 1964, Strelau, 1983). Various studies have reported either no relationship between these two properties i.e. E and SI or at best a weak one (e.g. Strelau, Angleitner and Ruch, 1989; Ruch, 1992). However, when equilibrium is discussed, then a positive relation between SI and E does emerge. Strelau et al. (1989) in a review of 19 studies found a main trend that suggests a low positive correlation between E and balance of the CNS.

The 'Activation' factor reveals high loadings on two dimensions of Rusalov's STQ - Ergonicity (Er) and Tempo (T). Rusalov (1989) has shown a high positive correlation (.240) between the scales Er and T. These two scales also correlate positively with Eysenck's psychoticism. Rusalov (1989) identified that an inherent impulsivity is present in the Er and T
scales. Impulsivity, along with sensation seeking behavior is what Eysenck (1985) had envisaged the structure of Psychoticism to be. So, the common thread of sensation seeking and impulsive behavior emerge in this factor.

The factor 'Variability in muscle tone' provides correspondence between EMG SD and the diastolic blood pressure index. Melamed, Harari and Green (1993) found that tension arousal (as revealed in heightened EMG readings) was related to blood pressure and heart rate reactivity.

The EMG measure also emerged in connection with psychoticism. High P score also warrants a corresponding rise in the muscular tension level. This fact has also been borne out in a study by Hilton (1975). He found a significantly high correlation between P and EMG.

Arousal is of special interest to personality psychologists because this concept appears to provide the basis for integrating individual differences in physiology, subjective experience and behaviour. This study was organized around the same premise. This should have led to some such factor which integrated the
various approaches followed in this study i.e. objective temperamental testing, indirect testing (UMACL) and psychophysiological measurement. However, one of the limitations of the present study was the emergence of a not so powerful first factor. This factor does account for 11% of the total variance, but, it failed to knit together objective temperamental traits tests e.g. PTS, STQ, Eysenckian personality system with physiological indices of arousal. Although the objective tests e.g. PTS, STQ and EPQ –R, do converge, yet, no correspondence appears between them and subjective mood states. Also, the psychophysiological measures emerge as more or less independent factors and do not show significant correspondence with mood or temperamental measures. The explanation for this surprising finding could be that the variance related to the methods of measurement probably plays some role in the factor structure. Matthews, 1985 found that empirically predictions from arousal theory in both psychophysiological and behavioral domains often fail to be confirmed.
The hetro trait vs. mono trait axis is also expressed in the findings, as the construct appears to have several components/aspects/traits. These can be listed as follows –

- Arousability (Energy & affect)
- Somatic arousal
- Nervous system arousability
- Social arousability
- Smaller components of bodily arousal e.g. cardiac, autonomic (sweat gland), etc.

The phenomena of arousal and arousability seem to have distinct but inseparable identity.

* Similar evidence is also available which indicates that arousal is a multidimensional rather than a unidimensional construct. This evidence is provided by work discriminating different neuro-transmitter systems associated with arousal, which may differ in their functional significance. (e.g. Gray, 1982, suggests that the operation of the Behavioral Inhibition System (BIS) varies according to whether it receives inputs from cholinergic, noradrenergic or serotonergic pathways).
There is considerable heterogeneity to be found in the concept of arousal/arousability. Thus, to present a unified theory of arousal/arousability would be a tall order indeed. The arousal state springs from arousability trait. Although the basic arousability level is stable, the arousal state is not. The arousal state can be intrinsic or extrinsic. Intrinsic arousal can be expressed as either central or peripheral arousal. Extrinsic arousal is expressed in stimulation seeking behaviour. All these aspects of arousal/arousability may be orthogonal or correlated. Still, there may be some hierarchical arrangement among these components.

High or low arousability might be expressed in the fact that the same intensity of stimulus gives rise to either a low or a high state of arousal. A person high in trait arousability is likely to keep the system's arousal tone high. Therefore, such temperamental persons would engage in activities giving stimulation to the system in order to enhance its arousal tone. However, the system tends to dissipate the intrinsic arousal due to its inherent mobility from low through high to low state-owing
to its limited energy supply (metabotropic changes) and transferase enzymes making changes in the ionic distribution in the synapses. (Phillis, 1984; Cooper, Bloom and Roth, 1982). All these components may be taken as relatively broad factors or group factors or secondaries.

It is indeed a challenging task to integrate all these seemingly diverse aspects of arousal/arousability. From this perspective, the task for researchers is to establish psychophysiological findings and to explain anomalies. Ours was a modest attempt which has reduced this amorphous concept into a multi-component construct along a horizontal axis.