

# THE CONTROL OF VISUAL IMAGERY IN MENTAL DISORDER

By

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## INTRODUCTION

In this paper are presented the results of a further stage in the work started by Gordon (1950), added to by Petrie (1952) and continued by Costello (1956). In her first investigation Gordon found that two different kinds of imagery processes existed on the basis of which people could be divided into two contrasting groups. "On the one hand there were people whose imagery tended on the whole to be 'autonomous' that is to say, the images which they experienced were relatively independent of any volitional control that they might wish to exert . . . The other group, in contrast, consisted of persons whose images appeared to be part of a more or less integrated functioning of personality so that the nature, appearance and disappearance of these images was under the conscious control of the subject."

In her second investigation Gordon set out to find some more objective criteria which might corroborate the differentiation of imagery processes. She found a significant correlation between the type of imagery of a person and the ability to control the rate of reversal on the Necker Cube so that the subject whose imagery was relatively controlled was capable of exerting more volition in relation to rate of reversal than the autonomous imagery type.

Petrie found that there was an increase in reversals, especially willed reversals, on the Necker Cube after her subjects had been leucotomized and related this to Gordon's work. She suggested that the patients were better able to control their imagery after operation.

Costello in his study on the effects of pre-frontal leucotomy obtained data suggesting a centralizing tendency after operation on two space tests. It was also found that when a group of normal subjects were divided into two groups on the basis of their performance on the Gordon test of imagery those with controlled imagery did better on the space tests than those with autonomous imagery. The following explanation was proposed for the centralizing tendency after operation on the space tests: "patients who before leucotomy scored low on the space tests had vivid autonomous imagery which was made weaker and more controlled by the operation thus resulting in a higher post-operative score. Secondly, patients who had high scores before the operation had weak controlled imagery which was made weaker by the operation. The drop in score for these patients is apparently due to the fact that, though their imagery is controllable, it is now too weak for the images to be formed easily." Data was also obtained in support of Gordon's findings relating the type of imagery—autonomous or controlled—to the ability to control the rate of reversal on the Necker Cube.

It was felt that this controlled-autonomous continuum of visual imagery was worthy of further study and it was decided to investigate the relationships

between the continuum and mental disorder. The two questions it was hoped to answer were:

1. Are there any differences between the Dysthymic and Hysterical groups of patients in their ability to control their visual imagery?
2. Are there any differences between Normals and Neurotics in their ability to control their visual imagery?

#### METHOD

Twenty dysthymics, twenty hysterics and twenty normals were tested. The data relating to age, sex, intellectual capacity and verbal ability are presented in Table I.

TABLE I  
*Data on Age, Sex, Intellectual Capacity and Verbal Ability*  
(*n* = 20 in each group)

Group	Age in Years	Sex (No. of Subjects)		Matrices Raw Score	Mill Hill Vocabulary Scale Raw Score
		Mean	M	F	Mean
Dysthymics ..	39·55	10	10	34·25	49·4
Hysterics ..	34·55	10	10	37·25	43·85
Normals ..	22·10	6	14	47·25	48·9

The two neurotic groups do not differ significantly in age, Matrices score or vocabulary score. The normal group is significantly younger than the two neurotic groups and gets a significantly higher mean score than the two neurotic groups on the Matrices test. The bearing these differences have on the rest of the data will be discussed later. The groups will now be described in more detail.

#### *The 20 Normal Subjects*

The normal group consisted of members of the nursing staff of St. George's Hospital with one exception, this being a fourth-year medical student. They were requested to avoid discussing their interviews with their friends. Apart from the fact that they were not given a Rorschach test, the procedure adopted for them was exactly the same as for the neurotic groups.

#### *The 40 Neurotic Subjects*

All the neurotic subjects were in-patients at St. George's Hospital or out-patients at one of the clinics served by the hospital. The Consultant Psychiatrists were asked to refer all neurotic patients who could be classified as dysthymics or hysterics. No patient was used who had any evidence or history of psychotic features, brain injury or epilepsy or who had received any form of psychosurgery. No patient was used who had started E.C.T. or insulin.

The patients were included in the dysthymic group if they could be diagnosed as having one or more of the following characteristics: manifest anxiety, reactive depression, obsessive compulsive features. They were included in the hysterical group if the psychiatrist could diagnose them as having one or more of the following characteristics: hysterical personality, conversion symptoms, hysteria, psychopathic personality.

All the patients were given the Rorschach which was administered, scored and interpreted according to the method described by Klopfer (1954). There was complete agreement between the classification—dysthymic or hysteric—decided upon by the psychiatrist and that based on the Rorschach results. Though the Experience Balance was given considerable weight when deciding into which group the subject should go it was decided that at this stage of the research on the control of visual imagery, no attempt should be made to minimize overlap between the neurotic groups along the dimension of introversion—extraversion by the use of Scales such as Guilford's R Scale (1942).

All the patients were co-operative throughout the testing.

#### *Procedure*

All the subjects were seen at two sessions, both sessions taking place within the same week. During the first session all the subjects were given the Matrices test and the Mill Hill Vocabulary Scale. These tests were followed by the Rorschach test in the case of the two neurotic groups.

During the second session all the subjects were first of all given the N.I.I.P. space test (Group Test 80A). The instructions of the National Institute of Industrial Psychology were followed closely in the administration of the test. It is felt however that by giving the test individually a better understanding of what he had to do was obtained by the subject during the sample tests than is the case when the test is administered to a group.

The space test was followed by the Necker Cube. A card on which was drawn the reversible box pattern was presented to the subject and the reversal of perspective was described to him until it was felt that he had grasped the idea. He was then told to look at the card for one minute and to tap the table with a pencil each time he noted a change in his perception of the drawing. The rate of reversal during this minute was taken as the subject's normal rate. The subject was next instructed to attempt to increase the number of reversals per minute as much as he could, tapping each time there was a change of perspective. Finally the subject was told to reduce the number of reversals per minute as much as he could, again tapping each time he noted a change in his perception.

The subject was then given a standard interview on visual imagery and related processes. At the beginning of the interview the nature of visual images was described to him and illustrated, distinctions such as that between remembering well what a person looked like and getting a visual image of the person being pointed out to him. The remainder of the interview included the Gordon test of visual imagery and questions on autonomous imagery, hypnagogic imagery and dreams. The Gordon test will be described in full. When it was felt that the subject had a clear idea of what was meant by a visual image he was asked to close his eyes and try to get a visual image of the following scenes, simply saying "Yes" if he could get an image of the scene and "No" if he could not:

1. A car standing in front of a garden gate.
2. The same car but in a different colour from that seen at first.
3. The same car lying upside down.
4. The same car back on its four wheels.
5. The car running along the road.
6. The car climbing up a very steep hill.
7. Climbing across the top of the hill.
8. Getting out of control and crashing through a house.

9. The same car running along the road with a handsome couple inside.
10. Crossing a bridge and falling into the stream below.
11. The same car all old and dismantled standing in a car cemetery.

An attempt was made immediately afterwards to discover why the subject had failed in the case of his failures and to discover if he had any difficulty with any of the scenes he had finally managed to image.

## RESULTS

### *Neurotic Groups*

In Table II the results on the space tests and the Necker Cube for the two Neurotic groups are presented.

TABLE II

*The Mean Scores on the N.I.I.P. Space Test and the Necker Cube for the Dysthymics and Hysterics with the "t" and "p" Values for the Difference between the Means (n=20 in each group)*

Group	N.I.I.P.	Necker	Necker	Necker	Necker	Necker
	Raw Score	Normal Score	Fast Score	Slow Score	Fast- Normal Score	Fast- Slow Score
	Mean	Mean	Mean	Mean	Mean	Mean
Dysthymics ..	24.7	10.75	16.7	5.8	7.1	12.05
Hysterics ..	20.4	16.55	23.9	9.6	7.9	14.8
	t=1.16	t=2.97	t=1.87	t=2.70	t=.26	t=.78
	p=>.05	p=<.01	p=>.05	p=<.05	p=>.05	p=>.05

From the data presented in Table II it can be concluded that:

1. The difference between the dysthymics and hysterics in their performance on the N.I.I.P. space test is not significant.
2. The hysterics' normal rate of fluctuation on the Necker Cube is significantly higher than that of the dysthymics.
3. The difference between the dysthymics and hysterics in their fast rate of fluctuation on the Necker Cube is not significant.
4. The dysthymics' slow rate of fluctuation on the Necker Cube is significantly lower than that of the hysterics.
5. The two groups do not differ significantly in their ability to vary the rate of reversal as assessed by the differences between the fast rates and normal rates and between the fast rates and slow rates.

It was found that thirteen of the twenty dysthymics were unable to visualize all the scenes in the Gordon test according to their reports and seven were able to do so. Ten of the hysterics were unable to visualize all the scenes and the other ten were able to do so. But it was also found that with one exception there was a clear difference between the kind of difficulty experienced by the dysthymics and the kind experienced by the hysterics. The thirteen dysthymics who failed on one or more of the scenes had vivid imagery of an autonomous kind, e.g. a vivid picture of a car that would not turn over or that would not go up the hill—"I saw the car and the hill clearly but the car just stayed at the bottom." Or a car that would not crash into the house—"The car kept going by the house and I could not get it to crash." Only one of the hysterics reported this kind of difficulty. The other nine hysterics who failed on one or other of

the scenes reported weak imagery of an unstable kind, e.g. "The car kept coming and going", "I could see the car but not the house." "I could only see the car at first—then I saw the house but the car faded away." "I could see a car but I could not see the couple inside it." Two of the hysterics said they could not see the car at all.

It was decided to bunch the two neurotic groups together and to see if there were any differences in performance on the tests between the following groups: the vivid-autonomous group (consisting of the fourteen patients—13 dysthymics and 1 hysteric—who had strong visual images which they could not manipulate); the weak-unstable group (consisting of the nine patients—all hysterics—who had no visual images or weak ones which they found hard to hold); the controlled group (consisting of the remaining seventeen patients—7 dysthymics and 10 hysterics—who were able to visualize all the eleven scenes).

TABLE III

*The Mean Ages and Mean Scores on the Matrices, Vocabulary Scale, N.I.I.P. Space Test and Necker Cube for the Vivid-autonomous Group and Controlled Group with the "t" and "p" Values for the Differences between the Means*

Group	Age	Matrices Raw Score	Mill Hill	N.I.I.P. Raw Score	Necker Normal Score
			Vocabulary Scale Raw Score		
	Mean	Mean	Mean	Mean	Mean
Vivid-autonomous .. ..	34.5	37.93	46.07	21.93	9.71
Controlled .. ..	41.29	34.29	50.41	28	13.76
	t=1.54 p=>.1	t=.89 p=>.3	t=1.13 p=>.2	t=1.39 p=>.05	t=2.137 p=<.05
	Necker Fast Score	Necker Slow Score	Necker Fast- Normal Score	Necker Fast- Slow Score	
	Mean	Mean	Mean	Mean	
Vivid-autonomous .. ..	13.36	5.429	3.64	8.64	
Controlled .. ..	23.47	7.295	9.70	16.11	
	t=3.00 p<.01	t=1.381 p>.1	t=3.08 p<.01	t=2.37 p<.05	

From the data presented in Table III it can be concluded that:

1. The differences between the two groups in age, intellectual capacity and verbal ability are not significant.
2. The difference between the two groups in their performance on the space test is not significant.
3. The controlled group's normal rate of fluctuation on the Necker Cube is significantly higher than that of the vivid-autonomous group.
4. The controlled group's fast rate of fluctuation is significantly higher than that of the vivid-autonomous group.
5. The difference between the two groups in their slow rate of fluctuation is not significant.

6. The controlled group are better able to vary the rate of fluctuation than the vivid-autonomous group, the difference between the means being significant for the fast-normal scores and the fast-slow scores.

TABLE IV

*The Mean Ages and Mean Scores on the Matrices, Vocabulary Scale, N.I.I.P. Space Test and Necker Cube for the Weak-Unstable Group and Controlled Group with the "t" and "p" Values for the Differences between the Means*

Group	Age	Matrices Raw Score	Mill Hill Vocabulary Scale Raw Score	N.I.I.P. Raw Score	Necker Normal Score
	Mean	Mean	Mean	Mean	Mean
Weak-unstable	32·78	35·11	40·33	13·22	19·55
Controlled	41·29	34·29	50·41	28	13·77
	t=1·96 p>·05	t=·023 p>·9	t=2·563 p<·02	t=2·905 p<·01	t=2·233 p<·05
	Necker Fast Score	Necker Slow Score	Necker Fast- Normal Score	Necker Fast- Slow Score	
	Mean	Mean	Mean	Mean	
Weak-unstable	27·67	13·11	8·11	14·55	
Controlled	23·47	7·29	9·70	16·11	
	t=·652 p>·05	t=3·415 p<·01	t=1·138 p>·05	t=·328 p>·05	

From the data presented in Table IV it can be concluded that:

1. The difference between the two groups in age, and in intellectual capacity is not significant but the controlled group have a significantly higher vocabulary score than the weak-unstable group.
2. The controlled group's performance on the space test is significantly better than that of the weak-unstable group.
3. The weak-unstable group's normal rate of fluctuation on the Necker Cube is significantly higher than that of the controlled group.
4. The difference between the two groups in their fast rate of fluctuation is not significant.
5. The controlled group's slow rate of fluctuation is significantly lower than that of the weak-unstable group.
6. The difference between the two groups in their ability to vary the rate of reversal is not significant.

From the data presented in Table V it can be concluded that:

1. The difference between the normals and the dysthymics and the normals and hysterics in their performance on the space test is not significant.
2. The normal group's normal rate of fluctuation on the Necker Cube is significantly higher than that of the dysthymics but is not significantly different from that of the hysterics.



3. The normals' fast rate of fluctuation is significantly higher than that of the dysthymics and hysterics.
4. The normals' slow rate of fluctuation is significantly higher than that of the dysthymics but is not significantly different from that of the hysterics.
5. The differences between the normals and dysthymics and the normals and hysterics in their ability to vary the rate of reversal from normal to fast rates is not significant.
6. The differences between the normals and dysthymics in varying the rate of reversals from fast to slow speeds is significant—the normals having a larger difference between fast and slow scores. The differences between the normals and hysterics is not significant.

*Differences Between the Normal Group and the Neurotic Group*

TABLE V

*The Mean Scores on the N.I.I.P. Space Test and the Necker Cube for the Normals, Dysthymics and Hysterics with the "t" and "p" Values for the Differences between the Means*

Group	N.I.I.P. Raw Score	Necker Normal Score	Necker Fast Score	Necker Slow Score	Necker Fast- Normal Score	Necker Fast- Slow Score
	Mean	Mean	Mean	Mean	Mean	Mean
Normals ..	27.05	22.0	33.95	10.15	13.0	24.3
Dysthymics ..	24.7	10.75	16.7	5.8	7.1	12.05
	t=.586 p>.05	t=4.068 p<.01	t=3.762 p<.01	t=2.69 p<.02	t=1.586 p>.10	t=2.505 p<.05
Normals ..	27.05	22.0	33.95	10.15	13	24.3
Hysterics ..	20.4	16.55	23.9	9.6	7.9	14.8
	t=1.88 p>.05	t=2.086 p>.05	t=2.018 p>.05	t=.304 p>.05	t=1.402 p>.05	t=1.831 p>.05

It was found that thirteen of the normal subjects were able to visualize all the eleven scenes in the Gordon test, two had vivid-autonomous imagery and five had weak-unstable imagery. As a further test of the relationships between control of imagery and performance on the space test and Necker Cube it was decided to combine the normals and hysterics and to compare the performances of the subjects with controlled imagery and those who had weak-unstable imagery.

TABLE VI

*The Mean Scores on the N.I.I.P. Space Test and the Necker Cube for the Weak-Unstable Group and the Controlled Group (combining the Normals and Hysterics)*

Group	N.I.I.P. Raw Score	Necker Fast-Normal Score	Necker Fast-Slow Score
	Mean	Mean	Mean
Weak-unstable ..	14.40	7.19	13.86
Controlled ..	30.57	13.61	24.57
	t=6.876 p<.01	t=1.656 p>.05	t=2.072 p<.05

From the data presented in Table VI it can be concluded that:

1. The controlled group's performance on the space test is significantly better than that of the weak-unstable group.
2. The difference in their ability to change from normal to fast rates of fluctuation is not significant.
3. The controlled group is significantly better able to change from fast to slow speeds.

In view of the fact that the normals were significantly younger than the two neurotic groups and got significantly better scores on the Matrices and yet did not perform significantly better on the space test it was decided to calculate the coefficients of correlation between age and N.I.I.P. scores and between Matrices scores and N.I.I.P. scores for the normals and dysthymics and normals and hysterics.

TABLE VII  
*Coefficients of Correlation between Age and N.I.I.P. Space Test Scores and Matrices Scores and N.I.I.P. Space Test Scores for the Normals and Dysthymics and Normals and Hysterics taken separately*

Group		N.I.I.P.	
Normals Dysthymics	Age .. .. .	-.2084	p > .05
	Matrices .. .. .	.5067	p < .01
Normals Hysterics	Age .. .. .	-.1186	p > .05
	Matrices .. .. .	.4976	p < .01

From the data presented in Table VII it can be concluded that:

1. There is a significant positive correlation between the Matrices scores and space test scores.
2. There is an insignificant negative correlation between age and space test scores.

The data from the standard interview, apart from the Gordon test, was not in a form that could be statistically or systematically analysed and will be presented during the discussion of the test results already presented.

#### DISCUSSION AND CONCLUSIONS

One of the most interesting of the findings is the distinction between people who are unable to control their imagery because their images are vivid and of an autonomous nature and those who cannot control their imagery because their images are weak and of an unstable nature. The data from the Gordon test suggests that the first type of imagery is associated with dysthymic disorders and the second type with hysteric disorders. That mental disorder is not a necessary concomitant of inability to control imagery processes is clear from the amount of overlap between the normal and neurotic groups. It may however be a contributory factor and certainly would seem to play a role in determining the kind of mental disorder to which the individual is prone.

This difference between the autonomous type and the unstable type as compared with the controlled type is not based solely on the Gordon test since we have shown that previous work relating the distinction to control of



fluctuation on the Necker Cube has been substantiated and in the case of comparison between the weak-unstable group and controlled group is also reflected in performance on the N.I.I.P. space test—the weak-unstable group not doing so well as the controlled group.

Inability to control images is reflected in an inability to vary the rate of reversal on the Necker Cube. A further analysis of the data suggests that other measures may indicate to which group—the vivid-autonomous or weak-unstable—the individual belongs.

The vivid-autonomous group has a significantly lower normal rate of reversal than the controlled group whereas the weak unstable group has a significantly higher normal rate of reversal than the controlled group. The vivid-autonomous group has a significantly lower fast score than the controlled group whereas the difference between the weak-unstable group and the controlled group on this measure is not significant. There is no difference between the vivid-autonomous group and the controlled group in their ability to reduce the number of reversals (slow score) but the weak-unstable group shows a significantly higher mean slow score than the controlled group.

These findings suggest that the weak-unstable group have generally faster rates of reversal than the vivid-autonomous group. If this is the case, then we would expect a difference between the dysthymics and hysterics in absolute rates of reversal—the hysterics having a faster rate of reversal. This is what we find (Table II). It will be seen that they do not differ significantly in their ability to vary the rate of reversal but the differences on the normal and slow scores are significant. There is no difference between their mean scores on the N.I.I.P. This would be expected since both groups have difficulty in the manipulation of their visual images.

It was found that the normal group used here was most like the hysteric group in that five of the subjects had weak-unstable imagery as assessed by the Gordon test and only two vivid-autonomous imagery. This reflected in the fact that three of the differences on the Necker Cube for the dysthymics and normals are significant whereas none of the differences on the Necker Cube for the hysterics and normals are significant. When the normals are compared with the two neurotic groups in their ability to vary the rate of reversal it is found that though their scores are higher in every case only one is significant, that between the mean fast-slow scores of the dysthymics and the normals. This again suggests that the type of imagery indicates more the type of disorder to which the individual may be prone rather than indicating mental disorder itself. This probably accounts in part for the fact that differences between the two neurotic groups and the normal group on the space test are not significant. In view of the fact that the normal group was significantly different from the two neurotic groups in scores on the Matrices along with the fact that there is a significant positive correlation between the Matrices score and the N.I.I.P. score one might perhaps have expected significant differences between the groups due to difference in intellectual capacity. The investigator can find no adequate reasons for this though the negative correlation between age and the N.I.I.P. scores, though insignificant for the samples studied, may be worth further investigation.

The data from the standard interview did not reveal any differences between the normals, dysthymics and hysterics or between the vivid-autonomous, weak-unstable and controlled groups in the incidence of dreams reported or the nature of the dreams. None of the subjects claimed a photographic memory or remembered instances of visual phenomena under the effects of anaesthesia

or instances of hypnogogic visual imagery. Only one of the subjects remembered a clear-cut instance of autonomous visual imagery. She was a young girl complaining of anxiety and depression and who belonged to the vivid-autonomous group. She had on numerous occasions had a vivid picture of children falling. She tried to see herself saving them but could not do so. This lack of significant data with respect to dreams, hypnogogic imagery, etc. suggests that they are not directly related as was previously thought (1956) to the daytime visual images studied here.

The findings presented would seem to fit in with the theory of cortical inhibitory and excitatory processes described by Pavlov (1941) and Eysenck (1955). Whether or not vivid images do correspond to a predominance of excitatory processes and weak images to a predominance of inhibitory processes is the next problem to be investigated. In this connection work has already started on the relationships between the alpha rhythm of the EEG and the vividness of visual imagery.

#### SUMMARY

1. Twenty dysthymics, 20 hysterics and 20 normals were given a standard interview on visual imagery and related processes which included the Gordon test of visual images. They were also given the N.I.I.P. space test and the Necker Cube.

2. The data suggests that individuals can be divided into three groups: (i) a controlled group the members of which are able to control their visual images; (ii) a vivid-autonomous group whose images are vivid and hard to manipulate; (iii) a weak-unstable group whose images are weak and not easily held.

3. The data suggests also that the groups differ in their ability to control the rate of fluctuation on the Necker Cube and the controlled group do significantly better than the weak-unstable group on the N.I.I.P. space test.

4. It would seem that mental disorder is not a necessary concomitant of inability to control visual images but the nature of an individual's visual images would seem to indicate the kind of mental disorder to which he is prone—vivid-autonomous imagery being associated with dysthymic disorders, weak-unstable imagery with hysteric disorders.

5. The general significance of the results is discussed.

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