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THE MEASUREMENT OF HALLUCINATORY PREDISPOSITION IN MALE AND FEMALE PRISONERS*

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Summary—This paper describes the development of a 12-item questionnaire scale to measure hallucinatory predisposition. The scale, which conforms to at least one mathematical model of unidimensionality, includes both pathological items and other items which appear to represent sub-clinical forms of hallucinatory experience.

The scale was used to test certain hypotheses concerning the link between aggressive–paranoid tendencies and hallucinatory predisposition (using the Eysenck's P scale) in a prison sample. The significant results presented do confirm such a link, although the precise behavioural correlates of hallucinatory predisposition require further definition.

INTRODUCTION

The impetus behind the present investigation stemmed from an earlier study reported by the second author (Slade, 1976a). There it was found that a small group of psychotic patients with a history of auditory hallucinations obtained elevated scores on the Eysencks' psychoticism (P) scale (Eysenck and Eysenck, 1973) which were comparable only to those of male and female prisoners. This finding has recently been replicated in a recent study employing larger samples (Place, 1980). One suggestion stemming from this finding is that of a link between auditory hallucinations and aggressiveness. This hypothesis has been tested more directly in another recent study (Judkins and Slade, 1980) using the Hostility and Direction of Hostility Questionnaire developed by Caine *et al.* (1967). Again it was found that a group of psychotic patients with persistent auditory hallucinations obtained higher scores than any of the normative hospital samples and were comparable only to those found in a prison population. Thus we have accumulating evidence suggesting that patients who suffer from auditory hallucinations report paranoid and aggressive tendencies of a similar intensity to those of prisoners.

The hypothesized link between auditory hallucinations (a perceptual response) and aggressiveness (an emotional response) has important implications for the neuroanatomical and neurophysiological pathways underlying auditory hallucinations. However, the evidence described above is purely correlational in nature and as such does not permit of any firm conclusions concerning cause–effect relationships. In order to achieve the latter it is necessary in the first instance to demonstrate the converse of the above described findings: namely, that individuals specifically selected for aggressive tendencies will be more highly predisposed to experience auditory hallucinations than those selected as having lesser or no such tendencies. The main aim of the study to be reported was to test two specific predictions: (1) that a sample of male and female prisoners would score higher on a measure of hallucinatory predisposition than a sample of normal controls; and (2) that prisoners who obtained high scores on the Eysencks' P scale would report a stronger hallucinatory predisposition than those who obtained low P scores.

A secondary aim of the present study stemmed from a necessary requirement of the main aim: namely the development of a suitable instrument for measuring hallucinatory

* The views expressed in this paper are those of the authors alone and do not necessarily represent those of the Home Office, Prison Department.

predisposition, as no such instrument currently exists. In this respect it has been argued elsewhere (Slade, 1976b) that the actual occurrence of auditory hallucinations stems from the interaction of 'stress events' and 'hallucinatory predisposition', both of which are viewed as continuously distributed variables. It follows from this continuum notion of 'hallucinatory predisposition' that, while overt hallucinatory experiences may be qualitatively distinct from the normal range of experiences, there should be sub-clinical forms which are represented at lower points on the hypothesized continuum. The secondary aim of the study was therefore to develop a unidimensional scale of hallucinatory predisposition on which clear-cut hallucinatory experiences would represent the upper ranges of the scale and sub-clinical forms (if these could be found) would be represented at lower points on the scale.

The two aims of the study were pursued in the same set of investigations although they kept functionally separate as will be described later.

METHOD

Materials

Hallucination Questionnaire (AH1). An initial 30-item questionnaire was constructed in the following manner. Five items were first formulated aimed specifically at revealing clinical symptoms of auditory hallucinations. To these were added two items aimed at revealing clinical symptoms of visual hallucinations. These seven items were therefore concerned with *overt clinical pathology.*

Next 20 items were formulated which were aimed at tapping areas which it was felt might represent a *sub-clinical* form of overt hallucinatory experience. Five of these items were concerned with 'vivid or intrusive' thoughts, five items with the 'quantity and quality of dreams' and nine items with 'vivid daydreams'. Finally, three items of a miscellaneous nature were added as filler items: these were (1) "I seldom think about the future at all"; (2) "At no time in my life have I experienced unusual sensations on my skin"; and (3) "I often find myself thinking about sex". Thus the final composition of the initial 30-item questionnaire was as follows:

Number of items	Content	
5	Auditory hallucinations	Clinical symptoms
2	Visual hallucinations	Clinical symptoms
5	Vivid/intrusive thoughts	Hypothesized sub-clinical forms
6	Dream experiences	Hypothesized sub-clinical forms
9	Vivid daydreams	Hypothesized sub-clinical forms
3	Miscellaneous fillers	

Of these 30 items, 15 were keyed in a positive direction while 15 were negatively keyed. The order of items was then randomized and presented in a format requiring a True–False response to each item.

Psychoticism (P) and Lie (L) scales. The 24 P items were extracted from the Eysenck Personality Inventory (Eysenck and Eysenck, 1973) and interspersed with the 16 Lie-scale items from the Eysenck Personality Questionnaire (Eysenck and Eysenck, 1975). The reasons for using the P items from the EPI rather than those from the more recent EPQ was that the former had been used in the previous study of the second author (Slade, 1976a) and it was felt desirable to use the same items again for comparison purposes.

Subjects

Three samples of subjects were used as follows:

(*a*) *Normal Control group.* This comprised 54 prison psychologists, 24 male and 30 female. Their mean age was 33.67 years (SD = 7.78 years).

(*b*) *Patient group.* This comprised 42 patients with a clear-cut history of auditory hallucinations taken from a number of different hospitals. There were 23 males and 19 females. The mean age of the group was 40.12 years (SD = 13.24 years).

(c) *Prisoner group.* This consisted of a sample of 200 prisoners tested at Risley, Walton and Strangeways prisons. There were 100 males and 100 females. The mean age of the group was 23.51 years (SD = 7.99 years).

Although the three groups differed significantly from each other in terms of age this was not found to be crucial as will be shown later. The Normal Control and Patient groups completed only the Hallucination Questionnaire while the Prisoner group completed the P and L scales in addition.

RESULTS

Development of an hallucinatory predisposition scale

The 30-item Hallucination Questionnaire was initially administered to the Normal Control ($N = 54$) and Patient ($N = 42$) groups. The number of subjects, in each group endorsing each of the 30 items is presented in Table 1. The endorsement frequencies for each item were contrasted using Chi-square tests including the Yates correction factor. The results of these Chi-square analyses are also displayed in Table 1. Nine items were found not to discriminate significantly between the two groups (i.e. items 1, 3, 4, 5, 9, 13, 19, 25, 27). A further five items (i.e. items 2, 8, 14, 15, 17) were found to discriminate in the unintended direction: that is, patients endorsed these items less frequently than controls. These 14 items were therefore excluded from further consideration. Thus using only the Normal Control and Patient groups the 30-item questionnaire was reduced to 16 items.

The next stage in the development, aimed at the construction of a unidimensional scale from the remaining 16 items, involved the use of three statistical procedures: namely,

Table 1. Number (and %) of subjects endorsing each of the 30 items

Item	Controls ($N = 54$) No.	%	Patients ($N = 42$) No.	%	Chi-square	Significance
1	19	35.2	23	54.7	2.93	—
2	53	98.1	26	61.9	18.88	$P < 0.01$
3	39	72.4	30	71.4	0.02	—
4	31	57.4	26	61.9	0.00	—
5	13	24.1	12	28.6	0.07	—
6	1	1.8	19	45.2	20.93	$P < 0.01$
7	19	35.2	31	73.8	12.62	$P < 0.01$
8	40	74.1	19	45.2	7.12	$P < 0.01$
9	31	57.9	17	40.5	2.07	—
10	14	25.9	36	85.7	33.64	$P < 0.01$
11	16	29.6	30	71.4	14.91	$P < 0.01$
12	13	24.1	22	52.4	6.99	$P < 0.01$
13	19	35.2	16	38.1	0.01	—
14	47	87.0	26	61.9	7.18	$P < 0.01$
15	36	66.7	17	40.5	5.54	$P < 0.05$
16	1	1.8	22	52.4	30.43	$P < 0.01$
17	53	98.1	35	83.3	5.00	$P < 0.05$
18	1	1.8	26	61.9	39.23	$P < 0.01$
19	37	68.5	20	47.1	3.46	—
20	1	1.8	24	57.1	34.68	$P < 0.01$
21	0	0	17	40.5	23.86	$P < 0.01$
22	1	1.8	23	54.8	32.51	$P < 0.01$
23	16	29.6	36	85.7	27.72	$P < 0.01$
24	3	5.6	29	69.0	30.51	$P < 0.01$
25	21	38.9	19	45.2	0.17	—
26	7	13.0	26	61.9	22.96	$P < 0.01$
27	25	46.3	14	33.3	1.15	—
28	2	3.7	8	19.0	4.42	$P < 0.05$
29	5	9.3	21	50.0	17.85	$P < 0.01$
30	4	7.4	11	26.2	4.98	$P < 0.05$

Table 2. Comparison of 16-item and 12-item scales by the three methods

	Factor analyses: percentage of variance accounted for by first factor	Item analyses: KR 20	Goodness of fit to Rasch model χ^2	*df*	*P*
16-Item scale	66.5	0.797	2911	2762	>0.16
12-Item scale	83.1	0.802	1978	1875	>0.22

factor analysis, classical item analysis and goodness of fit to the Rasch model (Rasch, 1960). Data collected from the Prisoner group were combined with the data from the initial two groups for this purpose, yielding a total N of 296 subjects.

Factor analysis and classical item analysis. These are standard procedures (e.g. Lumsden, 1961, 1976) and require little introduction. The data from the total sample of subjects (54 controls, 42 patients and 200 prisoners) were subjected to a series of factor analyses (unrotated principal components analyses using SPSS package PA2) and the reliability coefficients calculated independently using the KR 20 formula. Items were culled out systematically to maximize independently the value of the percentage of variance accounted for by the first factor of the factor analyses and the value of the KR 20 coefficient. Both methods agreed on a final 12-item solution obtained by culling out the same four items (i.e. items 22, 28, 29 and 30). A comparison of the results for this 12-item scale with those for the 16-item scale is provided in Table 2. Thus using the data from the total subject sample ($N = 296$), with the methods of factor analysis and classical item analysis, the questionnaire was refined further, entailing the exclusion of four more items.

Goodness of fit to the Rasch model. The Rasch model is a more recent development in test theory (Rasch, 1960, 1966; Levy, 1973) and has mainly been used in the field of education (Willmott and Fowles, 1974) and ability testing (Murray, 1975). Its use as a method for constructing unidimensional scales probably requires therefore more introduction (see Elliott *et al.*, 1977 for a fuller account). Briefly, the method consists first of all in estimating the ideal Item Characteristic Curve (ICC) for each item; this is the curve which would characterize the item if it fitted the model perfectly. Secondly, this ideal (or expected) ICC is compared to the observed ICC of the item by means of a Chi-square test: a statistically *non* significant ($P > 0.10$ is the usual criterion) Chi-square indicates that there is little difference between expected and observed ICCs of the item and that therefore it is a good fitting item.

If all the items were to fit the Rasch model perfectly, they would all have parallel ICCs and could be said to measure 'the same thing'. A scale made up of such items would be perfectly unidimensional. Constructing a unidimensional scale according to this method simply consists of excluding the items which do not fit the model according to some given criterion.

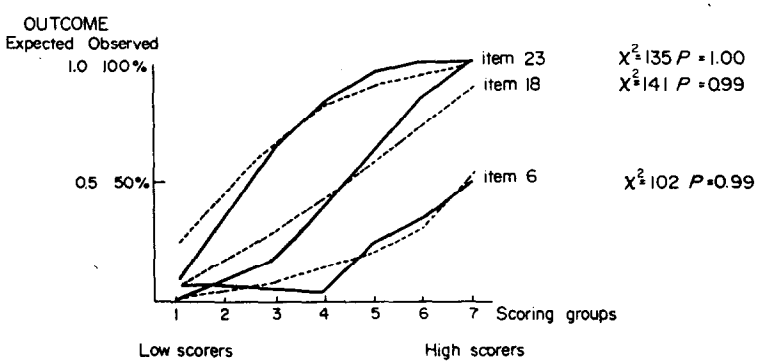

Fig. 1. ICCs of three accepted items.

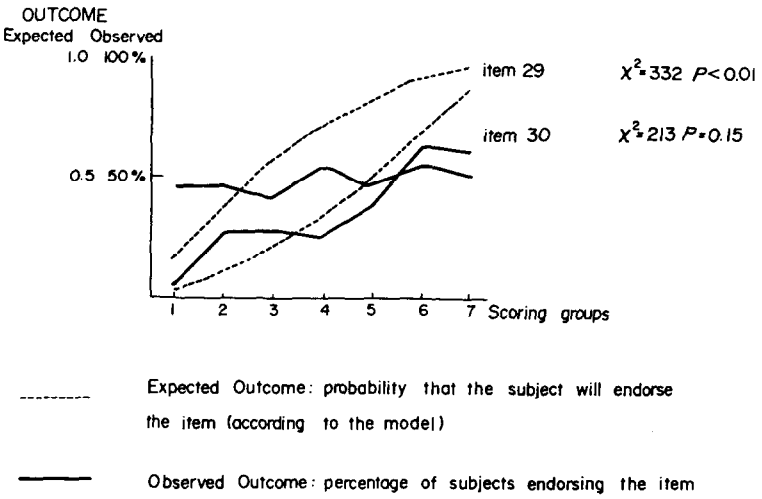

Fig. 2. ICCs of two rejected items.

For instance, Figs 1 and 2 show that the Rasch model method agrees with the factor analysis and the classical item analysis in excluding items 29 and 30 and accepting items 18, 23 and 6.

Summing Chi-squares over all items gives a criterion of fit for the test as a whole: Table 2 shows that the 12-item scale is well within the specified criterion for the model.

Characteristics of the 12-item scale. The correlation matrix for the final 12 items selected for the scale is presented in Table 3, together with significance values. It can be seen that 60 out of the 66 correlations are significant at the 5% level or greater: while on the other hand the highest correlation is +0.44. This represents the ideal state for a set of items intended to measure a behavioural continuum since one wants items to be correlated but not to the extent that they are statistically synonomous with each other. That is, one needs a set of items which, while contributing to the common variance of the scale, also contribute specific variance to various levels on the continuum.

The results of the factor analysis on the 12-item scale are presented in Table 4. It can be seen that all 12 items have loadings of above 0.30 on the first factor, which accounts for 83.1% of the variance. By comparison the second factor, which only accounts for 16.9% of the total variance, has two items loading above 0.30. Both of these items (item 9 and 11) are ones which were keyed in a negative direction. The simplest interpretation of these two factors is that the first represents the 'tendency to hallucinatory experiences' while the second represents a 'negative response set'.

Table 3. Correlation matrix for final 12 items in the scale (N = 296)

Item	1 (7)	2 (23)	3 (11)	4 (10)	5 (26)	6 (16)	7 (12)	8 (18)	9 (24)	10 (20)	11 (21)
2 (23)	0.32**										
3 (11)	0.22**	0.27**									
4 (10)	0.32**	0.39**	0.24**								
5 (26)	0.12*	0.31**	0.26**	0.21**							
6 (16)	0.26**	0.39**	0.23**	0.36**	0.39**						
7 (12)	0.24**	0.29**	0.34**	0.21**	0.32**	0.32**					
8 (18)	0.25**	0.35**	0.28**	0.44**	0.36**	0.43**	0.29**				
9 (24)	0.11	0.25**	0.12**	0.32**	0.11	0.18**	0.15**	0.29**			
10 (20)	0.20**	0.32**	0.23**	0.36**	0.23**	0.31**	0.25**	0.38**	0.34**		
11 (21)	0.13*	0.19**	0.08	0.19**	0.05	0.13*	0.07	0.23**	0.34**	0.18**	
12 (6)	0.14*	0.28**	0.07	0.27**	0.14*	0.16**	0.23**	0.32**	0.29**	0.24**	0.24**

* $P < 0.5$; ** $P < 0.1$.

Table 4. Results of factor analysis using final 12-item scale ($N = 296$)

Item	Factor 1 loadings	Factor 2 loadings
1 (7)	0.4164	0.0779
2 (23)	0.6098	0.0543
3 (11)	0.4238	0.2143
4 (10)	0.6142	−0.0865
5 (26)	0.4741	0.2959
6 (16)	0.5980	0.2173
7 (12)	0.4889	0.2272
8 (18)	0.6744	−0.0071
9 (24)	−0.4671	0.4397
10 (20)	0.5486	−0.0967
11 (21)	−0.3382	0.3718
12 (6)	0.4239	0.2143
Percentage of variance accounted for by factor	83.1%	16.9%

Turning to the question of the content of the 12-item scale, the items are presented in Table 5 in their order of frequency of endorsement by the undifferentiated sample of 200 prisoners. It can be seen that of the first seven items three are concerned with 'vivid' or 'intrusive thoughts', three with 'vivid daydreams' and one with overt 'auditory hallucinations': while of the latter five items, four are concerned with overt 'auditory hallucinations' and one with overt 'visual hallucinations'. Thus the latter items (i.e. less frequently endorsed) are concerned with overt clinical pathology, as hypothesized, while the items lower in the scale (i.e. more frequently endorsed) are primarily concerned with 'vivid intrusive thoughts and daydreams' which would appear to represent the hypothesized sub-clinical forms of hallucinatory pathology.

Group comparisons

Having constructed the scale in the manner described above, the first hypothesis to be tested was that the group of male and female prisoners would score significantly higher on the scale than the Normal Controls. The relevant findings are presented in Table 6.

Table 6. Questionnaire scores of Normal Controls and Prisoners

Group	N	Hallucination-scale scores: mean (SD)	P-scale scores: mean (SD)	Lie-scale scores: mean (SD)
1. Normal Controls				
A. Males	24	1.79 (1.66)	—	—
B. Females	30	1.63 (2.87)	—	—
t-Test and significance		$t = 0.35$ NS		
2. Prisoners				
A. Males	100	4.91 (2.77)	6.81 (2.80)	4.68 (3.44)
B. Females	100	5.25 (2.97)	6.75 (3.29)	5.42 (3.11)
t-Tests and significance		$t = 0.84$ NS	$t = 0.14$ NS	$t = 1.57$ NS
3. All subjects				
A. Controls	54	1.70 (1.66)	—	—
B. Prisoners	200	5.08 (2.87)	—	—
t-Tests and significance		$t = 8.28$ $P < 0.001$		

Table 5. Twelve-item Hallucination scale (Launay–Slade Hallucination scale)

Item No.	Item	Response	Type of item
1 (7)	Sometimes a passing thought will seem so real that it frightens me	True	vivid thoughts (VT)
2 (23)	Sometimes my thoughts seem as real as actual events in my life	True	vivid thoughts (VT)
3 (11)	No matter how much I try to concentrate on my work unrelated thoughts always creep into my mind	True	intrusive thoughts (IT)
4 (10)	In the past I have had the experience of hearing a person's voice and then found that there was no-one there	True	auditory hallucination (AH)
5 (26)	The sounds I hear in my daydreams are generally clear and distinct	True	vivid daydreams (VDD)
6 (16)	The people in my daydreams seem so true to life that I sometimes think they are	True	vivid daydreams (VDD)
7 (12)	In my daydreams I can hear the sound of a tune almost as clearly as if I were actually listening to it	True	vivid daydreams (VDD)
8 (18)	I often hear a voice speaking my thoughts aloud	True	auditory hallucinations (AH)
9 (24)	I have never been troubled by hearing voices in my head	False	auditory hallucinations (AH)
10 (20)	On occasions I have seen a person's face in front of me when no-one was in fact there	True	visual hallucinations (VH)
11 (21)	I have never heard the voice of the Devil	False	auditory hallucinations (AH)
12 (6)	In the past I have heard the voice of God speaking to me	True	auditory hallucinations (AH)

There it can be seen that the Total Prisoner group ($N = 200$) scored significantly higher than the total Control group ($N = 54$) on a t-test comparison ($t = 8.28$, $P < 0.001$). By contrast male vs female comparisons within both the Control and Prisoner groups proved to be non-significant as did the sex comparison within the prisoner group on the P scale. However, this was a fairly weak test of the hypothesis, given the fact that the Hallucination scale items were partly selected by dint of the fact that they had low endorsement frequencies in the Control group.

A much more rigorous test was available in respect to the second hypothesis, namely that prisoners who scored high on the P scale would obtain higher Hallucination scale scores than prisoners scoring low on the P scale. In order to test this hypothesis a higher P group was selected from the total Prisoner group (i.e. those with a P-scale score of 8 and above) and compared with a selected low P group (i.e. those with a P-score of 5 or less). The relevant findings are presented in Table 7. It can be seen that the two selected P groups differ significantly on the Hallucination scale ($t = 4.14$, $P < 0.01$) in the predicted direction; while no significant difference was found between the groups in terms of the Lie-scale scores, the two groups of course differ on the P scale as they were selected on this basis.

Correlations between variables

Correlations were computed between the Hallucination-scale scores, age, Lie-scale and P-scale scores, for the total Prisoner group and for Male and Female Prisoner groups separately. These are presented in Table 8. As can be seen, Hallucination-scale scores are non-significantly correlated with age and Lie scores in all three groups but positively correlated with P scores in all groups: the highest positive correlation with the P scale being found in the Female Prisoner group ($r = +0.462$, $P < 0.001$). The only other significant correlation was a small negative one between Lie and P scores in the Total Prisoner Group.

Criterion groups

The mean Hallucination-scale scores of six criterion groups are presented in Table 9, including the results for two small groups of normals and non-hallucinated schizophrenic patients tested by Place (Place, 1980). It can be seen that mean scores increase progressively from normal controls to non-hallucinated schizophrenic patients, to low P prisoners, to high P prisoners and finally to hallucinated patients. A series of t-test comparisons were carried out between neighbouring groups in terms of this progression, the results being presented in the final column of Table 9. It can be seen that the first three comparisons produced non-significant results, while the comparisons between low P and high P prisoners and between the latter and the hallucinated patients were both statistically significant.

Table 7. Questionnaire scores of low P and high P prisoners

Group	N	Hallucination-scale scores: mean (SD)	P-scale scores: mean (SD)	Lie-scale scores: mean (SD)
1. Low P prisoners	77	4.29 (2.55)	3.75 (1.18)	5.29 (3.38)
2. High P prisoners	80	6.12 (2.97)	9.91 (1.74)	4.65 (3.11)
t-Tests and significance		$t = 4.14$ $P < 0.01$	$t = 28.98$ $P < 0.001$	$t = 1.23$ NS

N.B. Low P subjects are those scoring 0–5; high P subjects are those scoring 8 + on the P scale.

Table 8. Correlations between questionnaire measures and age in the Male, Female and Total Prisoner groups

Variable	Male Prisoners: $N = 100$			Female Prisoners: $N = 100$			Total Prisoner group: $N = 200$		
	Age	Lie scale	P scale	Age	Lie scale	P scale	Age	Lie scale	P scale
Hallucination scale	+0.029	−0.163	+0.211*	+0.035	−0.031	+0.462**	+0.032	−0.090	+0.349**
Age		−0.099	−0.119		+0.091	+0.038		−0.026	+0.050
Lie scale			−0.147			−0.140			−0.142*

* $P < 0.5$; ** $P < 0.1$.

Table 10. Number (and %) of subjects endorsing Hallucination scale items in the various groups

Item No.	Normal Controls ($N = 54$)	Low P prisoners ($N = 77$)	High P prisoners ($N = 80$)	Hallucinated patients ($N = 42$)	Male prisoners ($N = 100$)	Female prisoners ($N = 100$)	Total prisoners ($N = 200$)
1 (7)	19 (35.2)	57 (74.0)	61 (76.2)	31 (73.8)	70 (70)	77 (77)	147 (73.5)
2 (23)	16 (29.6)	50 (64.9)	53 (66.3)	36 (85.7)	68 (68)	62 (62)	130 (65.0)
3 (11)	16 (29.6)	38 (49.3)	56 (70.0)	30 (71.4)	54 (54)	60 (60)	114 (57.0)
4 (10)	14 (25.9)	44 (57.1)	50 (62.5)	36 (85.7)	51 (51)	62 (62)	113 (56.5)
5 (26)	7 (13.0)	34 (44.1)	42 (52.5)	26 (61.9)	46 (46)	51 (51)	97 (48.5)
6 (16)	1 (1.8)	28 (36.3)	47 (58.8)	22 (52.4)	41 (41)	52 (52)	93 (46.5)
7 (12)	13 (24.1)	26 (33.7)	40 (50.0)	22 (52.4)	42 (42)	41 (41)	83 (41.5)
8 (18)	1 (1.8)	19 (24.7)	35 (43.7)	26 (61.9)	32 (32)	35 (35)	67 (33.5)
9 (24)	3 (5.6)	10 (12.9)	37 (46.3)	29 (69.0)	32 (32)	26 (26)	58 (29.0)
10 (20)	1 (1.8)	15 (19.5)	29 (36.3)	24 (57.1)	19 (19)	17 (17)	36 (18.0)
11 (21)	0 (0)	2 (2.6)	24 (30.0)	17 (40.5)	19 (19)	17 (17)	36 (18.0)
12 (6)	1 (1.8)	7 (9.0)	15 (18.8)	19 (45.2)	12 (12)	13 (13)	25 (12.5)

Table 9. Hallucination-scale scores for six criterion groups

Group	N	Mean	SD	t-Tests and significance
Normal Controls	54	1.70	1.66	$t = 1.64$ NS
Normal Controls (Place, 1980)	17	2.71	2.37	$t = 0.55$ NS
Non-hallucinated schizophrenic patients (Place, 1980)	12	3.17	2.08	$t = 1.68$ NS
Low P prisoners	77	4.29	2.55	$t = 4.14$ $P < 0.01$
High P prisoners	80	6.12	2.97	$t = 5.75$ $P < 0.01$
Hallucinated patients	42	7.57	2.44	

Finally the frequency of endorsements of each individual item for the main criterion groups was tabulated. These frequencies are presented in Table 10. It can be seen that, with a few exceptions, the ordering of criterion groups in terms of endorsement frequency follows a similar pattern for the groups. Particularly notable is the almost identical ordering for the two largest groups, the Male and Female Prisoner groups.

DISCUSSION

The main aim of the present study was to test several hypotheses concerning hallucinatory tendencies in a sample of prisoners. In order to achieve this it was deemed necessary to construct a suitable scale to measure the hypothesized hallucinatory predisposition dimension as no suitable scale is currently available. To this end a 30-item questionnaire was constructed, involving a set of items specifically formulated to elicit overt hallucinatory pathology and another set which it was hypothesized might represent sub-clinical forms of hallucinatory experience. This initial questionnaire was reduced to 16 items on the basis of a simple comparison of item endorsement frequencies between a Normal Control group and a group of auditorily hallucinated patients. A further four items were eliminated on the basis of consistent results obtained from three more complex and sophisticated statistical procedures; namely, factor analysis, classical item analysis and goodness of fit to the Rasch model. It is of some interest therefore that most of the scale definition was achieved by simple group comparisons while the more complex procedures were only required to achieve the final delimitation of appropriate items.

Turning to the content of the final 12-item version which was used to test the main hypotheses in this study, a number of features are notable. First, of the seven items which were formulated to elicit overt hallucinatory pathology only one (a visual hallucination item) was not represented in the final 12-item scale. Secondly, five out of six of the pathological items were placed in the upper range of the scale (i.e. they had the lowest endorsement frequencies); this was consistent with expectations and provides some face validity for the continuum notion of the scale. Thirdly, of the six non-pathological items which represented the lower ranges of the scale (i.e. they had the highest endorsement frequencies) all were concerned with waking experiences. Or to put it another way, none of them was concerned with dream experiences despite the fact that six such items were especially included. This is of interest as it tends to go against the general theory

of hallucinations proposed by West (1962) who suggests that dreams represent a sleeping manifestation of waking hallucinations, lying on the same continuum. If this is so one would have expected at least one of the dream items to be represented on the scale. Fourthly, when one considers the six non-pathological items which are represented, it is notable that five of them are concerned with the vividness of either thoughts or daydreams: that is with vivid imaginative experiences. This is consistent with the findings of a number of investigators (e.g. Mintz and Alpert, 1972; Slade, 1976a) which suggest that vivid mental imagery may be a necessary, although not sufficient, condition for the experience of hallucinations. The present findings therefore indicate that it is in the area of vivid realistic imaginative experience that the sub-clinical forms of hallucinatory experience are to be found. One qualification is required for this statement. Of the two items dealing with intrusive thoughts in the original 30-item questionnaire one was represented in the final scale (item 3, Table 5). It may be therefore that the 'intrusiveness' of imaginative experience represents another facet of the sub-clinical form, which contributes independently to the 'vividness' factor. Further investigation is clearly required on this point.

Turning to the hypothesis testing aspects of the study, confirmation was obtained for the prediction that the prisoner group would score higher than the normal control group on the Hallucination Scale. However, this was a weak test of the original hypothesis given the way in which the hallucinatory items were selected. A stronger test was provided for the second hypothesis that high P prisoners would score higher than low P prisoners. This hypothesis received confirmation from the data. Overall, the hypotheses that individuals who were selected for the presence of paranoid and aggressive tendencies would also be predisposed to hallucinations received some support. It is worth considering in this respect the general level of endorsement given by the total prisoner group to the overt pathological symptom items. Considering only the last five items on the scale (items 8–12, Table 5), it can be seen from Table 10 that the endorsement frequencies range from 12.5% for item 12 ("In the past I have heard the voice of God speaking to me"), to 33.5% for item 8 ("I often hear a voice speaking my thoughts aloud"). The latter report, if it were substantiated in an intensive psychiatric interview, would be considered a first-rank symptom of schizophrenia (Schneider, 1959). This study therefore raises questions concerning the incidence of frank psychiatric illness in a non-selected prison population.

A further point requiring some consideration concerns the correlations with the Hallucination scale. First, Table 8 shows that all three correlations with age were non-significant and close to zero, within the Prisoner groups. This is an important finding given the fact that it was not possible to match the main criterion groups in terms of age. The findings of virtually zero correlations with age suggests that our failure to match groups on this variable was not likely to have biassed the findings in any consistent fashion. Secondly, there were significant positive correlations between P-scale scores and Hallucination-scale scores in the Total Prisoner group and in both the Male and Female subgroups considered separately. When this finding is considered in conjunction with the statistically significant difference found between high P and low P prisoners it does strongly suggest an association between the two scales. The nature of this association will now be considered.

The P scale items which were used in this study were taken from the Eysenck Personality Inventory (Eysenck and Eysenck, 1973) and are presented in Table 11. The first possible explanation for the observed association involves direct contamination. That is, if the two scales included a substantial proportion of items which appeared to be measuring the same thing, one would expect to find a positive association between them as a contamination artefact. However, simple reference to Tables 5 and 11 shows this not to be the case. None of the items in the P scale (Table 11) refers to hallucinatory or vivid imaginative experiences; while none of the items in the Hallucination scale (Table 5) deals with paranoid or aggressive tendencies. In terms of the face content of the two scales there is no apparent overlap between them.

Table 11. Twenty-four P-scale items taken from the Eysenck Personality Inventory

	Item	Response
1.	Do most things taste the same to you?	Yes
2.	Do you enjoy hurting people you love?	Yes
3.	Have you had more trouble than most?	Yes
4.	Do you like teasing animals?	Yes
5.	Are there people who wish to harm you?	Yes
6.	Did you love your mother?	No
7.	Is there someone else who is to blame for most of your problems?	Yes
8.	Would you have done better if people had not put difficulties in your way?	Yes
9.	Would it upset you a lot to see a child or animal suffer?	No
10.	Would you take drugs which may have strange or dangerous effects?	Yes
11.	Was your father a good person?	No
12.	Are you usually very unlucky?	Yes
13.	Would you feel very sorry for an animal caught in a trap?	No
14.	Do your friendships break easily without it being your fault?	Yes
15.	When you are in a crowd, do you worry about catching germs?	Yes
16.	Do you care a lot about what others think of you?	No
17.	Was your mother a good person?	No
18.	Do people tell you a lot of lies?	Yes
19.	Do good manners and personal cleanliness matter much to you?	No
20.	Are you slow and unhurried in the way you move?	Yes
21.	Do you generally understand why people feel the way they do?	No
22.	Do you try not to be rude to people?	No
23.	Before making decisions, do you generally ask someone's advice?	No
24.	Do you like playing pranks on others?	Yes

The second possible explanation that must be considered for the observed association concerns a possible response bias overlap. If both scales were subject to a substantial response-set bias, of a similar magnitude and in a similar direction, once again one would expect to find an association between the scales as artefact. In the final 12-item Hallucination scale, 10 of the items were keyed in a positive direction. This raises the possibility of an acquiescent response set bias being involved. However, two other observations suggest that this is unlikely to provide an explanatory basis for the observed association. First, with the P scale (Table 11) it can be seen that 10 of the 24 items are negatively keyed, while 14 are positively keyed. Thus, with the P scale, any overwhelming acquiescent response bias will impose an artificial ceiling on the range of P scores, thus reducing the likelihood of finding a significant association with another scale. Secondly, it was noted from the results of the factor analysis of the 12-item Hallucination scale (Table 4) that the second factor had item loadings above 0.30 on only two items. Since these two items were the only two which were negatively keyed, it seemed reasonable to interpret this factor as a 'negative response set' factor. However, this factor accounted for only a small proportion of the total variance, suggesting that this type of response set was of fairly minimal importance on the Hallucination scale. Taking these two observations together it would be difficult to explain the association between the P and Hallucination scales meaningfully in terms of response-set artefacts.

Given that the observed association between scales cannot simply be accounted for by either content contamination or similar response set bias it is necessary to entertain the notion that it represents a true relationship. We therefore need to consider more precisely what its nature could be. This was done in two ways. First, each of the 12 items on the Hallucination scale was independently correlated with total P score in the undifferentiated sample of 200 prisoners. Nine of the items correlated positively and significantly beyond the 5% confidence level while six were significant at the 1% level. Of the latter four are overt pathological hallucinatory items (i.e. items 8, 9, 10, 11), one is a vivid daydream item (i.e. item 6) and one is an intrusive thought item (i.e. item 3). Thus total P score correlates with individual Hallucination scale items, particularly the overt pathological ones, as well as with total scale score. Secondly, each of the 24 P scale items was independently correlated with total Hallucination-scale score in the sample of 200 pris-

oners. Thirteen of the items correlated significantly beyond the 5% level, with nine being significant at the 1% level. Of the latter six are overt paranoid items (i.e. items 3, 5, 8, 12, 14, 18), two are hostility–cruelty items (i.e. items 2 and 13), and one is a miscellaneous item (i.e. item 20). Thus total Hallucination-scale score correlates with individual P scale items, as well as with total P score. The nature of the correlations suggests that it is the subset of paranoid and aggressive items which contribute primarily to the association of the P scale with the Hallucination scale. Although the paranoid items are predominant in this, there is room for doubt concerning the precise behavioural correlates of some of these paranoid items. For example, a positive response to item 14 ("Do your friendships break up easily without it being your fault?") may simply imply paranoid misinterpretation of actual events; alternatively it may suggest unrecognized aggressive behaviour on the part of the subject leading to frequent disruption of relationships. From a theoretical and practical standpoint it is clearly important in future studies to determine which of these two conflicting interpretations is the valid one. In terms of underlying neuroanatomical pathways an emphasis on 'paranoid misinterpretation' would tend to imply a cortical–cortical mechanism while an emphasis on 'aggressiveness' would tend to suggest a subcortical–cortical mechanism.

SUMMARY

The major aim of this study was to test the proposition that individuals predisposed to aggressive behaviour (particularly those scoring high on the Eysencks' P scale) would be more susceptible to hallucinatory experiences than those without such tendencies. In order to test this proposition it was deemed necessary to develop a suitable instrument for measuring hallucinatory predisposition.

A 30-item questionnaire was first administered to a sample of 42 patients with persistent auditory hallucinations and a Normal Control group of 54 prison psychologists; 16 items were found to discriminate significantly between the groups in the appropriate direction. These 16 items were then reduced to a 12-item scale on the basis of consistent results obtained from three statistical–mathematical procedures (i.e. factor analyses, item consistency analysis and goodness of fit to the Rasch model), using a total sample of 296 subjects. The final 12-item scale involved a combination of overt pathological items and other items which appeared to represent a sub-clinical form of hallucinatory experience.

Applying this Hallucination scale to an unselected sample of 200 prisoners (100 male, 100 female) it was found that they scored significantly higher than controls. More importantly it was found that selected high P prisoners scored significantly higher than selected low P prisoners. Moreover, significant positive correlations between the P scale and the Hallucination scale were found for both male and female prisoners separately as well as for the combined sample.

The association between the P scale and the Hallucination scale could not be accounted for in terms of either content contamination or similar response set bias. Further analyses suggested that the association involved hallucinatory experiences and paranoid–aggressive tendencies. However, the behavioural correlates of the latter still need further more precise definition.

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