

## CONSISTENT MISSING: A TYPE OF INFORMATION-PROCESSING ERROR IN ESP

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**ABSTRACT:** Consistent missing (CM), defined as the tendency of the subject in an ESP test to mistake particular symbols for certain other symbols, has been discussed as a type of information-processing error in ESP and also as a possible source of psi-missing. The present paper surveys the relevant literature and summarizes (1) the extent of occurrence of CM, (2) the relationship between scoring rate and CM, and (3) the available evidence concerning the factors that lead to CM.

Six of the 11 subjects for whom CM analyses have been carried out showed significant CM effects in all or parts of their data. The presence of CM was not consistently related to the direct-hit scoring rate; and in the two sets of psi-missing data that are available, CM did not appear to be the dominant factor in the production of the negative scoring. The factors that apparently sometimes lead to CM confusions include the similarities of meaning and associations between targets as well as the visual resemblances.

Further work should pay particular attention to the subjects' reports about the nature of their ESP impressions in order to investigate the extent to which CM is determined by the specific mechanisms used to mediate ESP information into consciousness.

One of the most useful methods for gaining insight into the internal mechanisms of a process is to investigate the nature of the errors that take place. Inaccuracies and seeming misdirection of psi information take such forms as psi-missing and displacement, as well as the various psychological transformations and substitutions reported in free response experiments and spontaneous case experiences. As part of a larger project of reviewing the information-processing aspects of ESP, the present paper surveys the literature on another type of apparently systematic ESP error, the so-called consistent missing (CM) effect.

Cadoret and Pratt (1950) coined the term *consistent missing* to refer to a "tendency of the subject in an ESP test to mistake a given symbol for a certain other symbol to a greater-than-chance degree when making his calls" (p. 244). CM was viewed as a possible "misdirection" of ESP in which, presumably, ESP information was being

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utilized, but not in a way that the usual analyses of hits would identify. Cadoret and Pratt looked for and found CM effects in the data of subjects who scored significantly above chance.

In a review of psi-missing, J. B. Rhine (1952) mentioned that CM could, in fact, be a mechanism that would yield overall psi-missing and Nash (1955) also suggested this possibility. CM could decrease or cancel positive scores and perhaps even swing the scoring rate into missing. This is one of the very few specific mechanisms that have been proposed to explain psi-missing and it belongs to a category of hypotheses that conceptualize psi-missing as a diversion of positive ESP on a trial-by-trial basis. All such hypotheses must consider the large number of trials that have to be known by ESP in order to produce a significant negative deviation. It has been pointed out several times (e.g., Thouless, 1935, 1972; A. A. Foster, 1940) that if ESP is assumed to work through a process of misdirecting positive ESP, then, for  $P = 1/5$ , four times more trials must be known in order to produce a given negative deviation as to produce a positive deviation of the same magnitude.<sup>1</sup> This general topic leads to questions about partial information in ESP and the role of the probability of a hit on each trial. A more general review and discussion of these topics will be deferred to a later time.

The purpose of the present paper is to survey the relevant literature and summarize (1) the extent to which CM occurs, (2) the relationship between scoring rate and CM, and (3) the existing evidence about the factors that lead to CM.

As general background, the question of the extent to which ESP errors in general and psi-missing in particular are due to motivational factors versus unmotivated "cognitive errors" should be kept in mind. While it is admittedly difficult to distinguish between the two hypotheses, previous reviews of psi-missing (Rhine, 1952, 1969; Rao, 1965, 1966) have noted that although motivational factors may sometimes have entered into the production of psi-missing, there have been many cases, particularly those involving position and differential effects, in which motivational factors did not seem plausible. This led J. B. Rhine (1969) to the position of being "much inclined to think that we are dealing in psi-missing with a *general universal tendency to judgmental error*. ..." (p. 34). The hypothesis that CM

<sup>1</sup> The ratio of the number of targets that must be identified for a given negative versus positive deviation is  $(1-P)/P$ , where  $P$  is the probability of getting a hit.

is a causative factor in psi-missing could be in line with such a position.

Several methodological factors should be discussed before presenting the experimental results. The usual method of testing for *any* association between targets and calls is to construct a contingency table of targets versus calls ( $N$  calls  $\times$   $N$  targets). The diagonal cells give direct hits and CM effects are represented in the off-diagonal cells. The standard chi-square test on such a table includes both CM and direct-hit effects, while the CM hypotheses should consider associations only in the misses, i.e., in the off-diagonal cells. Cadoret and Pratt (1950), with the help of Greville, devised a chi-square method of testing for associations only in the off-diagonal cells and this has become the basic statistical method of analyzing for the presence of CM.

One limitation in investigating CM is that we can identify only CM effects that are reasonably stable within the body of data being analyzed. If the specific associations or confusions change, the effects may cancel out and then be difficult or impossible to identify. Therefore, the pooling of the data collected under different conditions or from different subjects, must be done carefully, and it may be best to use data collected over a relatively short period of time.

Cadoret and Pratt also noted that displacement effects combined with certain response habits could lead to artificial CM results.<sup>2</sup> Unless otherwise noted, in accordance with their early recommendation, all reported analyses of CM have used data that were specifically found to be free of displacement effects.

Another factor that should be kept in mind is that the sensitivity of the overall CM analyses to specific exchanges or confusions may decrease as the number of possible targets increases. The relative amount of noise could increase because a larger proportion of the cells in the target-response matrix may not contain ESP effects.

Table 1 presents the overall scoring rates, the results for the CM analyses, and the type of experiment for studies in which the CM analysis was reported or could be found. For ease of identification, the experiments are referred to in the text in terms of the various

<sup>2</sup> They say, "Suppose, for example, that a subject shows a highly significant tendency to call star when this is the target one step ahead, and that he also has the tendency to call cross after star. In a tabulation of his data for consistent missing this subject would seem to associate the call, cross, with the target, star" (Cadoret & Pratt, 1950, pp. 251-252).

subjects' initials, as given in the second column of the table. Each horizontal line in the table is also numbered for easy reference. Various divisions of the data are presented in the body of the table.

#### I. EXTENT OF OCCURRENCE OF CM

The results of the CM analysis were available for 11 individual subjects. The data of D. L. (line 3 of the table) were excluded because of inadequate test conditions. Five of these subjects (G., E. F., K. G., S. W., and B. D.) had experimental results with significant overall CM effects, and another subject, M. W., showed significant CM effects when the data were divided according to direct hits scoring rate. Thus, about half of the subjects showed significant CM effects in all or parts of their data. Only two subjects, B. D. and L. H., were tested specifically with the CM analysis in mind at the time of data collection. (B. D. showed CM effects; L. H. did not.) The rest of the subjects were tested for other purposes and the CM analyses were carried out later—often by different researchers. While the studies that have been subjected to CM analyses may have been selected according to direct hits scoring, the literature gives little indication of selective reporting on the basis of the outcome of the CM analysis. The only criterion for the inclusion of experimental results in Table 1 was that the CM analysis had been reported or else the target-response matrix of data without displacement effects was available for analysis.

Two experiments that pooled the data of several subjects are also included in the table. The CM analysis for one, a clock card experiment by Fisk and West (1957), gave significant results (line 10 in the table). However, these results must be taken with caution since the procedure involved multiple calling of the same targets. Clock cards, originally developed by Fisk and Mitchell (1953), belong to a category of methods designed specifically to consider near misses or the degree of error in ESP calls that are not correct. (For a brief survey of these methods, see Burdick and Kelly, 1977.) While the general concept of near misses can be viewed as a form of CM, the CM analysis that evaluates incorrect calls in isolation from direct hits has not been applied to most of these data.

The other experiment with several subjects (line 11) was carried out by Nash and Nash (1961) and used a somewhat related strategy. Special target cards were constructed with controlled degrees of similarity in an attempt to investigate specific confusions between targets. Unfortunately, the evidence for direct hits in the experiment

Table 1  
SUMMARY OF CONSISTENT-MISSING (CM) RESULTS

Data Group	Subj.	Targets	Type of Experiment and Conditions		P	% Ex-pected	No. of Trials	% of Hits	CR Hits	p (CM Analysis) <sup>a</sup>	Original Experimental Report (CM Analysis Report)	
1a	V. D.	Location of square in 6 x 8 matrix	GESP	Columns	1/8	12.50	587	35.60	16.86	.2	Brugmans (1922)/Murphy (1961) (Schouten & Kelly, 1978)	
1b			GESP	Rows	1/6	16.67	587	29.64	8.38	.4		
2	M. H.	ESP cards	Clair., different rooms	Total	1/5	20.00	250	57.20	6.72	.2	Warner (1937) (Previously unreported)	
3	D. L.	Color cards	Clair., unscreened	Series 2 <sup>b</sup>	1/5	20.00	3,500	28.49	12.53	10 <sup>-10</sup>	Carpenter & Phalen (1937) (Cadoret & Pratt, 1950)	
4a	G.	ESP cards	Clair., unscreened	Series 1 <sup>c</sup>	1/5	20.00	1,500	30.00	9.65	.004	Carpenter & Phalen (1937) (Cadoret & Pratt, 1950)	
4b	G.	Color cards	DT, unscreened	Series 5 <sup>d</sup>	1/5	20.00	2,500	24.48	5.57	.6		
4c	G.	ESP cards	DT, unscreened	Series 6 <sup>e</sup>	1/5	20.00	2,500	24.20	5.22	.1		
4d	G.	ESP cards	DT, screened	Series 7	1/5	20.00	2,500	24.00	4.97	.02		
5a	P.	ESP cards	Distance clair.	Total	1/5	20.00	1,850	30.16	10.90	.3	Rhine & Pratt (1954) (Cadoret & Pratt, 1950) (High and low previously unreported)	
5b	P.	ESP cards	Distance clair.	Runs of 9 or more hits	1/5	20.00	900	42.89	17.12	.3		
5c	P.	ESP cards	Distance clair.	Runs of 5 or less hits	1/5	20.00	950	18.10	-1.42	.6		
6	S.	ESP cards	Distance GESP	Total	1/5	20.00	1,850	72.92	56.87	.1	Riess (1939) (Cadoret & Pratt, 1950)	
7a	E. F.	ESP cards	DT, screened	Total	1/5	20.00	2,625	21.03	1.29	.03	Cadoret & Pratt (1950) (Cadoret & Pratt, 1950)	
7b	E. F.	ESP cards	DT, screened	Runs of 6 or more hits	1/5	20.00	.....	.....	.....	.005		
7c	E. F.	ESP cards	DT, screened	Runs of 5 or less hits	1/5	20.00	.....	.....	.....	.7		
8	K. G.	ESP cards with erotic pictures	GESP <sup>f</sup>	Total	1/5	20.00	240	28.75	3.31	.001	Fisk & West (1955) (Cadoret, 1957)	
9	S. W.	ESP cards	Precognition	Total	1/5	20.00	2,000	22.60	2.87	<.005	Nielsen (1956) (Previously unreported)	
10	14S's	Clock cards	Clair. Multiple calling via mail	Total	1/12	8.33	3,696	.....	n.s.	.002 <sup>g</sup>	Fisk & West (1957) (Previously unreported)	
11	38S's	Special cards with controlled degrees of similarity	Clairvoyance	Total	1/8	12.50	9,120	13.09	1.69	.8 <sup>h</sup>	Nash & Nash (1961) (Previously unreported)	
12a	M. W.	ESP cards	Precognition <sup>i</sup>	Total	1/5	20.00	1,500	15.40	-4.42	n.s.	Timm (1969) (Timm, 1969)	
12b	M. W.	ESP cards	Precognition	High-scoring runs <sup>j</sup>	1/5	20.00	875	19.77	-.13	.6		
12c	M. W.	ESP cards	Precognition	Low-scoring runs	1/5	20.00	625	9.28	-6.65	<.01		
13a	B. D.	Playing cards	Single-card clair. Number	(I. C. = exper'er) Total	1/13	7.69	3,848	.....	n.s.	n.s.	Kelly et al. (1975) (Kelly et al. 1975)	
13b	B. D.	Playing cards	Suit	Total	1/4	25.00	3,848	.....	2.55	n.s.		
13c	B. D.	Playing cards	Suit	High-Scor. runs	1/4	25.00	.....	.....	.....	n.s.		
14a	B. D.	Playing cards	Single-card clair. Number	(H. K. = exper'er) Total	1/13	7.69	2,392	14.92	13.24	.2	Kelly et al. (1975) (Divisions as reported here previously unpublished)	
14b	B. D.	Playing cards	Number	Runs of 8 or more hits	1/13	7.69	1,196	20.57	16.66	.05		
14c	B. D.	Playing cards	Number	Runs of 7 or less hits	1/13	7.69	1,196	9.28	2.01	.4		
14d	B. D.	Playing cards	Suit	Total	1/4	25.00	2,392	20.00	1.11	<.0005	Kelly et al. (1975) (Divisions as reported here previously unpublished)	
14e	B. D.	Playing cards	Suit: Runs 14-46	Hits on number	1/4	25.00	285	42.46	6.74	<.0005		
14f	B. D.	Playing cards	Suit: Runs 14-46	Misses on number	1/4	25.00	1,431	25.16	-.11	<.0005		
14g	B. D.	Playing cards	Suit: Runs 1-13	Total	1/4	25.00	676	20.86	-2.44	.07		
14h	B. D.	Playing cards	Suit: Runs 1-13	Runs of 11 or more hits	1/4	25.00	312	25.00	0.00	.02		
14i	B. D.	Playing cards	Suit: Runs 1-13	Runs of 10 or less hits	1/4	25.00	364	17.31	-3.33	.2		
15a	B. D.	Playing cards	Shuffle method <sup>k</sup> Number	Total	1/13	7.69	2,860	13.92	12.46	n.s.		Kanthamani & Kelly (1975) (Kanthamani & Kelly, 1975)
15b	B. D.	Playing cards	Number	High-scor. runs	1/13	7.69	.....	.....	.....	n.s.		
15c	B. D.	Playing cards	Number	Low-scor. runs	1/13	.....	.....	.....	.....	n.s.		
15d	B. D.	Playing cards	Suit	Total	1/4	25.00	2,860	31.15	7.58	n.s.		
15e	B. D.	Playing cards	Suit	High-scoring runs	1/4	25.00	.....	.....	.....	n.s.		
15f	B. D.	Playing cards	Suit	Low-scoring runs	1/4	25.00	.....	.....	.....	n.s.		
16a	B. D.	Slides of playing cards	Visual perception Number	Total	1/13	7.69	3,900	72.43	151.7	<<10 <sup>-12</sup>	Kelly et al. (1975) (Kelly et al., 1975)	
16b	B. D.	Slides of playing cards	Suit	Total	1/4	25.00	3,900	78.51	77.16	<10 <sup>-13</sup>		
17a	L. H.	ESP cards	DT (J. K. = exper'er)	Total	1/5	20.00	11,125	23.08	8.12	.95 <sup>l</sup>	Subset of data, Morris (1971) (Kelly, personal communication)	
17b	L. H.	ESP cards	DT (J. K. = exper'er)	High-scoring runs	1/5	20.00	800	49.25	20.64	.5		
18a	L. H.	ESP cards	DT (E. K. = exper'er)	Total	1/5	20.00	6,350	20.09	1.96	.4	Kelly, Child, & Kanthamani (1974) and Kelly, personal communication (Kelly, personal communication)	
18b	L. H.	ESP cards	DT (E. K. = exper'er)	High-scoring runs	1/5	20.00	1,700	28.59	8.82	.4		
18c	L. H.	ESP cards	DT (E. K. = exper'er)	Low-scoring runs	1/5	20.00	1,700	13.94	-6.28	.4		
19a	L. H.	Digits on cards	DT (I. C. = exper'er)	Total	1/10	10.00	6,750	10.09	.90	.2	Kelly, Child, & Kanthamani (1974) and Kelly, personal communication (Kelly, personal communication)	
19b	L. H.	Digits on cards	DT (E. K. = exper'er)	Total	1/10	10.00	5,550	10.47	1.19	.4		
19c	L. H.	Digits on cards	Shuffle method	Total (E. K. = exper'er)	1/10	10.00	6,150	10.63	1.64	.11		
20a	L. H.	Slides of digits	Visual perception	Total	1/10	10.00	2,500	56.16	76.90	<10 <sup>-12</sup>	Kelly, Child, & Kanthamani (1974) and Kelly, personal communication (Kelly, personal communication)	
20b	L. H.	Slides of ESP cards	Visual perception	Total	1/5	20.00	1,250	53.68	29.73	.005		

<sup>a</sup> Some of the CM analyses were carried out on closed deck data. Burdick and Kelly (1977) note that both the open deck and closed deck results "will be asymptotically equivalent with increasing N..." (p. 100).

<sup>b</sup> Cadoret and Pratt (1950) noted that the conditions for this series did not completely preclude the possibility of sensory cues. The results are presented for the sake of completeness.

<sup>c</sup> The cross and circle cards were covered by male and female erotic pictures in line with the subject's associations. It is of interest to note that the significance of the hits is due entirely to calls of the erotic symbols. When erotic symbols were called, the scoring rate was 39/106 (36.79%, CR = 4.20); when neutral symbols were called, 30/134 (22.39%, CR = .58).

<sup>d</sup> This p value can be considered as only suggestive since the multiple calling violates the assumptions of independence underlying the chi-squared test.

<sup>e</sup> The analysis of displacement effects for these data was not available.

<sup>f</sup> Unfortunately the experimental conditions were not described other than mentioning that these were self-tests by a laboratory assistant. The precautions taken against recording and counting errors would seem to be particularly crucial since overlooking hits is a frequent result of such errors.

<sup>g</sup> High-scoring runs were defined by Timm (1969) as runs with five or more hits and runs with more than one hit on any symbol. Low-scoring runs were runs with four or less hits and no symbol with more than one hit.

<sup>h</sup> Kanthamani and Kelly (1975) note that in some of the shuffle series, the possibility of sensory cues was not completely eliminated.

<sup>i</sup> The -1 displacement score gave CR = 2.53. However, the CM effects were not significant.

while the low-scoring runs and/or the total may not show CM effects. This trend appears in the data for E. F. and B. D.'s single-card clairvoyance number attribute. However, the division of P.'s data into high- and low-scoring runs failed to show any indication of CM, and this was also true for L. H. (line 17b) and for B. D.'s shuffle data (lines 15b, 15e).

There are also cases with a nonsignificant number of hits overall but with significant CM effects: E. F. (line 7a) and B. D.'s SCC suit data (line 14d). The division of the data for E. F. into high- and low-scoring runs indicates that the CM effects were isolated in the high-scoring runs. On the other hand, the chance-scoring sections of suit data for B. D. (lines 14f, 14h) clearly show significant CM effects, as do the high-scoring data (line 14e). The series of B. D. with I. C. as experimenter (line 13a) and of L. H. (lines 18a-19c) are instances in which subjects of known ESP ability scored at chance without any evidence of CM, even when only the high-scoring runs were considered for L. H.

The results with overall psi-missing may provide insight into the role of CM in the production of psi-missing. Timm (1969) noted the opposing nature of positive ESP and CM and wanted to investigate "to what extent the mix-up [CM] effect accounts for psi-missing" (p. 114). A laboratory assistant had produced periods of relatively stable psi-missing in self tests and some of these data were investigated for CM. As shown in Table 1, CM effects were observed for subject M. W. (lines 12a-12c) only in the below-chance runs, suggesting a relationship between CM and the overall psi-missing. However, if a constant mixing-up or switching of calls is assumed, then CM can compellingly account for only about 22% of the overall negative deviation of hits.<sup>3</sup> Timm pointed out that the actual CM effect could be stronger since (a) a changing pattern of mixing up symbols would not be considered in this analysis, and (b) regression

<sup>3</sup> Timm estimated the magnitude of the CM effect by assuming that on those trials with ESP one particular symbol was called when another specific symbol was the target. Thus, he found which symbol was most frequently the target when each of the five symbols was called and then took the sum across symbols as a measure of the true scoring rate. With this transformation, there is a positive deviation of 60. As noted above, this can account for a negative deviation only one-fourth as large (i.e., - 15). The actual observed deviation was -67, so a consistent mixing-up of symbols can account for about  $15/67 = 22\%$  of the observed deviation. This method provides only a rough approximation since it may not consider some CM effects, and alternatively the selection procedure may play upon random fluctuations to make other confusions appear stronger than is actually the case.

towards the mean may have entered as the data were specifically selected for psi-missing but not for CM. He concluded that "for a particular person and for a particular experiment [CM] plays a considerable role in bringing about psi-missing. . . . This holds especially true if one assumes a fluctuation of the mix-up effect in time" (p. 122).

When the low-scoring suit data for B. D. (line 14g) are divided into missing (line 14i) and chance runs (line 14h), the CM effect is found only in the chance runs—exactly the opposite outcome from what Timm found. Apparently CM was canceling some positive scoring but the actual missing resulted from either a different mechanism or a more fluctuating CM effect.

Looking at the evidence as a whole, there does not seem to be a consistent pattern between ESP scores and the presence of CM. Apparently CM may or may not occur whether the scoring rate is positive, negative, or at chance.

### III. FACTORS THAT LEAD TO CM

The experiments with B. D. provide some insight into the nature of CM, at least for one subject, since an experiment was carried out specifically to compare the CM or confusion structure of ESP with confusions arising in a condition of visual perception (Kelly, Kantha-mani, Child, & Young, 1975). A strong CM effect appeared in the visual data (see lines 16a, 16b, Table 1). The comparison of the ESP with visual confusions is summarized in Table 2. The findings reported in this table are essentially equivalent to those reported by Kelly et al. (1975) although different divisions of the data and some new analyses are reported here in order to more clearly isolate data with different levels of ESP scoring. Two methods of comparing the visual confusion matrices with the ESP matrices are reported in Table 2. In one of these, a method originally suggested by Timm (1969) and applied by Kelly et al. (1975), an approximate *CR* is obtained for the ESP matrix using only the cells that showed the largest confusions in the visual matrix. One target cell is selected for each possible call; thus the bulk of the data are not used in this analysis. The second method reported here consists of a Spearman rank order correlation using as data points the off-diagonal cells of the visual matrix and the corresponding cells of the ESP matrix. The magnitude of the number representing each cell is the contribution by that cell to the CM chi-square, and the number is set as positive or negative depending on

**Table 2**  
**A COMPARISON OF VISUAL AND ESP CONFUSION MATRICES FOR B.D.**

Data Group	Condition	No. of Trials	CR for Direct Hits	<i>p</i> (CM Analysis)	Timm's CR from Vision	Spearman Correlation of Cells <sup>a</sup> ( <i>r<sub>s</sub></i> )
1	Number: total	2,392	13.24	.2	2.72	.25
2	Number: runs of 8 or more hits	1,196	16.66	.05	3.74	.28
3	Number: runs of 7 or less hits	1,196	2.01	.4	.22	.05
4	Suit: total	2,392	1.11	.0005	1.50	-.08
5	Suit: runs 14-16, trials with hits on numbers	285	6.74	.0005	4.24	.78
6	Suit: runs 14-16, trials with misses on numbers	1,431	.11	.0005	1.53	-.05
7	Suit: runs 1-13, total	676	-2.44	.07	-1.82	-.64
8	Suit: runs 1-13, runs with 11 or more hits	312	0.00	.02	-2.86	-.90
9	Suit: runs 1-13, runs with 10 or less hits	364	-3.33	.2	.05	.04

<sup>a</sup> There are 156 off-diagonal cells for the number attribute and 12 for suit.

whether the observed value for the cell was greater than or less than the expected value. Since the successive cells are not independent, these correlations must be considered primarily as descriptive statistics and *p* values have not been reported.

For the number attribute, both Timm's *CR* method and the correlation clearly indicate that the CM in the high-scoring ESP runs (Item 2 in the table) have confusions that are similar to visual confusions. The situation for suit is similar; the CM in the high-scoring data (Item 5) exhibits a structure similar to vision but the CM in the chance data (Item 6) does not show such similarity.

Particularly intriguing results appear in the psi-missing suit data. The lowest scoring runs (Item 9), as noted above, do not show CM, and thus the confusion matrix is not similar to the visual matrix. The confusions in the chance-scoring runs in this section (Item 8), however, show a strong negative relation to the visual confusions, i.e., the particular confusions that were overcalled in the visual task were undercalled in the ESP task and vice versa. The visual confusions tended to be between symbols of the same color while the ESP confu-

sions here tended to switch colors.

These results indicate that for the B. D. suit data the nature of the CM effects was different for data with different scoring rates. In the positive-scoring data (Item 5), CM effects occurred that were similar to those in the visual condition, while the chance runs of the first 13 runs (Item 8) contained CM effects that tended to be exactly the opposite of those found in the visual data. The chance-scoring data in the later runs (Item 6) showed CM effects that were unrelated to confusions in the visual condition. The strong missing data (Item 9) did not exhibit CM. Apparently B. D. was manifesting at least three different types of CM in the SCC suit data.

Kelly et al. (1975) note that there are two main alternative hypotheses to account for the similarity of confusions in B.D.'s vision and high-scoring ESP data. This finding could indicate "an intrinsic, general connection between the mechanisms of ESP and the mechanisms of vision" or alternatively, it could only reflect "some of the internal workings of ESP function in this particular subject" (p. 26). Since there is much empirical evidence contrary to the first hypothesis, the authors favor the latter. More specifically, they offer a plausible interpretation of the observed CM effects in terms of B. D.'s self-reported use of imagery as a mediating vehicle for ESP. Kelly et al. (1975) remark:

We assume that ESP information is acquired by unknown means at some nonconscious level of the organism. It has no specialized avenue to consciousness or behavior, but instead must appropriate the activity of other systems to construct what Tyrrell calls "mediating vehicles."

The present experiment appears to have succeeded in laying bare some of this internal activity in one exceptionally strong performer, effectively corroborating a principal feature of his introspective report. Specifically, the results are consistent with the hypothesis that on a significant fraction of occasions on which B. D. obtains ESP information, he encodes it in the form of visual imagery. On most such occasions the imagery is pale, indistinct, and fleeting, so that visual-like errors arise at a secondary stage when he attempts to identify it (p. 27).

The hypothesized role of visual-like confusions in imagery for B. D.'s SCC results is supported by the fact that on the psychic shuffle task in which he did not use images, CM effects were not found.

Proposed interpretations for the apparently different CM effects in B. D.'s low-scoring SCC suit data must be made more tentatively. Kelly et al. note that it may be relevant that B. D. reported that high ESP scores were associated with "better" imagery and that the presence of color was a crucial aspect of good imagery. Thus, the different pattern of CM in the low-scoring data could possibly be due to confu-

sions among the suit figures in the absence of color. It is, of course, also quite possible that the CM effects in the low-scoring data reflect some differences at a pre-imagery stage.

Kelly, Child, and Kanthamani (1974) also collected some visual confusions data for L. H. (see Table 1, lines 20a, 20b). As expected, strong CM effects were found in the visual data. However, no clear-cut evidence of either CM or ESP was found in data collected specifically for the purpose of comparing L. H.'s visual and ESP confusions. Since the absence of CM might simply have reflected an absence of ESP, further analyses were carried out using significant ESP data previously collected by Morris (1971). Unfortunately, no trace of CM effects was found, even after isolating the high-scoring runs.

On the assumption that visual confusions might be stable across subjects, this reviewer compared the visual data for L. H. with the ESP data for subjects S. W. and E. F. Neither the approximate *CR* nor the correlation revealed any similarity.

The work with B. D. suggests that the presence of CM in positive scoring data may, at least sometimes, be related to the use of visual imagery. Unfortunately, the use or disuse of imagery has not been reported for the other subjects.

There is also some evidence that more than visual-like confusions can be involved in the production of CM. In a very interesting study by Fisk and West (1955), the subject, K. G., reported two of the cards had symbolic sexual associations for him. Fisk then carried out a clairvoyance task in which the two cards were covered by appropriate erotic pictures. In an analysis of CM in these data, Cadoret (1957) noted that the neutral symbols tended to be confused with other neutral symbols and one particular erotic symbol tended to be called when the other was the target. Cadoret commented that most testing symbols have been selected specifically to be dissimilar and to excite few if any associations, and CM may be more likely when the subject categorizes targets (e.g., neutral versus sexual) and then responds more to the category of the target than to the specific symbol. Thus, he pointed out, the meaningfulness and associations of the targets may be important factors in some situations.

In experiments on the relationship between memory and ESP, Rao and associates have investigated the effect of association between the targets for incorrect calls. The targets in these experiments were words, and each subject cross-ranked all the words according to degree of similarity of association. The experimenters hypothesized that those subjects who had positive ESP scores overall would have incor-

rect responses that were more closely associated (i.e., ranked) with the correct target than subjects who had low ESP scores overall. An exploratory study (Rao, Morrison, & Davis, 1977) found significant ( $p < .02$ , two-tailed) evidence for this hypothesis while three replication and extension studies (Rao, Morrison, & Davis, 1977; Rao, Morrison, Davis, & Freeman, 1977; Rao, 1978) had results that were in the expected direction, but not significantly so.

#### DISCUSSION

The apparent lack of a consistent relationship between scoring rate and the presence of CM plus the evidence from B. D.'s data that one subject can show several types of CM effects indicate that this is a complex topic which may be difficult to investigate. The processes that lead to CM apparently vary with different tasks and with different subjects. The fact that CM has been found so frequently in the data which have been examined for it indicates that CM may often be an important characteristic of the ESP process and that it should receive more attention.

Because of the incidence of CM, Burdick and Kelly (1977) have recommended that the overall chi-square test for *any* associations between targets and calls be used when reporting forced-choice data— particularly for studies with special subjects. This method considers both direct hits and CM effects. In light of the fact that significant CM has been found in data with nonsignificant scoring overall, it is quite possible that ESP effects have been overlooked when analyses which only evaluated direct hits were employed. At the same time, it should be kept in mind that the overall target-response chi-square test is a less sensitive test of direct hits than a method that considers only direct hits (i.e., the usual *CR*). This could be a noteworthy methodological factor because in many cases direct hits are the only association between targets and responses.

The role of CM in the production of overall psi-missing is a particularly interesting question since missing is known to occur when there is no apparent motivation to obtain low scores. CM is one of the very few proposed mechanisms for psi-missing that does not require some kind of implied negative motivation. Specifically, the subject could confuse symbols such that the systematic miscalling would lead to overall missing even though the sole intent was to get hits. If CM is a causative factor in psi-missing, we would expect to find evidence that CM can lower scores to chance and in some cases to below chance. Stronger CM effects would be expected as scoring rates become

lower. In Timm's data the CM effect occurred strongly only in the lowest scoring runs, and for B. D. there are instances of chance scoring that would presumably have been significantly positive if the confusions had not occurred. However, other results are not clearly in line with the expected pattern. The lowest scoring runs for B. D. did not show CM effects, while the chance and higher scoring runs did. Also, the finding of different types of CM in B. D.'s results suggests that CM effects in the lower scoring or chance data may be qualitatively rather than quantitatively different from the CM effects in the high-scoring data. Since B. D. is an unusual subject, particularly with regard to the amount and role of mental imagery, the generalization of his results must be done cautiously. Although the matter is far from conclusive, the best guess for the available data is that CM did not account entirely for psi-missing but may have contributed to the production of low scores.

It should also be kept in mind that CM could occur when there is motivation for low scores. Thus, CM could be a mechanism for the production of psi-missing. From a more general point of view, CM could result from a situation in which, given that the correct target is to be avoided because of motivational factors, the calls are systematically associated with particular alternative targets rather than uniformly distributed over all the other targets. Thus, the presence of CM in psi-missing data does not disqualify the possible role of motivation. Also, under these conditions, CM would not necessarily reflect any particular similarity or "confusion" between targets.

In situations with overall positive ESP scores, the evidence suggests that CM occurs because of similarities and resulting confusions between targets. The confusions apparently can stem from factors such as the visual similarity of the targets or from the more abstract relationships of associations between targets.

One of the first topics for further investigation should be the question of the extent to which the presence and nature of CM are due to the specific mechanisms by which ESP information is mediated into consciousness. This reviewer is becoming strongly of the opinion that, whenever possible, information should be acquired *and published* about the self-reported nature of the subjects' ESP impressions. The subjects' introspective reports do not stand on their own but should be verified and complemented by analyses of experimental data. The work by Kelly et al. (1975) with B. D. is an example of the insight that can be gained by such an approach. The data from almost any forced-choice ESP experiment can be applied to questions such as

these if the appropriate information is obtained. More specific investigations along these lines should monitor or control the targets, the subjects' reactions and associations to the targets, and the mode of mediation of the ESP information into consciousness.

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