SUSCEPTIBILITY TO A VISUAL ILLUSION, AS RELATED TO PRIMARY AND SECONDARY SUGGESTIBILITY AND OTHER FUNCTIONS[1]

By H. J. EYSENCK

I. Introduction

Visual, auditory, and other illusions have often been used as tests of suggestibility. Gilbert(1) and Seashore(2) were probably the first to use illusions in this context, and Brown included several illusions among his numerous tests of suggestibility(3). Hollingworth put forward the orthodox view when maintaining that "any perceptual illusion may be said to constitute a case of suggestion"(4). Little is known, however, with regard to the correlation of 'susceptibility to an illusion' and 'suggestibility' as measured by any of the various tests of personal and impersonal suggestion in common use. The present paper reports on the relation between susceptibility to the Muller-Lyer illusion, and eight tests of suggestibility, as well as on a few data gathered from other tests.

II. Experimental method

In the Muller-Lyer illusion, the observer is required to equate two lines, one of which appears shorter because of two arrowheads affixed to the ends, while the other appears longer because of two inverted arrowheads going out from its ends. In this particular experiment, the 'arrowheads' part of the figure was held constant, while the 'inverted arrowheads' part of the figure was adjustable. The constant part was 7·7 cm. long; the oblique lines were one-quarter as long as the horizontal segments, forming an angle of 45° with them. The method of equivalents was used, the experimenter varying the movable part of the figure from a position where it was obviously longer than the constant part to a position where the observer called out 'Equal', and from a position where the movable part was obviously shorter until the observer called out 'Equal'. Each of these two ways of testing the susceptibility of the subjects was repeated three times. The three trials where the variable line was *shortened* ('IN' trials) will be denoted A_1, A_2, and A_3; the three trials where the variable was *lengthened* ('OUT' trials) will be denoted B_1, B_2, and B_3.

Sixty patients at Mill Hill Emergency Hospital were tested in this manner. Fifteen of these patients were male hysterics, fifteen were female hysterics; fifteen were male non-hysterics, fifteen were female non-hysterics. The hysterics without exception had conversion symptoms.

[1] I wish to express my thanks to Dr W. S. Maclay for his permission to use the clinical material at the Mill Hill Emergency Hospital. I am also indebted to the Rockefeller Foundation for a grant which enabled me to carry out this research.

III. RESULTS

(1) *Factorial analysis of Muller-Lyer illusion*

The six trials of these sixty patients were intercorrelated, and the resulting table factor analysed. The results are given in Table 1. Two factors are sufficient to account for all the significant correlations. (According to Fisher's method of calculating the significance of small samples, a correlation of 0·25 is significant ($p = 0{\cdot}05$), while a correlation of 0·32 is very significant ($p = 0{\cdot}01$), when $n = 60$.) The first factor is positive throughout, and accounts for 59 % of the variance, while the second factor is bipolar, and accounts for 13·5 % of the variance.

By means of Burt's adaptation of the Spearman-Brown prophecy formula, shown by the writer elsewhere to be applicable to data of this kind(5, 6), we can predict how closely the average susceptibility of our subjects on the six trials would correlate with their 'true' score, i.e. with the susceptibility score they would achieve if the experiment were repeated a very large number of times. This correlation is 0·99; in other words, six trials are sufficient to measure the phenomenon under consideration with considerable reliability.

Table 1

Trial	A_1	A_2	A_3	B_1	B_2	B_3	Factor I	Factor II
A_1	—	0·792	0·670	0·391	0·481	0·546	0·750	0·367
A_2		—	0·718	0·491	0·532	0·641	0·846	0·343
A_3			—	0·330	0·349	0·527	0·660	0·369
B_1				—	0·768	0·774	0·710	−0·460
B_2					—	0·756	0·751	−0·374
B_3						—	0·870	−0·267
						Variance	0·590	0·135

Table 2

$A_1 = 1{\cdot}8$ cm. $\pm 0{\cdot}602$	$B_1 = 2{\cdot}5$ cm. $\pm 0{\cdot}530$
$A_2 = 1{\cdot}7$ cm. $\pm 0{\cdot}683$	$B_2 = 2{\cdot}4$ cm. $\pm 0{\cdot}636$
$A_3 = 1{\cdot}6$ cm. $\pm 0{\cdot}690$	$B_3 = 2{\cdot}3$ cm. $\pm 0{\cdot}612$

While the first factor in our analysis simply expresses the fact that the susceptibility to the optical illusion which is being investigated tends to remain a constant quantity for each subject, as compared with the other subjects, the second factor seems to indicate that certain subjects are more susceptible to the illusion under condition *A*, while other subjects are more susceptible to the illusion under condition *B*. This finding raises interesting questions regarding the methodology of the psycho-physical methods generally. What precisely are the factors which make condition *A* different from condition *B*? How far are factors of this kind general, and how far are they specific to the present test? In the absence of definite experimental evidence, we can here only raise these questions; further research is needed to provide the answers. It may be suggested, however, that a systematic reworking of the standard psycho-physical methods of experiment by means of modern statistical methods of analysis may yield interesting results, and clarify many of the problems left unsolved by the older methods.

On the average, the strength of the illusion was about 25 %, i.e. it was about as strong as when observed by Heymans' subjects under optimum conditions(7). The exact amount of error in the six trials, together with the standard deviations, is given above in Table 2.

It will be noted that with each succeeding trial a practice effect is observed; this practice effect is equally as strong in condition *A* as in condition *B*. This decrease in susceptibility to the illusion with successive trials, in the absence of any information regarding the nature or amount of error to the subjects, is well in line with Judd's results(8). There also appears a tendency, though not as strongly marked, for the standard errors to increase from the first to the third trial in each of the two conditions.

(2) *Correlation between susceptibility to Muller-Lyer illusion and tests of suggestibility*

The correlations between susceptibility to the Muller-Lyer illusion, and the results of eight suggestibility tests, are throughout small and non-significant. The battery of suggestibility tests used has been described elsewhere in detail by the writer(6). In that paper, it had been shown that the customary division into personal, prestige suggestibility on the one hand, and impersonal, non-prestige suggestibility on the other, contradicts the experimental findings, and the results of a factorial analysis carried out on the intercorrelations between the tests. The results of this factorial analysis made it necessary to assume the existence of two entirely unrelated kinds of suggestibility: 'Primary suggestibility', as shown in the Hull Body Sway Test, two Arm Levitation Tests, and the Chevreul Pendulum Test; and 'Secondary suggestibility', as shown in the Progressive Weights and the Progressive Lines Tests, both in their usual form as tests of impersonal suggestibility, and in a modified form, scored as tests of personal suggestibility.

The correlation between primary suggestibility, as measured by the tests mentioned, and susceptibility to the Muller-Lyer illusion, is on the average −0·009. The correlation between secondary suggestibility, as measured by the tests mentioned, and susceptibility to the Muller-Lyer illusion, is on the average 0·007. The detailed correlations are given in Table 3.

Table 3

	Correlation with susceptibility to illusion
Tests of primary suggestibility:	
(1) Body Sway Test	0·044
(2) Arm Levitation, Up	−0·083
(3) Arm Levitation, Down	−0·116
(4) Chevreul Pendulum	0·120
Tests of secondary suggestibility:	
(1) Progressive Weights, Personal	−0·103
(2) Progressive Weights, Impersonal	0·036
(3) Progressive Lines, Personal	−0·054
(4) Progressive Lines, Impersonal	0·149

These correlations disprove rather conclusively the assumption that susceptibility to perceptual illusions is closely connected with suggestibility, as ordinarily understood and used in psychological testing. In fact, susceptibility to the Muller-Lyer illusion fails to show any tendency to correlate either with primary or with secondary suggestibility. We must conclude, then, either that there is no connexion between 'suggestibility' and susceptibility to perceptual illusions, or that such susceptibility constitutes a tertiary kind of suggestibility. It would not seem advisable to make any decision between the two alternatives until more is known about the correlations between susceptibility to one kind of illusion and susceptibility to others.

(3) *Correlation of Muller-Lyer illusion with other data*

Three further sets of data were obtained from the sixty subjects taking part in this study, viz. their intelligence scores on a perceptual test of intelligence, their scores on two perseveration tests, and their scores on two personal tempo tests. Details regarding the actual tests used are given elsewhere(9). These scores were correlated with susceptibility to the illusion, and the following results obtained:

Table 4

	r
Susceptibility to illusion and intelligence	0·213
Susceptibility to illusion and perseveration	0·305
Susceptibility to illusion and personal tempo	−0·196

Of these three correlations, only the one with perseveration is significant, although the other two may be considered suggestive. It has not been found possible to fit these results into any theoretical framework.

It has often been maintained, more particularly by the French school, that there is a particularly close relation between suggestibility and hysteria. In a previous study, the writer failed to find any positive connexion between hysteria and either primary or secondary suggestibility(9). No such connexion between hysteria and susceptibility to the Muller-Lyer illusion became apparent in the present study either. The average error for the hysterics was 1·9 cm., as compared to an average error of 2·2 cm. for the non-hysterics. In view of the high probable errors, this difference is of course insignificant, and its direction would in any case not favour those who might believe that hysteria and (tertiary) suggestibility are positively related.

IV. SUMMARY AND CONCLUSIONS

A test of susceptibility to the Muller-Lyer illusion was given to sixty patients at Mill Hill Emergency Hospital, half of whom were male, half female. The same patients were also given eight tests of suggestibility, a test of intelligence, two tests of perseveration, and two tests of personal tempo. In addition, a clinical diagnosis rated half the patients as (conversion) hysterics, and the other half as free from hysterical symptoms. Correlations were given showing the relationships obtaining between susceptibility to the illusion and the other variables. It appeared that susceptibility to the Muller-Lyer illusion:

(1) Is unrelated to primary suggestibility.

(2) Is unrelated to secondary suggestibility.

(3) Is unrelated to hysteria.

(4) Is related positively to perseveration.

(5) Appears to be related positively to intelligence, although the correlation is not significant.

(6) Appears to be related negatively to personal tempo, although the correlation is not significant.

(7) Remains rather stable from trial to trial.

(8) Depends to some extent on the exact method of measurement adopted.

(9) Shows the influence of training, even in the absence of instruction.

(10) Appears to increase in variability with successive trials.

REFERENCES

(1) GILBERT, J. A. (1894). "Researches on the mental and physical development of school children." *Stud. Yale Psychol. Lab.* II, 40–100.
(2) SEASHORE, C. E. (1895). "Measurements of illusions and hallucinations in normal life." *Stud. Yale Psychol. Lab.* II, 1–67.
(3) BROWN, W. (1916). "Individual and sex differences in suggestibility." *Univ. Calif. Publ. Psychol.* II, 291–430.
(4) HOLLINGWORTH, H. L. (1931). "Diurnal variations in suggestibility." *J. Appl. Psychol.* XV, 431–5.
(5) EYSENCK, H. J. (1939). "The validity of judgments as a function of the number of judges." *J. Exp. Psychol.* XXV, 650–4.
(6) EYSENCK, H. J. (1941). "The validity and reliability of group judgments." *J. Exp. Psychol.* XXIX, 427–34.
(7) HEYMANS, G. (1896). "Quantitative Untersuchungen über das 'optische Paradoxon'." *Z. Psychol.* IX, 221–55.
(8) JUDD, C. H. (1902). "Practice and its effects on the perception of illusions." *Psychol. Rev.* IX, 27–39.
(9) EYSENCK, H. J. (1943). "Suggestibility and hysteria." *J. Neurol. Psychiat.* (in the Press).

(*Manuscript received* 2 *February* 1943)