

## Brief Report Some cognitive effects of wintering-over in the Antarctic\*

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An automated series of visual discrimination and memory tasks was presented to an accumulating sample of Antarcticans over a five year period at Scott Base. The outcome revealed no deterioration in their cognitive performance, and it left for further consideration the evidence to the contrary that was obtained from the legacy of self-reports by the people themselves, as well as the observations of trained observers.

The psychological effects of wintering-over in the Antarctic remain a matter of debate. On the one hand are the self reports of many expeditioners themselves and of independent observers who indicate some deterioration, and on the other there are the reports of psychologists who for the most part report otherwise (Taylor, 1987). One exception are the Soviet psychologists Soroko, Matusov, and Sidorov (1984) who stated that:

'During the winter tour of duty on the Antarctic continent mental and physical working capacity falls. Reports of some increase in the working capacity of polar scientists. . . must be regarded as erroneous, because they were obtained by the use of simple proof reading tests and tests not requiring high mental strain. More careful investigations with high information loading and quantitative evaluation of the throughput of the brain revealed a marked decrease in memory function and rapid fatigue of polar scientists during intensive mental activity'. . .

Another exception is White, Taylor, and McCormick (1985), who found a decrement in the performance of their 15 Antarctic subjects, compared to 24 police recruits on certain mental paper folding tasks. On the other hand, a series of before and after tests, found no associated decrement in alpha wave activity, elapsed time estimation, reaction

time, taste and smell (Barabasz, 1978; Gregson, 1978; Simmonds, 1974).

When the International Biomedical Expedition to Antarctica (IBEA; Rivolier, Goldsmith, Lugg, & Taylor, in press) introduced the portable HP97 automated version of a memory test and a visual discrimination task, it was decided to administer them to a group of NZ winter-over personnel at Scott Base.

### Method

The sample was made up of 33 annual winter-over staff at Scott Base, Antarctica. Each subject was tested twice, once at the beginning and once at the end of their year in Antarctica.

#### *The Vigil 97 Test:*

Two aspects of vigilance (immediately memory and visual discrimination) were measured by the Vigil 97 test, and they were presented to the subject on a programmable printing calculator (Hewlett Packard HP97). The items for each test alternated. Those for the immediate memory test were presented in the following way: First, four digits were displayed twice for two seconds, and they were followed by a blank and a line of zeros. At this point the subjects had to key in the digits they recalled from the display. If the responses were correct, the next memory item would start with a display increased by one digit. If they were incorrect the number of digits were reduced by one. Those items were interspersed with visual discrimination items in which subjects had to detect whether two separate five-digit numbers displayed twice for two seconds were different or the same. Following the presentation of ten memory items, interspersed with ten visual discrimination items, the machine printed the following results automatically: Number of sequences; Mean number of digits recalled correctly; Standard deviation of the mean; Number

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Table 1: Results of Immediate Memory Test and Visual Discrimination Task (N = 33).

		Before	After	t-score
Immediate Memory Test (digits correctly recalled)	M	6.98	7.03	0.36
	SD	0.77	1.07	
Visual Discrimination Task (differences accurately detected)	M	3.48	3.73	2.99**
	SD	0.50	0.44	
(differences falsely detected)	M	2.38	2.49	0.95
	SD	0.54	0.38	

\*\* $p < .005$

of differences presented; Number of differences correctly detected; and Number of differences falsely detected. Each test session consisted of one trial, followed by four sequences of items.

### Results

Results of the Immediate Memory test and Visual Discrimination test are presented in Table 1. There was no significant difference in the mean number of digits correctly recalled, before and after the wintering-over period. There was, however a significant increase in the number of differences correctly detected.

The results were found to be consistent with those of the IBEA study (Defayolle, Boutelier, et al., 1985), in that there was no deterioration in either immediate memory or visual discrimination skills over the course of the Antarctic winter. Rather, a significant improvement was noted in one measure, the number of differences correctly detected. A similar result was found in the IBEA study, which was ascribed, as it can be here, to a learning effect due simply to the subjects repeating the test rather than to any environmental factor. The results were not the same in the mental paper folding (MPF) task, for reasons that are not clear. Either the MPF was more complex than the HP97 tasks, or

else it presented less of a motivational challenge. If the former, it disclosed deterioration, but if the latter it reflected the customary level at which the subjects worked except when they felt obliged to extend themselves. It seemed that in a normally unstimulating environment they reduced the level of their cognitive functioning until their sensory environment required them to respond more appropriately.

### Discussion

No evidence was found to suggest that the subjects suffered a decrease in their cognitive abilities with regard to either Immediate Memory or Visual Discrimination. In fact in some aspects of the test the reverse was the case, and the subjects showed an increase in some of their test scores that can probably be attributed to a learning effect. The outcome provided reassurance that any perceived loss of memory and visual discrimination was belied by actual test performance.

The results left open the problem of devising procedures that would quantify the sluggishness that subjects' perceive in themselves and independent observers often report. Those perceptions occur too frequently to be dismissed as the effects of compliance, and they are reported too frequently to be regarded as observer bias.

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