Aside from demonstrating that a high need for achievement is not the unmixed blessing it might be assumed to be, these results help clarify the meaning of the two scores. I interpret the need for achievement as a tendency to postpone immediate gratification to attain greater future gratification, to inhibit emotional impulses, and generally to maintain a "Protestant ethic" with emphasis on hard work, sobriety, and concrete results. While detracting somewhat from his inference that a society high in the need for achievement is most fortunate, these results generally support and strengthen McClelland's overall interpretation of the need-for-achievement score.

The need for power is seen as correlated with the acting out of impulses and with a manipulative, aggressive attitude toward other people. I infer also a loss of humane values and a willingness to engage in violence (as exemplified in murder and suicide). Possibly the high alcoholism rate reflects a high anxiety level in countries high in the need for power.

A weakness of this study is its failure to correlate the 1925 motivation scores with death-rate-cluster scores for more years, say from 1926 to 1980. The only data I can offer are correlations of the 1925 motivation scores with 1960 death rate clusters; they were slightly lower and insignificant, but only barely. The problem is that not enough time has elapsed, nor is enough data available, to fill in the gaps. McClelland has also given motivation scores for many more countries for 1950; there are no relationships between these scores and those for death rate clusters for about 1960; however, none would be expected until death rates from about 1975 are available. The ideal future cross-validation study would take the 1950 motivation scores and correlate them with the death rate clusters for every year from 1950 to, say, A.D. 2050.

In addition, other behavioral indices must be added to the cluster (for example, number of hours watching television per capita for the inhibition cluster, crime rates and number of riots for the aggressiveness cluster), including other death rates if possible, since recently available drugs appear to control ulcers and hypertension.

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9. Tables showing the countries and raw data used for most of these computations may be obtained from me by sending a request written on an institutional letterhead. I thank Mrs. Janet F. Rees and Dr. William N. Dember for their assistance in performing and reporting this study.

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Strychnine and the Inhibition of Previous Performance

Abstract. *The injection of strychnine sulfate into rats inhibits a hurdle-crossing response. Hurdle-crossing tends to decrease with increasing strychnine doses. The data are interpreted as being consistent with consolidation theory.*

Studies of maze learning (*1*), visual discrimination (*2*), and active avoidance learning (*3*) have shown that injections of subconvulsive doses of strychnine sulfate facilitate learning which involved the emission of locomotor responses. These findings have been attributed to strychnine's enhancement of the consolidation of persisting memory traces which were initiated by training trials.

While there is considerable evidence (*4*) for strychnine's facilitation of locomotor behavior there is no data on whether or not strychnine will similarly affect learning which involves the withholding (that is, inhibition) of a previously performed response. In order to provide this information, we investigated the effects of strychnine on rats' holding back from reentering a situation where a noxious stimulus (shock) had been previously experienced.

The apparatus consisted of a white start box (8 by 9 by 10 cm) separated from a black shock box (29 by 22 by 15 cm) by a guillotine door and a hurdle, 2.5 cm high. The start-box floor was Plexiglas; the shock-box floor consisted of 22 stainless steel rods placed 0.64 cm apart and wired to a Grason-Stadler shock generator (model E 1064GS).

Fifty-four male, Holtzman, albino rats were used. On each of the first 4 days of the experiment, each rat was placed in the start box and allowed to explore both boxes for 120 seconds. A 0.01-second timer measured the amount of time which elapsed before the rat's first hurdle-crossing on each day to provide an operant index of this behavior.

On the 5th day, each rat was placed directly in the shock box and, after 5 seconds, was administered two 1-second presentations of inescapable shock (0.2 ma), separated by 4 seconds. Ten seconds after the end of the second shock, the rat was returned to his home cage, and 15 minutes later received an intraperitoneal injection of either strychnine (0.2 mg/kg, 0.1 mg/kg, 0.05 mg/kg, 0.025 mg/kg, or 0.0125 mg/kg) or 95 percent saline. Nine rats were randomly assigned to each injection condition (*5*).

Beginning on the next day, each rat was administered one test trial on each of 7 days. A test trial began with the rat's being placed in the start box. Five seconds later the guillotine door was raised, starting a 0.01-second timer. When the rat crossed the hurdle into the shock box the timer stopped, yielding a measure of how much time had elapsed before hurdle-crossing occurred. (Henceforth this measure will be referred to as delay of hurdle-crossing.) The rat was returned to his home cage 10 seconds after crossing the hurdle or after 120 seconds in the start box without crossing, whichever came first. In the latter case a latency of 120 seconds was recorded for that trial. No shock occurred during test trials.

After the end of this first experiment,

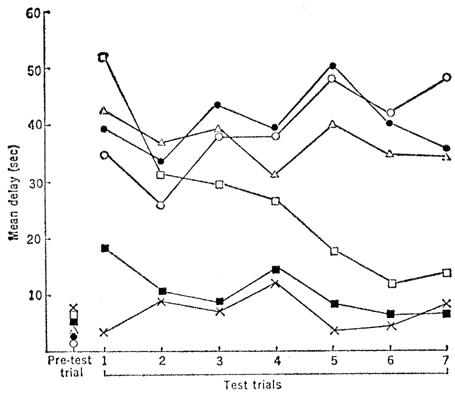

Fig. 1. Mean delay of hurdle-crossing, in seconds, for each injection condition on the last pretest trial and over all test trials. Key: saline, ×; strychnine: ●, 0.2 mg/kg; ○, 0.1 mg/kg; △, 0.05 mg/kg; □, 0.025 mg/kg; ■, 0.0125 mg/kg.

a second experiment evaluated the possible aversive effects of strychnine injections alone on hurdle-crossing behavior. This experiment replicated the procedures and injection conditions (N = five rats per group) of the first experiment except for the procedures on the shock day (the 5th day). On this day, in the second experiment, the rat was placed in the shock box but no shock occurred. Thus, test-trial performance presumably reflected the effect of the injection conditions alone.

Figure 1 shows the results of the first experiment. Mean delay of hurdle-crossing is presented for all groups for the last exploratory (the pretest) trial and over all test trials.

Since maximum strychnine effects might reasonably be expected on the test trial immediately following injection, data for trial 1 were analyzed separately. The treatment effect was reliable ($P < .05$). Scheffé comparisons (*6*) showed no reliable differences among strychnine-dose groups, but each such group, except the 0.0125 mg/kg dose group, showed reliably longer delays in crossing the hurdle than did the saline group ($P < .05$ or better). The effects of strychnine over all tests trials were evaluated with a repeated measures analysis of variance (*7*). Only a reliable treatment effect was obtained ($P < .05$). Scheffé comparisons showed that delays of hurdle-crossing for the 0.2 and 0.1 mg/kg dose groups were reliably longer than those of the 0.0125 mg/kg and saline groups ($P < .05$). the 0.05 mg/kg dose group's delay of hurdle-crossing was also reliably longer than that of the saline group ($P < .05$) but only marginally longer than that of the 0.0125 mg/kg dose group ($P = .05$ to $.10$).

In the second experiment, test-trial performance of all groups was slightly and nonsignificantly below that of the saline group shown in Fig. 1. Analyses over all the second experiment's data showed no reliable effects of injection conditions.

Since hurdle-crossing behavior in the second experiment showed no reliable effects of injection conditions alone, the results of the first experiment suggest that strychnine injections facilitated the rats' learning to inhibit reentry into the situation where they were previously shocked. These data were consistent with expectations from a consolidation viewpoint. Presumably, memory traces of the shock experience were enhanced by strychnine injections in the first study.

However, the facilitative effects of strychnine seemed to have been regulated by the dosages used. Inhibition of hurdle-crossing was reliably shown over all test trials (relative to saline controls) following 0.2 mg/kg, 0.1 mg/kg, and 0.05 mg/kg injections. Following a 0.025 mg/kg injection, however, inhibition was reliably shown on test trial 1 but decayed thereafter; a 0.0125 mg/kg injection provided no reliable evidence for inhibition at all. These results suggested that strychnine dosage determined both the initial appearance and the apparent maintenance of response inhibition. The finding of a dose-response relationship here was consistent with previous findings with Metrazol (*8*) and strychnine (*4*) in similar hurdle-crossing situations.

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Surveyor V: Chemical Observations

The observation that the lunar soil is of basalt-like composition at the Surveyor V site is taken by many (*1*) to substantiate the view, previously widespread, that volcanism formed the bulk of the lunar surface and that it supplied a differentiated type of rock. The case for this is, however, by no means simple and clear (*2*). The arguments against the explanation that a widespread differentiation occurred on the moon are now still valid and indeed have been strengthened in some cases by recent observations. They are concerned with the following points.

1) The lunar ground has suffered very little horizontal deformation in the whole of the history as depicted by its present surface. Even the oldest craters show as much tendency to circularity as the youngest. There are no chains of folded mountains and none of the large distortions of the high ground that would have been expected had large volumes been displaced in pouring lava over the low ground.

2) There is no widespread stratification visible on the lunar ground, even on the steep slopes of large fresh craters. Corresponding slopes on the earth would generally demonstrate much more clearly visible stratification, in respect both to color or albedo and to the tendency of erosion to cause terracing.

3) The large increase in resolution that the pictures from Lunar Orbiter give over terrestrial telescopes has led to little new morphological information indicating volcanism. The expectation that high resolution pictures would demonstrate a mass of clear volcanic features has not been fulfilled. The observed features that are internally caused are thought by many to be explicable in terms of movements of subterranean ice and water, rather than of magma (*3*). Subterranean water may have become available in the moon at a much lower temperature than that which would cause large-scale melting of rock.

4) The structural strength of the moon is high enough to allow the persistence of the present large departure from equilibrium in the distribution of its mass. A hot interior leading to a large amount of lava flooding on the surface is not compatible with this. The existence of substantial convection in the mantle has been proposed as the solution of the similar dilemma on the earth. Convection seems very unlikely