A STUDY ON THE PSYCHOLOGICAL EFFECTS OF EXPERIMENTAL ISOLATION AND SEMI-STARVATION

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ABSTRACT

A batch of Naval personnel was kept in isolation under conditions of semi-starvation for a period of 5 days. It was observed that during this period there was no significant deterioration in the capacity of the subjects for mental effort. Feelings of tiredness and exhaustion which were reported by the subjects also appeared to be more an outcome of idleness and unwillingness to continue with the situation than the result of any serious physical weakness.

Introduction

Study of changes in human behaviour under conditions of isolation and semi-starvation is a subject of interest to many agencies. Personnel of the Armed Forces meet with such situations often, as for example, in the case of personnel posted in far off pickets in the hills, jungles or deserts. Personnel of the Navy and Air Force too sometimes get isolated because of certain mishaps. They have to depend on their own meagre resources till such time as help reaches them. Besides Armed Forces, mountaineers and polar explorers also have to face the problems of survival under emergency conditions.

The present study is an attempt to find out how far experimental isolation and semi-starvation affect human behaviour.

Method

This experiment was carried out on a batch of 23 Naval personnel who volunteered for the study. They were placed in a Naval cutter moored to a buoy off the Bombay harbour. Two packs of cards and a few magazines were made available to the subjects to keep off the monotony.

The food supplied to the subjects consisted of sweets with a calorific value of 700. In addition each subject was supplied with 500 c.c. of water per day. The subjects were not allowed to supplement this supply of food and water from any other source. They had no contact with the land except through a wireless set which was provided for communication with the trial office ashore in case of emergency. Fuller details regarding the experimental conditions as well as the results of physiological and biochemical studies are published elsewhere[1].

The psychological study of the subjects included administration of psychological tests before and after the trials and also recording of the opinions of the subjects about how they felt during the trials. For the former purpose

three psychological tests were administered. For the latter purpose, the subjects were asked to fill in two questionnaires, one on each day of the trial and, the other at the end of the trial period.

Description of the Tests

To study whether or not the experimental conditions brought about any changes in the capacity for mental effort of the subjects, three tests were administered namely: (*i*) coding test (*ii*) perseverance test and (*iii*) memory test. In the coding test, the task set was to substitute numbers for letters of the alphabet with the help of a code given at the top of the test-sheet. The test time was three minutes. A subject's efficiency on the test was calculated by using a standard coding rate of two letters per second as the reference.

In the Perseverance Test the subjects are given ten trials of writing down two letters e.g. N, Z alternatively. Each trial lasts 25 seconds and a rest pause of 5 seconds is allowed to a subject between two trials. Efficiency score of a subject is based on the last eight trials leaving out the first two. The eight trials are divided into two blocks, consisting of 1 to 4 and 5 to 8. The number of sets (of letters) a subject repeats in the first block of trials is subtracted from the number of sets he repeats in the second block of trials, and the result thus obtained is added to or subtracted from another number 25, as the case may be. This method is adopted to eliminate negative signs and to make the scores on this test comparable with the scores on other tests.

In the memory test a set of 20 three-lettered nonsense syllables is presented to a subject for three minutes. The subject is then asked to write down the items he can recall. The percentage of correctly recalled items becomes the score.

Questionnaires

In addition to the above tests, the subjects also filled two questionnaires, one daily and the other at the end of the trial. The first questionnaire related to the day to day problems of the subjects and the second aimed at gathering their impressions of the experiment as a whole; the subjects were assured that their answers would be kept confidential and they were encouraged to write whatever they felt genuinely about the trials.

Results

Data of this study falls under two heads; data pertaining to psychological tests and data relating to opinion survey. The results of psychological tests are given in Table 1 below.

TABLE 1

Result of Psychological Tests

Test	Mean Scores		't' value of the difference between the means	Remarks
	Before	After		
Coding	24·7	23·6	0·80	Not significant
Memory	30·0	26·3	0·88	,,
Perseverance	21·6	22·6	0·73	,,

As is clear from the above table, there is no significant deterioration in the performance capacity of the subjects on the three tests.

Analysis of the answers to the Questionnaires

Of the two questionnaires, the one which was filled by the subjects every day, included questions about (*i*) Sleep, (*ii*) Tiredness, (*iii*) Weakness, (*iv*) Hunger and (*v*) Acceptability of Food. The last column in this questionnaire was provided to the subjects for mentioning any other point not covered by the above questions.

Information obtained from the first five questions was rated on a three point scale ranging from 0 to 2, according to the scheme of scoring given in Table 2.

TABLE 2

Scheme of Scoring the Answers to Questionnaire No. 1

Item	0	1	2
Sleep (during last 24 hours)	Slept for more than 8 hrs.	Slept for 4-8 hrs.	Slept less than 4 hrs.
Tiredness/Weakness ..	Not at all	Some-what	Very much
Hunger ..	Very much	Normal	Not at all
Acceptability of Food	Good	Not so Good	Not Good

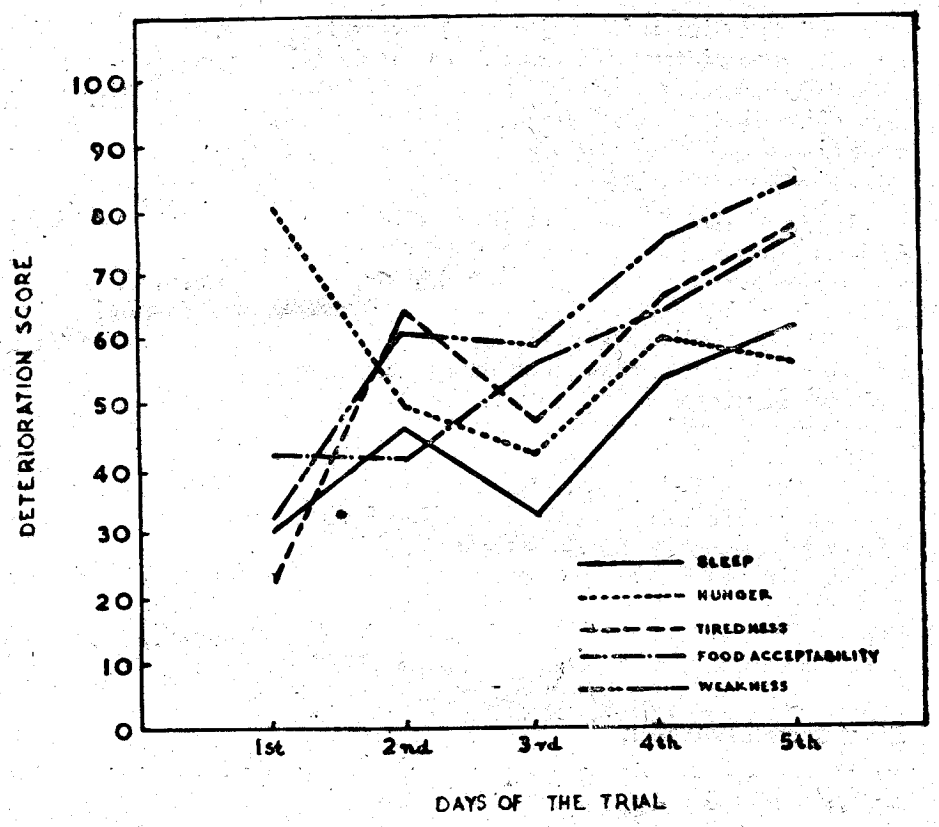
It would be noted from the above scheme of scoring that the higher an individual scores the greater the deterioration he reports. Adopting this method answers of all the 23 subjects were placed into different categories and were converted into numerical values. The total scores of the group on each item obtained by pooling all the individual scores were further converted into deterioration scores expressed in percentages. The following formula was applied for converting the raw scores into deterioration scores.

$$\text{Deterioration score} = \frac{\text{Total score of the group}}{\text{Maximum possible score of the group } (23 \times 2)} \times 100$$

The deterioration scores of the group on each day for each of the five items are shown graphically in Fig. 1.

It will be observed from the graphs that the deterioration scores of the subjects for sleeplessness, tiredness, weakness and dislike of food have increased gradually as the duration of the experiment extended. But the deterioration score for hunger has decreased from 81·0 on the first day to 55·3 on the last day. This point will be discussed in the latter part of the paper.

Analysing the responses to the last column (any other points) of this questionnaire, it was found that 68% of the subjects wanted a change in diet by the third day. Most common alternative choices of the group were 'something saltish', 'Dog Biscuits' and Channas (Grams). About 80% of the group reported excessive thirst and 25% excessive gas formation in the stomach.



No other trouble was reported by the subjects in their answers to this questionnaire.

In the second questionnaire which was filled by the subjects on the last day of the trial, eight questions were included to assess sociability and emotional stability among the subjects and obtain their reactions to the experimental situation as such. From the answers obtained to this questionnaire, it was noted that 34·3% complained about lack of sociability, 18·3% about increased mental worries and 43·8% about the uncomfortable nature of the experimental situation.

In addition to the above, two questions more were included in this questionnaire. In one, the subjects were asked if they repented for having volunteered for the trials. Only 2 out of the 23 subjects gave a reply in the affirmative to this question. In the next question the subjects were asked what they disliked most during the trials. It was found from the answers to this question, that the main dislike of the group was food. Excessive thirst was reported as the second most disliked thing.

Discussion of results

Semi-starvation and isolation are two aspects of this experiment. The condition of semi-starvation was created for the subjects by giving them a restricted type of food, namely sweets having 700 calories only. The conditions of isolation were simulated by putting the subjects in a cutter in the sea some distance away from the shore. These two factors, therefore had a combined effect on the psychological well-being of the subjects.

We found that the results of the psychological tests administered to the subjects before and after the trials did not reveal any significant change in their performance capacity. Here two things are to be kept in view. Firstly, that all the subjects included in the study were physically and mentally healthy. Secondly, the duration of the trial was limited to 5 days only. In view of the fact that the subjects were all volunteers they were determined to put up with certain amount of discomfort. This becomes clear when we learn that only 2 out of 23 subjects repented for having volunteered for the trials. May be, if the trial period had been extended the subjects would have shown some deterioration in their mental efforts. But as it is, our results are quite in conformity with those of Brozek and Taylor[2] who also did not record any noticeable changes in the psychomotor abilities of their subjects during a 24 day trial period. Lack of concentration and decrease in the thinking ability which subjects undergoing such trials sometimes complain of, have also been found to be more a result of emotional upset and slight physical weakness than any decrease in their mental efficiency.

Effect of semi-starvation

From responses to the first questionnaire we gather that a majority of the subjects felt very tired and weak by the fifth day and many of them were unable to sleep even for 4 hours per day. On the hunger and food acceptability side, we note that though the percentage of subjects disliking food had been increasing gradually, yet the percentage of subjects reporting very hungry came down substantially.

So far as the effect of semi-starvation on the functional ability of an individual is concerned, it has already been pointed out that there is no significant loss in the mental effort during a period of five days. Psycho-motor ability, in fact, can remain unaffected for a longer period. Deterioration in physcial fitness too mostly appears a matter of feeling only. The present study was supposed to be continued for 7 days but did not because certain subjects could not resist the sensation of thirst and did not like to continue with the trials. But when the experiment was terminated on the 6th day morning, they all came to life once again. Their feelings of listlessness and tiredness vanished in no time. Brozek[3] has also reported that feelings of tiredness and weakness are not actually related to the loss in capacity for physical and mental work even when the subjects are kept under acute starvation with hard physical work, during a few days period. This shows that an individual can live on his body reserves for quite a few days without showing any real adverse effect on his mental and physical efficiency, provided he has the keenness to continue.

The other aspects of semi-starvation are dislike for food and feeling of hunger. As already mentioned, we have in this study found that while the percentage of subjects disliking food has increased gradually the number of those reporting 'very hungry' had come down. A number of subjects had left a good portion of their already inadequate food supply unconsumed. Ordinarily one would expect a hungry man to be less selective about what he eats, The revulsion to food which some subjects had shown in spite of the fact that they were hungry, only proves that acceptability of food is a major factor in food consumption[4]. However, some experiments have shown that acute starvation may force one's likes and dislikes for food into background and one is ready to eat anything edible available.

In response to the question "What did you dislike most during the experiment?", about 80% of the subjects reported food as the most disliked thing. Thirst has figured out as second in importance. Practically no one has complained about the isolation Comparatively much less number of subject had talked about the chill at night heat during day time, lack of bedding etc. No doubt the observation about food in this study has been reported by the subjects under the conditions of semi-starvation only, but it does reveal the importance of hunger drive. It appears that under the grim pangs of hunger and thirst other motives tend to fade. In the talk of hungry men food and everything connected with it constituted the main theme.

Effect of Isolation

From the answers to the second questionnaire, it has been found that during the trial period about 35% of the group experienced lack of social understanding. Among the group members, about 20% reported increased mental worries and about 45% have complained about the uncomfortable experimental situation. Life in the cutter was not all smooth; certain discomforts were part of the trials. These discomforts in addition to the stress of isolation aggravated their distress and some of them felt very much agitated at heart. The intensity of their agitation can be assessed from the answers some of them wrote in the last column (any other point) of the first questionnaire. One writes, "Even if I am given all the dollars in America I will not volunteer for this experiment again". Another says "I want to go to-morrow and no power on earth can stop me".

A man gets accustomed to a particular type of living. Any change in it, external or internal, is likely to create emotional imbalance in him. The greater the change, the worse it is for him. Extreme sudden changes sometimes leave the man mentally a wreck. Society constitutes a necessary environment for him. He is happy among his fellow-beings. Away from them he is miserable. Solitary imprisonment has been considered the worst type of punishment. On the other hand, forced community living with a few persons also irritates a man. It is the experience of some mountaineers that faced with the vast and wild vacant expanse of high altitude surroundings and compelled to see the same few faces day in and day out, they are at times so much perturbed emotionally that they feel like killing their few colleagues. Yet it was found that the individuals though subjected to such stressful situations do not feel the severity so much when engaged in active pursuits or

when they have a chance to plan for future. A recent study carried out on 39 members of International Geophysical Year (IGY) research team, who spent twelve months at an isolated Antarctic station has revealed that purposeful isolation had no adverse effect on their mental health. Moreover the acceptance of the fact by most of the persons that there was no possibility of release from the situation increased their tolerance for each other's weaknesses, capacity for a balanced appraisal of a situation and desire to work hard[5]. On the other hand, those who have to sit idle under such oppressive circumstances, as was to case with the subjects of this study, feel lonely and depressed and become unduly suspicious.

In the present study, however, the situation was not so severe comparatively. But isolation and semi-starvation coupled with idleness seem to have made the situation sufficiently difficult for the subjects. The duration of the experiment was fixed before hand and they could do nothing about it. So their helplessness took the form of lack of social understanding, increased worries and grumblings about the experimental situation. Lack of moral standards and increased selfishness have been reported by Lipscombe *et al*[6] in a study on the internees of the famous Belsen Camp. Brozek and Taylor[2] in their study of the psychological effects of maintenance on survival ration during a 24 day period have also reported that some of their subjects revealed symptoms of hypochondriasis, depression and hysteria on the M.M.P.I. So we can say that in a stressful situation involving isolation and semi-starvation, the main thing to be looked after is not so much the physiological aspect but the emotional well-being of the subjects. If the desire to get along with the situation has not failed the subjects, they can bear it for a much longer period without any substantial loss of mental and physical efficiency than otherwise.

Conclusion

This study has revealed that persons subjected to the conditions of isolation and semi-starvation for a short period, extending upto five days, do not show any significant deterioration in their mental abilities. Their feelings of tiredness, and listlessness too are mostly psychological and much less real. A man can live on his body reserves for quite a few days if only he has the desire and keenness to do so. Lack of social understanding and increased worries and irritation are also mainly the off-shoot of idleness and the unwillingness of the subjects to put up with the situation. It appears if the persons subjected to isolation alone have an aim to pursue and have full knowledge of how long they have to withstand the stressful situation then they are likely to develop a better type of mutual understanding and an intense desire to achieve the goal.

Acknowledgements

The authors are thankful to Surg. Lt. Comdr. M. S. Malhotra for making this study possible and to Surg. Lt. Comdr. T. B. De Netto for his valuable help in the collection of the data. We are also thankful to the Naval officers and Ratings who volunteered for this study.

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