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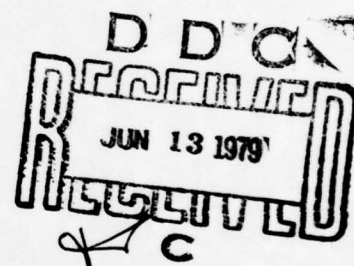
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BARRACKS LIVING: THE EFFECTS OF STIMULUS
REDUCTION/ENRICHMENT ON PERFORMANCE SKILLS

by

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20. Abstract (cont.)

perceptual skills of isolated soldiers were negatively related to time. Job performance and discipline problems also appeared related to barracks isolation.

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BARRACKS LIVING: THE EFFECTS OF STIMULUS REDUCTION/ENRICHMENT ON PERFORMANCE SKILLS

BRIEF

Requirement:

To determine the impact of barracks isolation as experienced by approximately 25% of USAREUR enlisted personnel on soldiers' problem solving skills, vigilance skills and job performance.

Procedure:

In Study I, newly arrived enlisted personnel (11B10-MOS) were administered a test of cognitive skills and perceptual acuity. This test was again administered to the same personnel after three months of barracks isolation (stimulus reduction) due to their arrival in USAREUR with a "negative leave balance." In Study II, soldiers were designated by their supervisors as barracks rats (stimulus reduction) or non-barracks rats (stimulus enrichment) according to a criterion based on where they spent off-duty time (in the barracks or off the post.) Designated soldiers were then administered the test of cognitive and perceptual skills. Interviews were held with supervisory personnel in selected USAREUR companies to determine the effects of barracks isolation on performance from the commander's perspective.

In Study III, a sample of soldiers who had participated in the previous study were rated by their immediate supervisor as well as another leader on six job performance categories adapted from the Enlisted Evaluation Report (EER) form.

Findings:

In Study I, the test results indicated that cognitive skill levels significantly declined after three months of barracks isolation in USAREUR. Perceptual acuity, however, was not affected by isolation and in fact improved somewhat. In Study II, the sample was subdivided into soldiers in the early, middle, and late stages of their USAREUR tour. No differences were found between soldiers under conditions of stimulus reduction/enrichment in the early stage (1-9 months) of a USAREUR tour. Soldiers under conditions of stimulus reduction serving in the middle (10-18 months) and late (19+ months) stages of their USAREUR tour scored significantly below comparable stimulus enriched soldiers. Again, no differences were found between soldiers under conditions of stimulus reduction/enrichment on the test of perceptual skills.

Interviews with supervisory personnel indicated that barracks rats were more likely to utilize drugs and less likely to take initiatives in job performance. In general, they were considered mediocre performers.

However, it was reported that barracks rats were not likely to cause disciplinary problems.

The impressions related to job performance gained from the commander interviews were confirmed in a direct comparison of barracks rats and non-barracks rats in a mechanized infantry battalion. Commanders rated barracks rats consistently below non-barracks rats in six job skill dimensions. Differences were greatest for leadership qualities, ability to work with others and knowledge of the job.

Utilization of Findings:

It is recommended that incentives be provided by commanders in the form of three-day passes to soldiers, especially during their first six months in country, to encourage them to "get out of the barracks." Also, it is recommended that commanders provide positive incentives and opportunities for new soldiers to participate in structured tours of Germany and Europe. Finally, it is recommended that commanders encourage soldiers to have contact with German peers either through Kontakt and German-American clubs or in other ways.

In addition to commanders' prerogatives, it is recommended that military communities explore mechanisms which will facilitate cross-cultural contact between American soldiers and German civilians such as the joint use of local recreational facilities, e.g., swimming pools, gymnasiums, etc.

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BARRACKS LIVING: THE EFFECTS OF STIMULUS REDUCTION/ENRICHMENT
ON PERFORMANCE SKILLS

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Barracks Living: The Effects of Stimulus Reduction/Enrichment on Performance Skills

Variation in everyday experiences is normative for human beings. Situations in which everyday variation is significantly reduced are both rare and generally aversive. (see Fiske & Maddi, 1961). Isolation, confinement, stimulus deprivation are all conditions which result in significantly reduced variation. What are the consequences of a reduction in experienced variation? The question of the effects of reduced variation on military personnel has long been of interest to military planners. For example, in World War II, the problem of maintaining performance during prolonged sessions of watching a radar screen was salient. During the Korean War, the effects of brain-washing led to studies of severe stimulus reduction on individuals. (see Fiske, 1961). While the lack of variation can be thought of as an individual variable, it is equally important to note that groups of individuals can together experience reduced variation when isolated or confined. Isolated groups, according to Mullin (1960) are confronted with three major stresses. First, isolated environments regardless of their relative complexity eventually become boringly predictable when compared with conventional environments. Second, the interdependence of the members of isolated groups requires them to find ways to cope interpersonally under somewhat unfavorable conditions; and last, many of the usual sources of emotional satisfaction are often missing in isolated environments. In the U.S. Army in Europe (USAREUR), a kind of group isolation occurs which has been labeled the "barracks rat phenomenon." Basically, this characterization is applied to the approximately 20-25% (ODCSPER Personnel Survey, 1977) of enlisted soldiers who seldom if ever venture out of the military community in which they are stationed. The ways in which a typical barracks rat behaves are quite stereotyped and usually follow a pattern of sameness reminiscent of artificially isolated environments. The barracks rat makes a circle between his barracks room, work, and perhaps one or two recreational facilities on post (e.g., EM Club, movie theater, bowling alley). This lack of variation which then limits the soldiers' opportunities for contact with individuals other than those within his limited group coupled with the reduced opportunities to participate in activities which would be available in the U.S.A., all point to the barracks rat syndrome as a kind of self-selected group isolation and stimulus reduction, albeit not as severe as has been typically the case in prior studies of these phenomena.

What are the consequences of being a barracks rat? In a statement of human research needs, the 32nd Air Defense Command has noted that barracks isolation may create an apathy on the part of the soldier which "negates costly recreation and drug abuse programs." In addition, it very well may be that individual and group performance skills are affected by barracks isolation. Two individual skills that might be affected by "barracks isolation" and have received previous research attention are perceptual acuity (vigilance) and cognitive functioning. In a review of the literature on the effects of impoverished environments, Zubek (1964) noted that in general perceptual skills and sometimes cognitive skills are impaired by conditions of isolation and confinement.

Cognitive Functioning

A number of scientists have explored the impairment in cognitive functioning and performance efficiency as a result of extended isolation and confinement (Eilbert & Glasser, 1959; Burns & Kimura, 1963; Rohrer, 1961). Actual tests of cognitive skills during isolation have, however, been relatively rare. Hanna and Gaito (1960) found that intellectual functioning of individuals in six man groups confined for one week was not impaired by their confinement. However, Zubek, et al. (1962) found significant impairment on a test of numerical reasoning after one week in six person groups. Hannes (1924) found no evidence of intellectual impairment as measured by tests of verbal reasoning, numerical ability, logical reasoning, memory, etc., after two weeks of confinement. Similarly, McGrath et al., (1962), Zubek (1969), Oleson and Zubek (1970) and Voshima (1967), all showed no decrement in intellectual functions after short term (one week or less) confinement. Altman and Haythorn (1967) found that after ten days of isolation the subjects were better than non-isolated subjects on a group task involving abstract reasoning. Thus, for short term isolation, cognitive skills have been shown to improve, decline and exhibit no changes.

Three studies involving longer periods of isolation (over one month) have been reported. Rodgin and Hartman (1966) found some decrement, but accounted for them with task-specific motivation after 56 days of isolation. Agadzhanian et al., (1967) found that after 60 days of isolation, error rates for solving mathematical problems had increased significantly; and finally, Mullin (1960) has reported interview data with subjects following a three-month wintering-over period in Antarctica which suggests that many of the men suffered memory lapses and difficulties in concentrating. Also, intellectual activity, e.g., reading, was perceived to decline over time. In summary, it would seem that most of the studies relating intellectual functioning to isolation and confinement have shown either no effects or detrimental effects with the detrimental effects more often found in studies involving longer periods of isolation.

Perceptual Skills

Research relating perceptual skill levels to isolation and confinement is no more consistent than the research on intellectual skills. Zubek (1961) demonstrated that one week of stimulus deprivation resulted in a decrement in visual skills although auditory skills were unaffected. Adams and Chiles (1961) reported decrements in signal monitoring and vigilance tasks over 15 days of isolation. Alluisi, et al., (1963) on the other hand, found no significant impairment of visual or auditory skills over a five to 15 day confinement. Farrel and Smith (1964) and Page, Dagley and Smith (1964) reporting on the Boeing 5-man/30 day confinement study, found significant improvement in perceptual skill performance over time. However, without a control group these data are difficult to interpret. Hartman et al., (1964) found no decrement in performance level for dyads isolated for 30 days and

Rodgin and Hartman (1966) similarly found no degradation of perceptual skills in four-man crews isolated for 56 days. Altman and Haythorn (1967) found that incompatible dyads isolated for ten days suffered impairment of individually assessed perceptual skills but not on an assessment which required cooperation between the team members. Finally, Johnson et al., (1968) Smith and Myers (1967), and Smith (1967) all found that subjects' perceptual skills improved after one week or less of isolation. From the review of the above studies it would seem that most studies of isolation and confinement show that perceptual skills are either not affected by stimulus deprivation or in fact improved by it. Those studies which do show negative effects are all studies of short term (15 days or less) isolation.

The purpose of the present study is to determine the effects of barracks isolation on cognitive and perceptual skills, as well as its effects on drug abuse, job performance and soldier morale. Barracks isolation in USAREUR differs extensively from the kinds of isolation studied in past research. First, barracks isolation is significantly longer than any of the studies reviewed previously. Soldiers are stationed in USAREUR for 2-3 years, and individuals may isolate themselves for that entire period. Second, barracks isolation differs in terms of degree. Most isolation studies previously have been more severe than is barracks isolation. Third, individuals who are isolated in USAREUR choose to be so, unlike many of the laboratory experiments which randomly assigned subjects to isolated and non-isolated conditions. Finally, the opportunity to seek variation, to explore the outside environment is at all times generally available to the "barracks rat." These differences between barracks isolation and the kind of isolation studies previously preclude easy generalization from the results of past studies to the current situation. However, since past studies of "long term" isolation resulted in either no effects or a performance decrement in cognitive skills and no effects or a performance increase in perceptual skills, it is tentatively hypothesized that barracks isolation will result in similar effects as long-term laboratory isolation. Tentative verification or refutation of this hypothesis is sought here, in order to determine whether or not a more definitive effort is worth pursuing.

STUDY I

The effects of barracks isolation may differ depending on whether or not the isolation itself is self-imposed. Barracks rats in most senses have a choice as to whether they will withdraw from the outer world or not. However, one group of soldiers which does not have that choice is the newly arrived enlisted person with a negative leave balance. This condition is in fact typical of most soldiers assigned to USAREUR directly after graduation from Advanced Individual Training (AIT). These individuals have generally taken more leave time than they have accumulated in order to visit friends and relatives before coming overseas. Thus, for them, barracks isolation is a temporary situation experienced during the first few months of their USAREUR tour and only a relatively small number of them will eventually be full-fledged barracks rats. In order to determine the effects of barracks isolation independent of the potential confounding of self-selection, a longitudinal approach was utilized in which soldiers were

tested before and after a period of "negative leave" imposed barracks isolation.

Method

Subjects were 15 male enlisted personnel at the ranks of E2/E3 assigned to the U.S. Army in Europe. Subjects were between the ages of 18 and 21 and had been in the Army an average of 6 months. Subjects were all recent graduates of AIT centers holding the Military Occupational Specialty (MOS) of basic infantryman (11B) and were assigned to line companies in mechanized infantry battalions. All subjects had negative leave balances which would inhibit their ability to engage in off-post activities during the early months of their USAREUR tour.

Procedure

Subjects were administered the initial tests of cognitive skills and perceptual acuity during their in-processing at a division level replacement detachment. At this point subjects had been in USAREUR on the average of four days. The cognitive skills and perceptual acuity tests were administered to small (4-6) groups of soldiers and took 45 minutes to complete. This administration of the tests was designated as the pretest. A posttest was administered to subjects who were assigned to certain designated USAREUR battalions. The posttest was identical to the pretest and was administered approximately three months after the pretest had been taken. Again, subjects took the tests in small groups and were allowed 45 minutes to complete the tests.

In the pretest condition, subjects were assembled in the replacement detachment briefing room and the experimenter explained that they would be given a test of problem solving skills which was a part of an overall research effort designed to determine the effectiveness of Army training programs like the one (AIT) from which they had recently graduated. Subjects were assured that the test was for research purposes only and would not affect them personally in any official manner.

In the posttest condition. Subjects were additionally told that the researchers were conducting a follow-up investigation in order to determine how stable and reliable the test instrument was.

Assessment Instrument

Two types of performance skills were assessed: Cognitive skills and perceptual acuity. Cognitive skills were assessed using a 33-item test consisting of problems of abstract reasoning, mathematical and spatial relationships. The test of perceptual acuity consisted of 12 items of the embedded figure type which required the subject to identify number and letter patterns within random number and letter sequences. In order to make the test more interesting, all test questions were set in a cartoon

style format in which the questions were related to the adventures of stock cartoon characters familiar to the soldier. (See Appendix A)

In addition to the cognitive skills and perceptual acuity data, information was collected about the extent to which subjects had participated in off-post activities during the past three months. This information was collected as a manipulation check on the isolation hypothesis.

RESULTS

The manipulation check on the extent of subjects' participation in off-post activities indicated that subjects could indeed be characterized as isolated since only 2 of the 15 S had been off post at all during the three months and these two had only been off post (to a local gasthaus) one time.

The mean cognitive skills scores on the pretest and the posttest are presented in Figure 1. A correlated t test of the mean number of correct answers on the cognitive skills test before assignment to a USAREUR unit ($\bar{X}=20.87$) versus the mean number of answers' correct on the cognitive skills test after three months in a USAREUR unit ($\bar{X}=15.53$) was significant, $t(14)=3.64$, $p < .01$. Soldiers' "problem solving" skills clearly seem to decline during their tenure in USAREUR, at least for the limited period (3 months) surveyed in this study.

Figure 1 also presents the mean perceptual acuity scores on the pretest and the posttest. A correlated t test of the mean number of answers correct on the perceptual acuity items before assignment to a USAREUR unit ($\bar{X}=10.07$) versus the mean number of answers correct after three months in a USAREUR unit ($\bar{X}=11.13$) was not significant, $t(14)=1.11$, $p < .20$. Soldiers' perceptual acuity as measured by this test seems to show an effect different from that noted for cognitive skills since perceptual errors seem to decline, although not significantly, with time.

It should be noted that the pretest and posttest involved the same instruments, and the effect on the posttest of having taken the test previously is not known. One would expect, however, that any such effect would be opposite to what was found with the cognitive items, i. e., one would expect prior exposure to have a beneficial effect on scores. This may account for the positive change on the perceptual items, but such an interpretation raises the question as to why these items benefitted from prior exposure while the cognitive items didn't.

It should also be noted that the mean scores on the perceptual items were very nearly the maximum scores possible--i.e., 12---so that the possibility of finding significant change was limited. This restriction does not apply to the cognitive items.

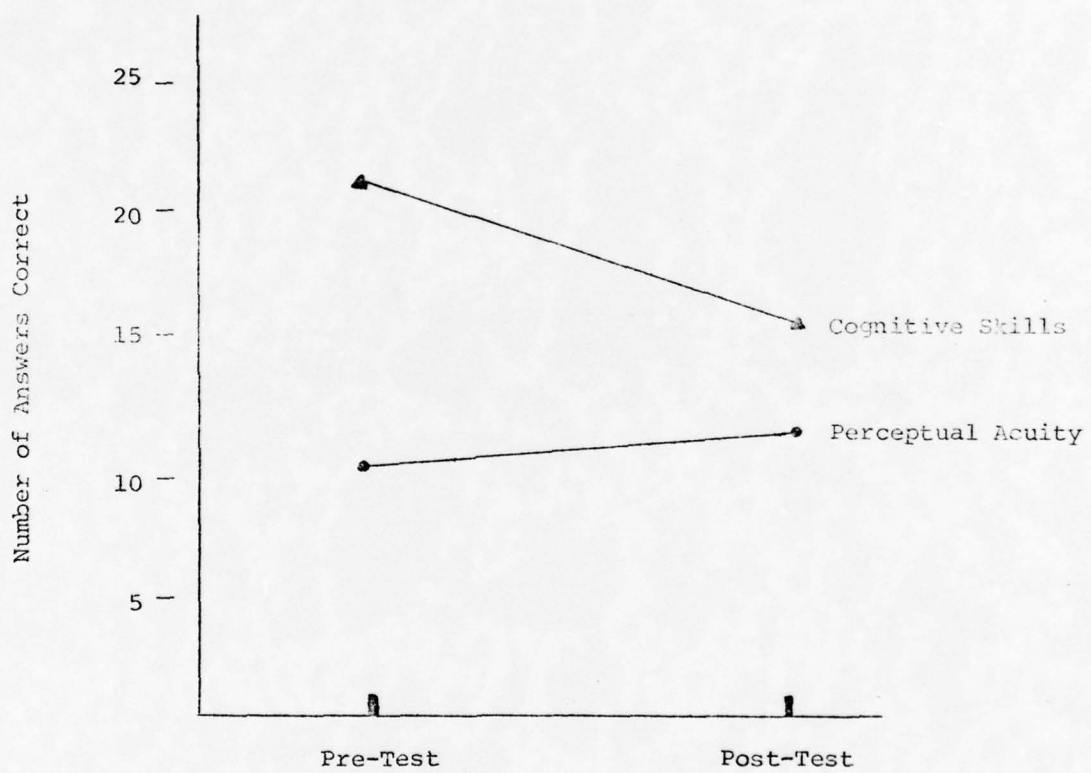


Figure 1. Mean Scores on the Tests of Cognitive Skills and Perceptual Acuity Over Time.

Discussion

The results of Study I indicate that this initial 3-month period in USAREUR during which activities are largely restricted to the local military kaserne has a negative effect on soldiers' problem solving skills. No such effect was found for perceptual skills. In fact, if anything, perceptual skills may increase as a result of such isolation. What is it that these new soldiers do or don't do that would cause such a decline in cognitive skills? Interviews with 75 enlisted personnel in their first few months during the conduct of the Soldier Orientation Study (Miller, 1976) suggest that the lack of a challenge in soldiers' work assignments could be a mechanism whereby dullness sets in. Soldiers in their first few months in USAREUR are often given the least desirable duties required of their unit. Clean-up details and other tasks not requiring cognitive skills are commonplace. Perhaps, it is this type of utilization during the initial months that accounts for the decline in skill level. If the type of duties performed by newly arrived soldiers is an important factor related to cognitive skills, then it would be expected that assigning new soldiers more interesting and difficult tasks might preclude the cognitive decline found in this study. (Although consistent with the hypothesis of isolation effect, it should be noted that the results are also consistent with alternative explanations such as lowered morale).

STUDY II. STIMULUS DEPRIVATION VS. STIMULUS ENRICHMENT

The results of Study I seem to indicate that isolation in the form of limiting one's field of social interaction to the immediate military community/post may have a detrimental effect on cognitive skills. This conclusion is strengthened by comparing the perceptual acuity data to the cognitive skills data. The fact that the trends for these two skills differ markedly suggests that the decline in cognitive skills is due to social isolation, and not to a reduction in general functioning. However, it must be noted that without a control group of non-isolated subjects, it is difficult to draw really firm conclusions. The first purpose then of Study II is to provide a direct test of the isolation hypothesis by testing groups of soldiers under conditions of stimulus enrichment (those whose off-duty time is spent in varied off-post activities) as well as testing soldiers under conditions of stimulus reduction (those whose off duty time is spent in non-varied, on-post activities, i.e., barracks rats.)

The second purpose of Study II is to examine the long-term effects of isolation. Most of the previous studies of isolation have used situations in which subjects experienced intensive isolation for a period of days/weeks. In the real world environment of the US Army in Europe, however, soldiers commonly characterized as "barracks rats" experience mild isolation for periods ranging up to 36 months. Thus, Study II proposes to examine the effects, over an extended period of time, of stimulus reduction/enrichment, operationally defined as being a "barracks rat" in the perception

of commanders.

Because of the fact that most soldiers experience some degree of involuntary social isolation during the early months of their USAREUR tour, it is expected that the cognitive skill levels of those who become barracks rats as well as those who do not will be negatively affected. Support for this hypothesis can be found in an internal reanalysis of the cognitive skill scores of the subjects in Study I. A number of months after the Study I posttest, the commanders of the soldiers who had participated in the first study were contacted and asked to characterize our subjects as barracks rats or non-barracks rats. At this point, the soldiers had been in country for approximately seven months. Twenty-six percent of the soldiers who had participated in the first study were characterized as barrack rats. An analysis comparing the soldiers so characterized with their non-rat compatriots on the 3-month posttest revealed no differences between the two groups, $t(13) = .21$ $p = n.s.$ The mean error rate for the barracks rats was 17.00 problems missed and for the non-barracks rats it was 17.64 problems missed. Thus, it is expected that differences between the cognitive skills of barracks rats as compared to non-barracks rats will only become evident after the initial isolation stage which affects everyone has passed. (Although this t-test is based on a very small n , it should be noted that the difference is not only not significant, but in a direction favoring the barracks rat).

Method

Subjects were 72 male, enlisted personnel at the ranks E1-E5 serving with the US Army in Europe. Subjects were between the ages of 18 and 25, had been in the Army from 6 months to 5 years and had attained an educational level between 8th grade and some college experience. All subjects served in mechanized infantry battalions.

Procedure

Subjects were classified by supervisory personnel as being one of two types of individual; barracks rat (stimulus reduction) or non-barracks rat (stimulus enrichment). Individuals designated as barracks rats were those whose off-duty time was spent on the military post, generally in the barracks themselves with their few out-of-barracks activities being fairly routine: snack bar, movies and EM club. These individuals were those whom local slang would term a "barracks rat." Individuals designated as non-barracks rats were those who spent their off-duty time generally away from the local military base in varied activities including tours, visits to the local community, etc. Subjects were administered the composite test of cognitive skills and perceptual acuity (see Appendix A) used in Study I in groups ranging in size from twelve to thirty-seven.

After a group had been assembled in a battalion classroom, the experimenter explained that they would be given a test of problem-solving skills that had been previously administered to other groups of soldiers. It was further explained that the test was not an official test so that their performance would not be "for the record." The experimenter noted

that he was more interested in how different groups of soldiers performed than in any one individual's score. Finally, subjects were told that their time was limited to 45 minutes and that if they got stumped on any one problem they should skip to the next problem. After finishing the test, subjects were, at their option, debriefed as to the full purpose of the research. Less than twenty percent of the subjects chose to attend the debriefing.

Assessment Instrument

The same tests of cognitive skills and perceptual acuity used in Study I were again used. In addition to completing the 33-item cognitive skill test and the 12 item perceptual acuity test noted above, subjects provided information about their educational background, military occupational, specialty, rank, race, type of environment (urban/rural) in which they were raised and attitudes towards their tour in Germany.

The results of Study I indicated that soldiers isolated within the military community (barracks rats) scored lower on the test of cognitive skills at the posttest than they had initially. Thus, the duration of isolation may be an important variable. In order to study the temporal effects of stimulus reduction/enrichment, soldiers at a wide range (1 month-27 months) of tour completion were tested. For comparison purposes, tour length was subdivided into three categories: Early, 1-9 months (MDN=6); Middle, 10-18 months (MDN=15); and Late, 19-27 months (MDN=23).

Of the thirty-two soldiers in the early stage of their tour, fifteen were classified as barracks rats while the other seventeen were classified as non-barracks rats. Of the nineteen soldiers serving in the middle stage of their tour, nine were classified as barracks rats while ten were classified as non-barracks rats. Soldiers in the late stages of their tour totaled twenty-one with twelve classified as barracks rats and nine classified as non-barracks rats.

Results

Cognitive Skills

Figure 2 presents the mean cognitive skills scores of the barracks rats and non-barracks rats who are in the early, middle and late stages of their USAREUR tour. Analysis of variance using time and stimulus condition as the independent variables indicated a significant main effect of stimulus reduction/enrichment, $F(1,66) = 7.33$, $p < .01$, and a marginally significant Time x Stimulus Condition interaction, $F(2,66) = 2.53$, $p < .08$. As can be seen in Figure 2, barracks rats and non-barracks rats do not differ in the early months of their USAREUR tour, $F(1,66) = .03$, $p > .80$. However, during the middle stages of their USAREUR tour, non-barracks rats score significantly better on the cognitive skills test than do the barracks rats, $F(1,66) = 5.35$, $p < .025$. The superior performance of the non-barracks rats on the cognitive

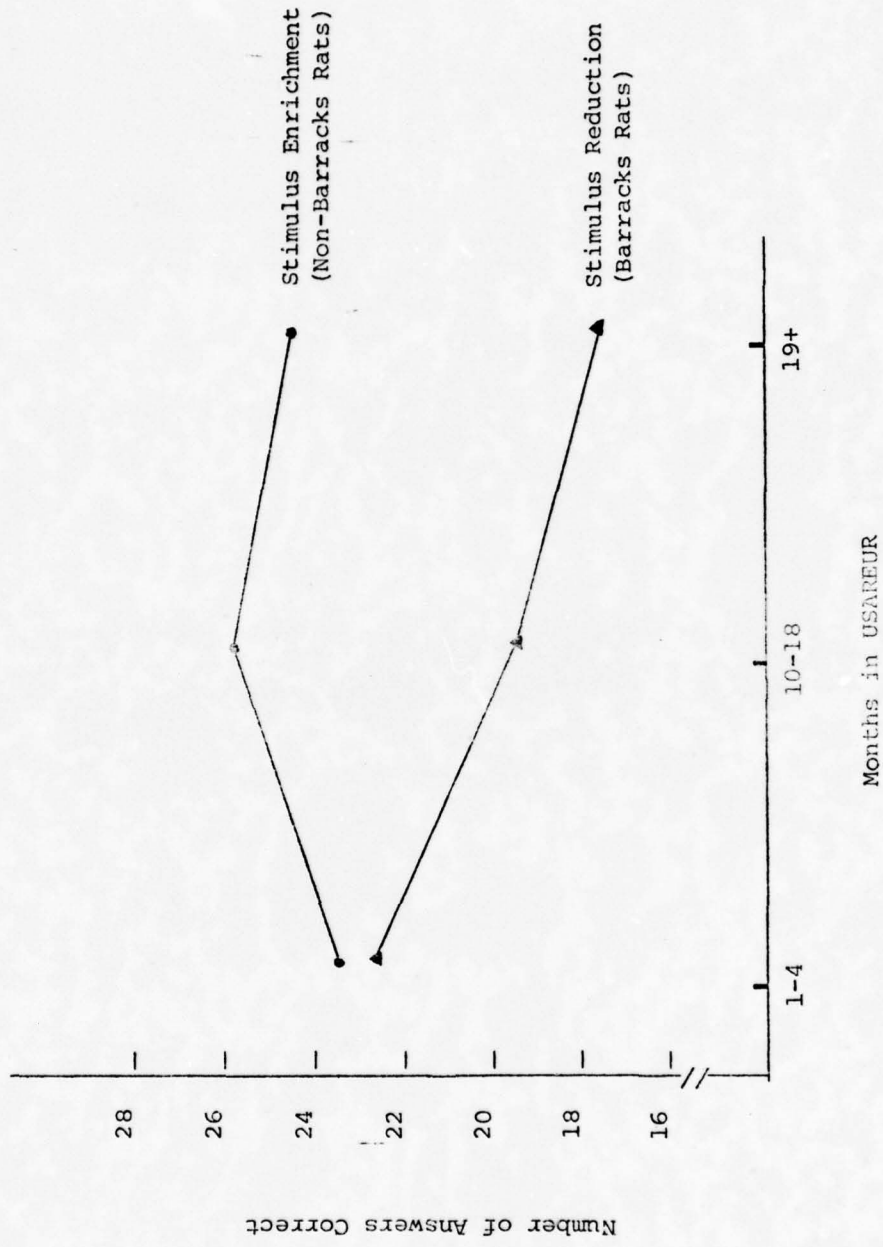


Figure 2. Mean scores on the test of cognitive skills of soldiers under conditions of stimulus reduction/enrichment.

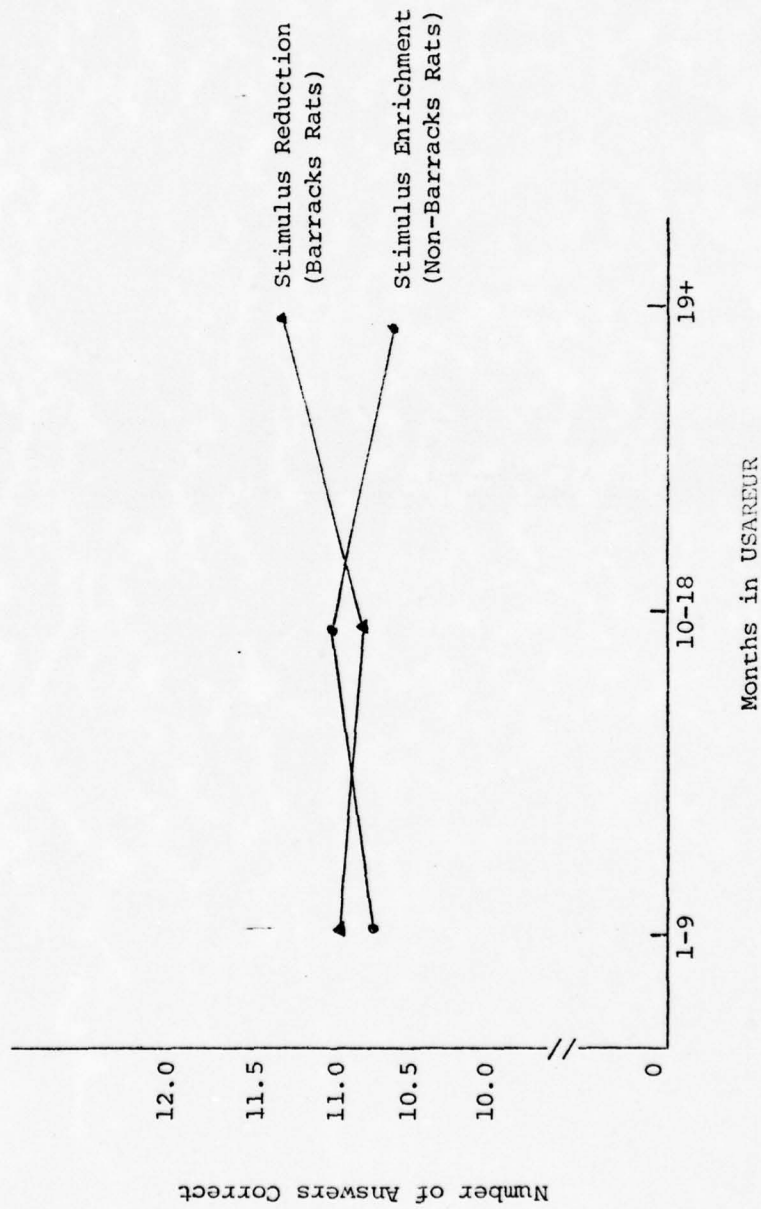


Figure 3. Mean perceptual acuity scores of soldiers under conditions of stimulus reduction/enrichment.

skills test as compared to the barracks rats is also evident for soldiers serving in the later stages of their USAREUR tour, $F(1,66)=6.79$, $p < .01$

Perceptual Acuity

The mean perceptual acuity scores of the non-barracks rats and barracks rats at early, middle, and late stages of USAREUR tour completion are presented in Figure 3. Analysis of variance using time and stimulus condition as the independent variables indicated no significant effects of time or stimulus condition ($F_s < 1$) on perceptual acuity scores.

Individual Characteristics of Soldiers Under Conditions Of Stimulus Reduction/Enrichment

Who are these soldiers who during a USAREUR tour become barracks rats? How do they differ from their peers who do not? While it was beyond the scope of this study to do a comprehensive personality inventory, some information on personal/social characteristics was collected. Specifically, the following dimensions provided by the subjects themselves can be considered: race, educational level, attitudes towards their USAREUR tour, and type of environment in which the subject was raised. Table 1 presents the percentage of subjects who were characterized as barracks rats as a function of their individual differences.

Chi square analysis indicated no significant effect of race, $\chi^2(3)=1.32$, $p < .70$, or of educational level, $\chi^2(3)=.82$, $p < .80$, or of attitudes towards their USAREUR tour, $\chi^2(3)=1.96$, $p < .60$. Chi square analysis did indicate a marginally significant effect of type of home-town environment on the likelihood that a soldier would be characterized as a barracks rat $\chi^2(3)=4.90$, $p < .20$. As can be seen in Table 1, fewer barracks rats in this study come from rural homes (26.6%) than other types of environments (56.1%).

Interviews With Commanders

In order to learn more about the characteristics of a barracks rat, interviews were held with eleven company commanders and six platoon sergeants in a variety of military units. Leaders' opinions about the job performance, disciplinary problems, morale and reenlistment rates of barracks rats were solicited. Commanders generally agreed among themselves that barracks rats were often mediocre workers, neither first rate or really bad performers. Their job performance was characterized by the attitude of "do enough to get by" and they were perceived as seldom taking the initiative on the job. Basically, the barracks rat was seen as the type of individual who, faced with the suggestion of doing a job before being ordered to do it, would counter with "let's wait until we are ordered."

Regarding disciplinary problems, barracks rats were seen as passive individuals who would seldom if ever provoke a fight or cause interpersonal frictions. The primary disciplinary problem caused by the barracks rat was due to his/her greater likelihood of using drugs than the non-barracks rat.

Commanders felt that barracks rats are often 1st term soldiers who are unprepared for the type of duty and style of living experienced by USAREUR soldiers and that their reenlistment rates are well below that of non-barracks rats. Problems of financial resources, transportation and ability to cope with new environments were all seen to hinder soldiers in overcoming the barracks rat syndrome.

Table 1

Stimulus Reduction/Enrichment As a Function of Individual Differences

Variable	n	Percent Classified As Barracks Rats (Stimulus Reduction)
Racial Group		
White	34	50.0
Black	26	50.0
Hispanic	6	33.3
Other	6	66.7
Educational Level		
8-12 Grade	15	40.0
H.S. Graduate	50	52.0
College	7	57.1
Attitudes towards Usareur		
Positive	27	40.7
Neutral	29	51.7
Negative	16	62.5
Home-town Environment		
Rural	15	26.6
Small town	16	56.3
City	29	51.7
Metropolitan	12	66.7

Discussion

In both studies presented so far, isolation in the barracks was associated with a significant decline in the cognitive skill levels of the soldiers tested. No such effects were found for perceptual skills. In Study I, it was found that soldiers who were isolated for three months as a circumstance of coming to USAREUR with negative leave balances, scored significantly below their previous level as tested soon after arrival in USAREUR. Perceptual skills showed a non-significant improvement during the same time span. In Study II, subjects who were characterized as barracks rats and non-barracks rats in the same unit were compared. It was found that barracks rats in the early stages of their tours did not differ from non-barracks rats, but that as time in USAREUR increases, differences between them appear and increase with barracks rats being progressively less adept at cognitive problem solving with increasing time in USAREUR. Again, no differences were found regarding perceptual skills.

Using the figures on cognitive skills generated in studies I and II, it is possible to form the following composite picture of what happens to soldiers in USAREUR. The non-barracks rat experiences an initial decline in cognitive skill level due to the inherent isolation of being in a new environment coupled with negative leave. During the middle stages of his tour this skill level is restored somewhat possibly due to the increasing variability in his experience. Finally, during the late stages of his tour, the non-rat again experiences a slight decline in cognitive skills, perhaps due to the inherent lack of variability available to a military culture ensconced in an alien environment. For the barracks rat, the initial decline simply continues throughout the soldiers' entire tour so that his cognitive skill level becomes increasingly inferior as the effects of his reduced variation in experience accumulate.

STUDY III

Interviews conducted with commanders during the course of Study II indicated that soldiers subjected to self-imposed stimulus reduction, i.e., barracks rats were considered to be mediocre performers at their jobs. In order to test this hypothesis empirically, a third study was conducted which directly compared the job performance of barracks rats with non-barracks rats.

Method

Subjects

Forty eight male enlisted soldiers assigned to four companies of a mechanized infantry battalion who had participated in Study II were

selected for evaluation in Study III. This number included twenty-seven "barracks rats" and twenty-one non-barracks rats as previously designated by supervisory personnel.

Assessment Instrument

Six items taken from the Army Enlisted Evaluation Report (EER) form were used to assess the job performance of the soldiers selected for this study (see Appendix B). These items consisted of six job skill descriptions, each accompanied by a six point rating scale ranging from (6) "ranks with the best" to (1) "needs much improvement." The job skills included "scope of knowledge about duties," "dependability in performing without supervision," "attitude towards duties," "leadership qualities," "initiative," and "ability to work with others." A composite job performance score was derived by adding each of the ratings on each of the items which yielded a maximum possible score of 36 and a minimum possible score of six.

Procedure

The EER job scales were given to the first line supervisors of each soldier in the study and to a second leader higher in the chain of command (1st sergeant, platoon sergeant or platoon leader). Both of these leaders were requested to evaluate the soldier designated on their form candidly for research purposes only. In order to minimize inflated evaluations, the leaders were assured that the evaluations would not be made a part of the soldier's record or made available to the soldier himself or the chain of command in the unit.

Results

The correlation between the ratings of the first line supervisors and the more senior leaders was significant, $r(48) = .87$, $p < .001$. Therefore, these two ratings were combined into a single composite score for each soldier in the study. Figure 4 presents the mean composite performance ratings of the barracks rats and non-barracks rats who are at the early, middle and late stages of their USAREUR tour. The broken lines represent the classification of the subjects as derived from Study II. However, Study III was conducted approximately three months after Study II, during which time a number of the subjects in Study III were now beyond the limits of their original Study II time-classification. Therefore, these subjects were reclassified using the limits of Study II (1-9 month=Early, 10-18 months=Middle, 19+ months=Late).

Specifically, thirty-six percent of the subjects who were classified as "Early tour" in Study II had now served beyond nine months in USAREUR and were reclassified as "Middle tour" subjects. Similarly, fourteen percent of the "Middle tour" subjects of Study II were reclassified as "Late tour" subjects since they had served beyond 18 months in USAREUR.

This reclassification is represented by the solid lines in Figure 5. Analysis of variance, using the reclassified time designations indicated a significant effect of stimulus reduction/enrichment on composite performance ratings, $F(1,46)=4.88$, $p < .03$. Simple effects analysis indicated that no difference exists between soldiers under conditions of stimulus reduction/enrichment in the early stage of their tour, $F(1,42)=.01$, $p=n.s.$ However, for those in the middle stages of their USAREUR tour, soldiers under conditions of stimulus enrichment are rated significantly higher than their counterparts under conditions of stimulus reduction, $F(1,42)=4.10$, $p < .05$. Similarly, for those soldiers in the late stages of their USAREUR tour, stimulus reduction has a negative effect on performance ratings, $F(1,42)=4.46$, $p < .05$. The results using the un-reclassified time designations are consistent with those using the reclassified time except that soldiers under conditions of stimulus reduction tend (marginally) not to score as well as do stimulus enriched soldiers in the early stages of their tour, $F(1,42)=2.05$, $p .20$.

Table 2 presents the mean scores for barracks rats and non-barracks rats on each performance dimension rated. Analysis of variance indicates that the most significant performance differences are found for "knowledge about duties", "qualities of leadership", and "ability to work with others". Barracks rats are rated as significantly less informed about their duties and as having less of a positive influence on others than non-barracks rats. Non-barracks rats are rated as significantly more able to work with others than are barracks rats. Non-barracks rats also score significantly higher than barracks rats on dependability and enthusiasm for duties. Of marginal significance is the difference between barracks rats and non-barracks rats on initiative taking.

It is readily apparent upon comparing the job performance ratings presented in Figure 4 with the cognitive skill scores presented in Figure 2, that these two variables are similar. A correlational analysis of the relationship between the job performance ratings and cognitive skill scores was significant, $r(48)=.49$, $p < .001$. The correlations between the job performance ratings of first-line supervisors as well as the more senior leaders with cognitive skills were $r=.51$, $r=.43$, respectively. Table 3 presents the correlation coefficients relating cognitive test scores to each job performance skill as rated by both the first-line supervisors and the more senior leaders. It is interesting to note that in the minds of first-line supervisors, cognitive skills are most significantly associated with "knowledge about duties". For more senior leaders, cognitive skills are more significantly related to "attitudes towards duties" and "ability to work with others".

Discussion

The results of this study, coupled with the results of the previous two studies offer evidence that problem solving skills and job performance are negatively related to "barracks isolation." In Study I, a decline

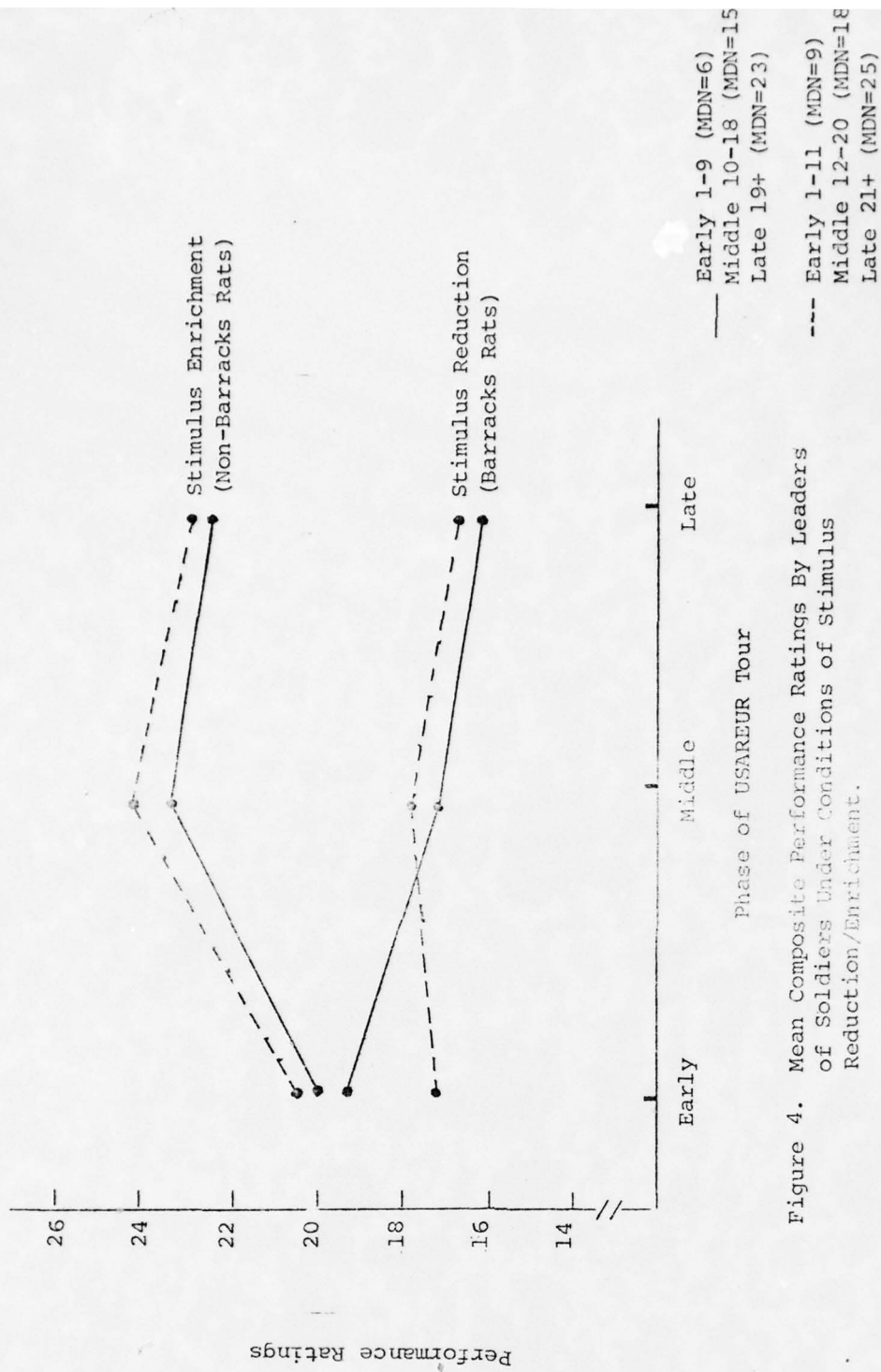


Figure 4. Mean Composite Performance Ratings By Leaders of Soldiers Under Conditions of Stimulus Reduction/Enrichment.

Table 2

Job Performance Ratings of Barracks Rats
And Non-Barracks Rats

Job Skills	Barracks Rats \bar{X}	Non-Barracks Rats \bar{X}	Difference (BR-BR)	Significance Test
1. Is well informed on all phases of assigned duties. (Scope of knowledge about duties).	2.98	3.84	-.86	$F = 9.26$ $p < .01$
2. Carries out orders with out constant supervision. (Dependability in performing without supervision).	3.19	3.76	-.57	$F = 4.97$ $p < .05$
3. Shows interest and enthusiasm for duties. (Attitude toward duties).	3.02	3.69	-.67	$F = 5.42$ $p < .05$
4. Demonstrates qualities of leadership. (exerts positive influence on others).	2.40	3.64	-1.24	$F = 12.37$ $p < .001$
5. Displays ability to initiate action without direction from others. (Aggressive pursuit of methods to improve duty performance).	3.00	3.57	-.57	$F = 2.88$ $p < .10$
6. Is successful in working with others. (Ability to work in harmony with others).	3.06	4.07	-1.01	$F = 12.18$ $p < .001$

Note: All F tests have 1/88 d/f.

Table 3

Correlations Between Cognitive Test Scores
And Job Performance Ratings

Job Skills	1st Line Supervisors ^a	Senior Leader ^b
1. Is well informed on all phases of assigned duties. (Scope of knowledge about duties).	.56***	.35**
2. Carries out orders without constant supervision. (Dependability in performing without supervision).	.49***	.40**
3. Shows interest and enthusiasm for duties. (Attitude toward duties).	.44***	.43***
4. Demonstrates qualities of leadership. (Exerts positive influence on others).	.46***	.23
5. Displays ability to initiate action without direction from others. (Aggressive pursuit of methods to improve duty performance).	.44***	.29*
6. Is successful in working with others. (Ability to work in harmony with others).	.52***	.43***
7. Composite job performance rating ($\bar{X}_1 + \bar{X}_2 \dots \bar{X}_6$)	.51***	.43***

$$a_n = 48$$

$$b_n = 47$$

$$*p < .05$$

$$**p < .01$$

$$***p < .001$$

in problem solving skills seems related to environmental invariation. Lack of opportunity to "get out" of the barracks along with less than challenging job requirements probably interact to produce a decline in thinking processes. In Study II, a decline in cognitive skills was shown to be associated with barracks isolation, as defined by being a barracks rat, only after the isolation had been experienced for a number of months. This is probably because all USAREUR troops, non-barracks rats as well as barracks rats, experience isolation initially. Thus, no differences would be expected or were found between these two groups during their first few months in USAREUR. The results of Study III indicated that job performance is related to barracks isolation in much the same way as cognitive skills are. Over time, barracks rats are rated as less satisfactory workers as compared to non-barracks rats .

Who becomes a barracks rat? The results of Study I implicate environmental factors in causing the effects found with barracks|rat syndrome. However, the findings related to individual factors in Study II suggest that certain individuals may be more susceptible to the tendency to withdraw into the isolation of barracks living. Further research is needed to identify the process whereby some soldiers isolate themselves while others seek out new experiences during their tour in Europe and to determine the degree to which the relationship between barracks isolation and measures of cognitive, perceptual, and job performance variables are due to stimulus reduction, motivation, or individual differences variables. The answers to these questions may contribute greatly to the development of programs to maintain the soldiers in USAREUR at a higher level of individual combat readiness.

References

- Adams, O. S., & Chiles, W. D. Human performance as a function of the work-rest ration during prolonged confinement. ASD Tech. Rept. 61-720. (Contract No. AF 33 (616)-6050, Aeronautical Systems Div., Aerospace Med Lab., Wright-Patterson AF Base, Ohio). Lockheed-Georgia Co., November, 1961.
- Agadzhanian, N. A., Bizin, I. P., Doronin, G. P., & Kuznetsov, A. G. (Change in higher nervous activity and some vegetative reactions under prolonged conditions of adynamia and isolation). Zhurnal vysshei nervnoi Deiatelnosti, Pavlov., 1963, 13, 953-962. (In Russian).
- Alluisi, E. A., Chiles, W. D., Hall, T. J., & Hawkes, G. R. Human group performance during confinement. Tech. Rept. No. AMRL-TDR-63-87. (Contract No. AF 33 (616)-7607, 657th Aerospace Med. Res. Lab., Wright-Patterson AF Base, Ohio). Lockheed-Georgia Co., November, 1963.
- Altman, I., & Haythorn, W. W. The effects of social isolation and group composition on performance. Human Relations, 1967, 20, 313-340.
- Burns, N., & Kimura, D. Isolation and sensory deprivation. In N. Burns, R. Chambers, & E. Hendler (Eds.), Unusual environments and human behavior. New York: Macmillan, 1963, pp. 167-192.
- Eibert, L. R., & Glasser, R. Differences between well and poorly adjusted groups in an isolated environment. Journal of Applied Psychology, 1959, 43, 271-274.
- Farrell, R. J., & Smith, S. Behavior of five men confined for 30 days: psychological assessment during project MESA. Contract No. NASW-658, the Boeing Co., Seattle, Washington, Number D2-90586, 1964.
- Hanna, T. D., & Gaito, J. Performance and habitability aspects of extended confinement in sealed cabins. Aerospace Medicine, 1960, 31, 399-406.
- Hartman, B. O., Flinn, D. E., Edmunds, A. B., Brown, F. C., & Schubert, J. E. Human factors aspects of a 30-day extended survivability test of the minuteman missile. - USAF School of Aerospace Medicine, Aerospace Medicine Division (AFSC), Brooks AF Base, Texas, Technical Documentary Report No. 64-62, October, 1964.
- Johnson, E., Smith, S., Myers, T. I. Vigilance throughout Seven Days of Sensory Deprivation, U.S. Naval Medical Research Inst., Bethesda, Md., Psychonomic Science, 1968, 11(8), 293-294.

- Fiske, D. W. Effects of Monotonous And Restricted Stimulation, In D. Fiske & S. Maddo (Eds.), Functions of Varied Experience. Homewood, Ill.: The Dorsey Press, 1961.
- McGrath, J., Maag, C., Hatcher, J., & Breyer, W. Human performance during five days confinement. Tech. Memo. 206-14. Human Factors Research, Los Angeles, January, 1962.
- Miller, R. L. The Current Status of In-Processing in USAREUR. Tech Report No. GRC-OAD-172 (Contract No. DAHC-19-75-C-009) U.S. Army Research Institute, Alexandria, Virginia, 1976.
- Mullin, C. S. Some psychological aspects of isolated Antarctic living. American Journal of Psychiatry, 1960, 117, 323-325.
- Oleson, D. S., Zubek, J. P., Effect of one day of sensory deprivation on a battery of open-ended cognitive tests., U. Manitoba, Winnipeg, Canada, Perceptual & Motor Skills, 1970, Dec. Vol. 31(3), 919-923.
- Page, R. N., Dagley, C., & Smith, S. Manned environmental system assessment (MESA) program - Final Report. Contract No. NASW-658, The Boeing Company, Seattle, Washington, Number D2-00487-5, June 1964.
- Rodgin, D. W., & Hartman, B. O. Study of man during a 56-day exposure to an oxygen-helium atmosphere at 258 mm. Hg. total pressure: XIII. Behavioral factors. Aerospace Medicine, 1966, 37, 605-608.
- Rohrer, J. H. Interpersonal relationships in isolated small groups. In B. E. Flaherty (Ed.), Psychophysiological aspects of space flight. New York: Columbia University Press, 1961, 263-271.
- Smith, S., Myers, T. I. Stimulation Seeking During Sensory Deprivation, Naval Medical Research Inst., Bethesda, Md., Perceptual & Motor Skills, 1966, 23(3, Pt. 2), 1151-1163.
- Smith, S., Myers, T. I., Murphy, D. C., Vigilance During Sensory Deprivation, U.S. Naval Medical Research Inst., Bethesda, Md., Perceptual & Motor Skills, 1967, 24(3, Pt. 1), 971-976.
- Suedfeld, P., The cognitive effects of Sensory Deprivation: The Role of Task Complexity, Rutgers State U., Canadian Journal of Psychology, 1968, 22(4), 302-307.
- Zubek, J. P., Aftanas, M., Hasek, J., Sansom, W., Schuldermann, E., Wilgosh, L., & Winocur, G. Intellectual and perceptual changes during prolonged perceptual deprivation: low illumination and noise level. Perceptual Motor Skills, 1962, 15, 171-198.

Zubek, J. P., Bayer, L., Shephard, J. M. Relative effects of prolonged social isolation and confinement: Behavioral and EEG changes, U. Manitoba, Winnipeg, Canada, Journal of Abnormal Psychology, 1969, 74(5), 625-631.

Fiske, D. W., & Maddi, S. Functions of Varied Experience. Homewood, Ill: The Dorsey Press, 1961.

APPENDIX A

Composite Test of Cognitive Skills
and Perceptual Acuity

1. The electricity was off in the boy's bedroom, and he needed to find a pair of clean socks. He felt in the drawer for the socks. He knew that they were all exactly alike, except for color. Twelve were brown and twelve were blue. How many socks did he need to take out to be sure that he had a pair of one color? (He didn't care which color). The socks are not in pairs in the drawer.

The number of socks he needed to pull out were: (check one answer).

- a. Two d. Five
 b. Three e. Twelve
 c. Four f. Thirteen

2. George, Harry, Mike, Tom, Earnest, and Jim ran in the annual company 1,000 meter foot-race. George beat Harry to the finish line, but trailed behind Tom by five meters. Jim beat Earnest by about three paces. Harry came in a few meters ahead of Mike. Tom ran just a little behind Earnest.

Who won? _____

Who came in third place? _____

Who came in last? _____

3. The FBI has been told by a reliable informanant that a very important person has been marked for assassination by the mob. The person could be a certain politician, a religious leader, a judge, or an ambassador. The FBI knows that the assassination attempt will be made in New Haven. They know, moreover, that only one of the people will be there, that only one will be in New York, and that only one will be in Miami. Although he doesn't yet know the exact whereabouts of everybody, he does know that:

The politician will be in Atlanta

The religious leader and ambassador will not be in New York.

The judge and religious leader will not be in Miami

Who is the person to be assassinated? Check one.

1. The politician
 2. The religious leader
 3. The ambassador.
 4. The judge

6. Find the number sequences listed below in the diagram at the right.

132 - 9498

226 - 5825

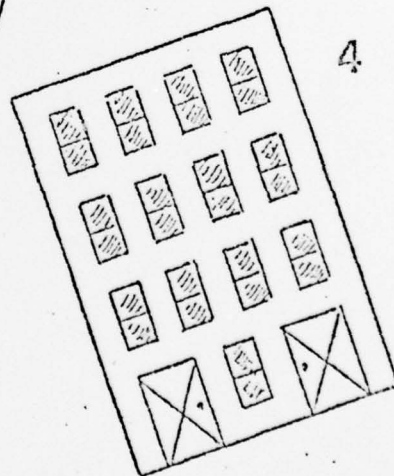
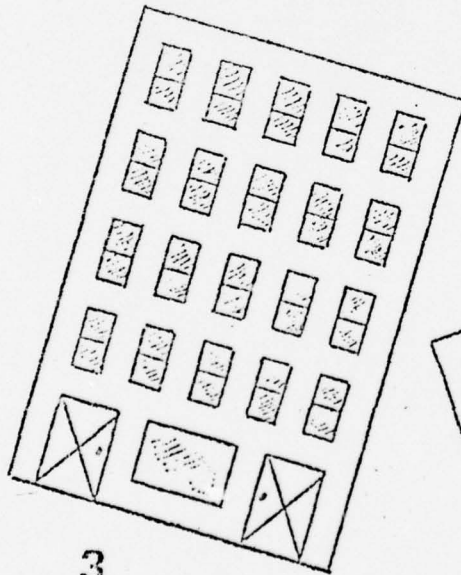
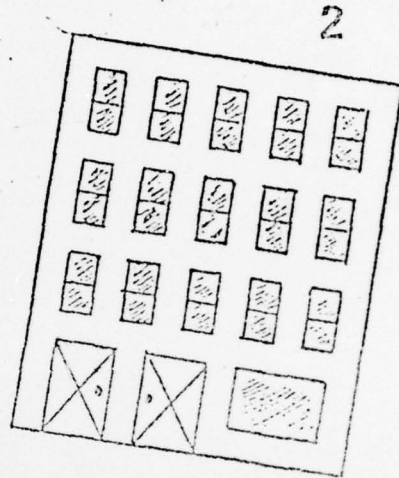
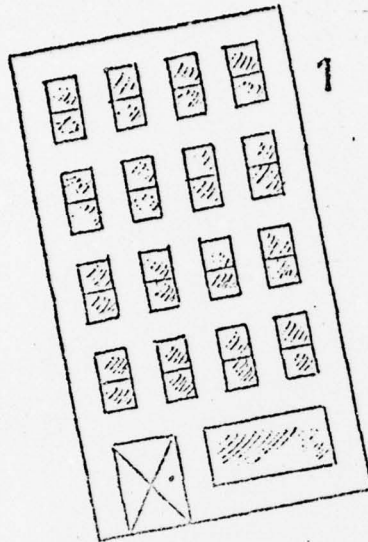
278 - 6920

382 - 5555

489 - 3252

9	1	2	3	2	3	7	0	5
2	3	2	4	5	0	2	1	6
3	0	6	8	2	6	0	1	7
1	3	5	2	9	2	7	2	8
3	3	8	2	5	5	5	5	0
3	2	2	5	3	1	3	2	7
1	6	5	9	0	4	9	2	2
1	7	3	3	4	6	2	1	7
3	2	2	3	8	9	0	7	2
3	4	1	7	9	2	8	9	6
8	4	2	3	3	5	1	1	4
2	5	4	0	2	2	1	3	0
1	9	4	4	5	6	8	1	9
1	2	8	6	2	7	8	8	5
3	6	6	6	7	7	3	9	1

7. Which building is four stories high, has two front doors, one big window on the first floor, and five windows on each of the three upper floors.



8. Decode the following message:

H	T
I	G
O	F
Y	T
A	D
R	E
R	E
S	A
F	U
L	O
A	L

The message is:

9. The mob has planted a shock bomb in a public building in Manhattan. The FBI must find it before it goes off. An anonymous tipster has told the FBI that the bomb can be found in City Hall, Grand Central Station, Rockefeller Center, or Madison Square Garden. The FBI knows, too, that at the places where they won't find the bomb, they will find dummy containers, including a carton and a briefcase. Only one container will be found at any one building. The FBI knows that:

The dummy briefcase is at Grand Central Station.
The dummy flight bag is not at City Hall or Madison Square Garden.
The dummy carton is not at Rockefeller Center or City Hall.

The bomb is at (check one):

1. Grand Central Station
2. City Hall
3. Madison Square Garden
4. Rockefeller Center

10. Decode the following message:

TNEMTRAPED	NO YADIRF
EROTS	NOONRETFA
LLIWEB	TA
DETOOL	HSUR
	RUOH

The message reads:

11. Complete this puzzle. Insert the numbers 5, 6, 7, and 8 in the empty boxes so that the same number never appears twice in the same row across or in the same column down.

5	7	8	6
6			5
7			8
8	6	5	7

12. Peter has to open Mr. Jameson's office safe so that he can take out \$100,000 needed to trap the gangsters who have kidnapped Robbie Robertson, the city editor of the "Bugle". Although, Mr. Jameson is out of town, he has prepared for just such an emergency by making a code, with the combination to the safe, which he has left in his desk.

CRACK THIS CODE!

The code is made up of a number of series. A series is a group of numbers which are repeated in a definite order. Each line across is the start of a series. After you have filled in all the dashes in each line, you will find another series going down in the column of circles. When all the circles have been filled in, the code will be completed.

6	9	6	9	6	9	6	9	⑥
2	2	5	5	2	2	—	—	①
8	8	1	8	8	1	—	—	①
4	7	3	4	7	3	—	—	①
7	6	6	7	6	6	—	—	①
3	5	2	3	5	2	—	—	①
								①
								①

13. Decode the following message:

BOMI BM NUSIHCALL

The message reads:

_____.

14. Fill in the number which completes the following sequences.

For example:

1 2 3 4 5 ?

The answer is 6 since that is the number which comes next when counting by ones.

Answers

1. 2 5 8 11 14 ?

1. _____

2. 2 4 8 16 32 ?

2. _____

3. 1 2 4 5 7 8 ?

3. _____

4. 1 6 5 10 9 14 13 ?

4. _____

5. 1 5 2 6 3 7 4 8 5 ?

5. _____

15. From the list below, circle every letter b which is followed by a letter e like this:

Ex. o h e r g s t u l a k n o b e f g h b r a k t u o p m

u j m o p l k j k w e t b q e r g i j k t r n o c d e f g h b e i j o u
h j b r u o p q e j i k l o p n m b v u h k l a q w r t a s d f g h j k
k l j i u t u b e j i u q w e r t y u i o p a s d f g h j k l z x c b f
z x c v a s d f g h j k i l i k o p r g h j j k b e i u j k l p o q w e
a s d f g h j k l m n b v c x z q w e r t y u i o p l k j h g n m v t u
q w e i u g b n m k l o p l i u j i o p e h b e k m n v p z x o p q t h
a q r t g b n h y u j k m p d f g j k l a z x c v y q b v o p j k l b o
u y r i b e o p i k m n q r m z b e o a s d f g n m l o p q e g j q z x
p o i u y t r e w q a s d f g h j k l p z c v b n h y t r e e w b e t y
a s d f z c v b n y t r e w h j k m n g h u i o p l k j m h w d f g h j
e r t u p l k w b e r t g h b r o b c r f g k l p q x z m l k j h i p

Appendix B

Performance Evaluation Survey