was greater precision and care in the responding of the older Ss than in that of younger Ss. Second, it may be the case that younger Ss are not as sensitive to the ordering phenomenon as are older Ss. Either or both of these factors could result in a greater variance in the scale values for the older Ss than for younger Ss.

Direct assessment of order preferences at younger ages than those tested presents considerable methodological and logistic problems. However, it would seem worth the effort to attempt to develop

techniques with more face validity than Bever and Epstein's. The more direct the procedure, the more meaningful will be comparisons between the results of such a procedure and the results reported here.

REFERENCES

- BEVER, T. G. The cognitive basis for linguistic structures. In J. R. Hayes (Ed.), *Cognition and the development of language*. New York: Wiley, 1970. Pp. 279-362.
- MARTIN, J. E. Semantic determinants of preferred adjective order. *Journal of Verbal Learning and Verbal Behavior*, 1969, 8, 697-704.

Dimensions of subjective response to short-term sensory deprivation*

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A semantic differential type of rating procedure was applied to sensory deprivation by a population (N = 26) which underwent 6 h of sensory restriction. The results of cluster analysis on a matrix of correlations between the 29 scales showed that judgments of the unpleasantness of deprivation were quite highly related to judgments of its boringness, but that both these clusters were only slightly related to two clusters interpreted as measuring stress. Some possible consequences of these data for the theoretical analysis of sensory deprivation are discussed.

A reliable effect of sensory deprivation is that Ss report that it is unpleasant, boring, and mildly stressful. There has, however, been rather little work examining the nature of subjective response other than by analysis of postdeprivation interview data. Myers and his associates (Myers, 1969) have developed and used an Isolation Symptom Questionnaire (ISQ) and have reported the existence of three correlated factors: tedium stress, unreality stress, and positive contemplation. Their data have been obtained mainly from long-term studies, and the ISQ, as its name implies, focuses upon symptoms of deprivation, rather than on subjective affects *per se*. Zuckerman (Zuckerman, Levine, & Biase, 1964) has used his Multiple Affect Adjective Check List (MAACL) (Zuckerman & Lubin, 1965) in the sensory deprivation situation and has reported reliable changes in affective responses arising from a number of deprivation situations. [Zuckerman (1969a) reviews and summarizes this work]. The MAACL is designed to measure

experimentally induced affects in general, and it would seem possible that some qualitative aspects of the response to sensory deprivation might not be measured by it.

The work to be reported here specifically investigates the broad nature of subjective response to sensory deprivation, with a view to offering a more complete description of it.

SUBJECTS

The Ss were 26 male undergraduates at the Welsh College of Advanced Technology. Their ages ranged from 18 to 24 years (M = 19.8 years), and they were paid £1/10 (\$3.60) for their participation.

TEST

A subjective rating test was made up of 29 bipolar, 7-point rating scales. One pole of each scale was an adjective which had been reported in previous work to have been applied to sensory deprivation. The other pole was an opposite selected by E, usually from Roget's *Thesaurus*. The scales were listed in a randomly determined order, and the direction of the scale (i.e., whether from good-bad or from bad-good) was also randomized. This procedure departs from the semantic differential method described by Osgood, Suci, & Tannenbaum (1957), where scales loading on the same

factor are maximally separated, and the direction alternates. An attempt to order the scales systematically here would have prejudged the outcome of the investigation, since the factorial structure was not known.

PROCEDURE

The experiment was explained to the Ss as "an investigation of your reactions to 6 h of sensory monotony," and the general conditions of the experiment were described. The Ss underwent a personality and cognitive testing procedure (unconnected with the results reported here), lasting just over 1 h. They were then taken into a sound-deadened deprivation cubicle (approximately 6 x 10 ft) and made comfortable in an adjustable chair. Electrodes were attached for the continuous recording of GSR. All Ss wore earphones delivering 25 dB white noise, and all wore goggles. Half the Ss were confined in the dark and half in the lighted cubicle wearing translucent goggles. They were instructed to remain still, quiet, and awake. They were continuously monitored through the substation of an intercom.

After 6 h, the E entered the chamber, removed the goggles and earphones, and administered a standard form of interview. The interview was designed to elicit any idiosyncratic responses and to give the Ss time to reorientate themselves. In practice, few Ss made idiosyncratic responses and none appeared disoriented. The interview was not intended to be a major source of data. Finally, the Ss filled in the rating scale blank under the following written instructions: "Below are some pairs of opposites. I want you to look back on the time you spent in the cubicle and try to decide where the experience falls between the two extremes. If it fell at one of the extremes, put a tick in the space next to the word. If the experience was neutral, put a tick in the central space. Use the other four spaces to make up an imaginary scale on which you would rate the time you spent in the cubicle. E.g., a scale might run: extremely good, very good, fairly good, neutral, fairly bad, very bad, extremely bad. Try to make the gaps in the scales equal, i.e., the difference between 'neutral' and 'fairly' should be the same as the difference between 'extremely' and 'very.' You do not have to use the whole scale if you do not feel that the experience was extreme, nor does it matter if many of your answers fall in the extreme categories."

RESULTS AND DISCUSSION

The responses made by the Ss in the light and dark conditions did not differ, and, therefore, the data from both groups have been pooled.

*From a thesis presented by the author to the University of Wales for the PhD degree. The author wishes to thank Dr. J. O. Robinson for his encouragement and help in supervising the work.

Table 1
Mean Correlations Within Clusters and Mean Correlation of Scales in Each Cluster With Those of Each Other Cluster

Cluster	I	II	III	IV
I	+0.393	+0.248	+0.066	+0.166
II	+0.248	+0.343	+0.152	+0.079
III	+0.066	+0.152	+0.386	+0.186
IV	+0.166	+0.079	+0.186	+0.357

Table 2
B Coefficients of Clusters in Whole Matrix (Leading Diagonal) and of Clusters When Compared With Only the Items of One Other Cluster

Cluster	I	II	III	IV
I	3.82	1.58	5.69	2.41
II	1.38	2.62	2.26	4.34
III	5.85	2.54	2.82	2.08
IV	2.19	4.52	1.92	32.50

Three of the 29 scales were found to be inapplicable to the experience of sensory deprivation. The majority of Ss used the midpoint of these scales, and it has been argued that this indicates that the scale is irrelevant to the concept, rather than that the concept is genuinely neutral with respect to the scale (Osgood, Suci, & Tannenbaum, 1957). The three were "frightening," "weakening," and "spooky."

Three further items, "special," "physical," and "emotional," did not correlate significantly (Kendall tau coefficients, two-tailed test, $p > .05$ were accepted) with any other and, therefore, were omitted from further analysis.

The matrix of Kendall tau coefficients between the remaining 23 scales was submitted to a cluster analysis described by Fruchter (1954).¹ The small N and high number of variables made a factor analysis inappropriate. It is a feature of cluster analysis that each variable can appear in only one cluster: there is no distribution of variance between factors. Possibly as a result of this fact, four scales could not be fitted into the eventual cluster pattern. They correlated with two or more clusters and substantially altered the significance of any to which they were added. These four scales were: "active," "restless," "stuffy," and "free." It is clear that they, unlike the six items omitted for irrelevance or no correlation, may have some psychological significance in subjective judgments of sensory deprivation by this population. They are simply not interpretable within the constraints imposed by the method of analysis.

Table 3
Scales Comprising the Four Clusters Isolated

Cluster I: Boringness	
Purposeful	— Aimless
Varied	— Monotonous
Stimulating	— Dull
Interesting	— Boring
Cluster II: Unpleasantness	
Enjoyable	— Impossible to enjoy
Fun	— Not fun
Warm	— Cold
Comfortable	— Uncomfortable
Pleasant	— Unpleasant
Tolerable	— Intolerable
Cluster III: Stress	
Easy	— Difficult
Peaceful	— Disturbed
Simple	— Confusing
Calm	— Uneasy
Relaxing	— Strenuous
Content	— Anxious
Cluster IV: Affectingness	
Ordinary	— Extraordinary
Impersonal	— Personal
Shallow	— Deep

Table 1 shows the mean correlations within clusters on the leading diagonal, and the mean correlation of the scales of each cluster with those of each other cluster. Table 2 shows the B coefficients of each cluster (ratio of correlation within to correlation without) on the leading diagonal and the B coefficients which would have been obtained from the clusters had only the scales of two clusters been present in the matrix. Fruchter (1954) quotes a B coefficient of 1.3 as the minimum significant differentiation between clusters. It can be seen that all clusters are significantly differentiated and that the differentiation is better when the whole matrix is considered.

The scales composing the four clusters are listed in Table 3. Cluster I has been termed the "boringness" cluster, Cluster II, "unpleasantness," Cluster III, "stress," and Cluster IV, "affectingness." Cluster IV is difficult to interpret, owing to its small size. It is, however, very sharply differentiated from the rest of the matrix and strengthens the clusters by its differential correlation with them. It would seem to represent a shade of meaning on "stress," such that Ss finding the situation ordinary, impersonal, and shallow are unlikely to be stressed.

Clusters I and II are quite highly related, as are Clusters III and IV. It is clear, however, that each cluster may represent a distinct dimension of judgment and that the two pairs of clusters, I and II compared with III and IV, are markedly differentiated.

The findings may have some theoretical and practical significance.

The terms, "stress" and "affect," appear to be used almost interchangeably in some theoretical formulations, and each has been described as the subjective concomitant of hallucination, cognitive confusion, and endurance in sensory deprivation. In some instances, at least, the subjective report of aversion may be independent of reports of stress.

This study employed a relatively short-term deprivation period and differed from other deprivation situations in that the Ss remained sitting (not lying) and experienced, even in the dark condition, continuous aural stimulation. There is not much evidence to suggest that the physical conditions of deprivation play a large part in determining subjective response, but these results should be interpreted with caution. In deprivation lasting several days it may be that these dimensions of response fuse or that different dimensions emerge.

Nevertheless, theoretical formulations such as those of Eysenck (1967) and Zuckerman (1969b) must be applied with careful specification of the subjective response predicted. It is clear that, in at least some deprivation situations, responses relating to the subjective pleasantness of the situation may be independent of responses relating to subjective stress.

REFERENCES

- EYSENCK, H. J. *The biological basis of personality*. Springfield, Ill: Charles C Thomas, 1967.
- FRUCHTER, B. *Introduction to factor analysis*. New York: van Nostrand, 1954.
- MYERS, T. I. Tolerance for perceptual and sensory deprivation. In J. P. Zubek (Ed.), *Sensory deprivation: Fifteen years of research*. New York: Appleton-Century-Crofts, 1969. Pp. 289-331.
- OSGOOD, C. E., SUCI, P. H., & TANNENBAUM, G. J. *The measurement of meaning*. Urbana: University of Illinois Press, 1957.
- ZUCKERMAN, M. Variables affecting deprivation. In J. P. Zubek (Ed.), *Sensory deprivation: Fifteen years of research*. New York: Appleton-Century-Crofts, 1969a. Pp. 47-84.
- ZUCKERMAN, M. Theoretical formulations I. In J. P. Zubek (Ed.), *Sensory deprivation: Fifteen years of research*. New York: Appleton-Century-Crofts, 1969b. Pp. 407-432.
- ZUCKERMAN, M., LEVINE, S., & BIASE, D. V. Stress response in total and partial perceptual isolation. *Psychosomatic Medicine*, 1964, 26, 250-260.
- ZUCKERMAN, M., & LUBIN, B. *Multiple Affect Adjective Check List*. Educational and Industrial Testing Service, California, 1965.

NOTE

1. Note that Kendall tau coefficients are numerically smaller than product-moment correlations on the same data and at the same levels of significance; e.g., with $N = 26$, a tau of .274 and an r of .381 reach the .05 level of significance (two-tailed probability).