

RESEARCH LETTER

PARAPSYCHOLOGY LABORATORY
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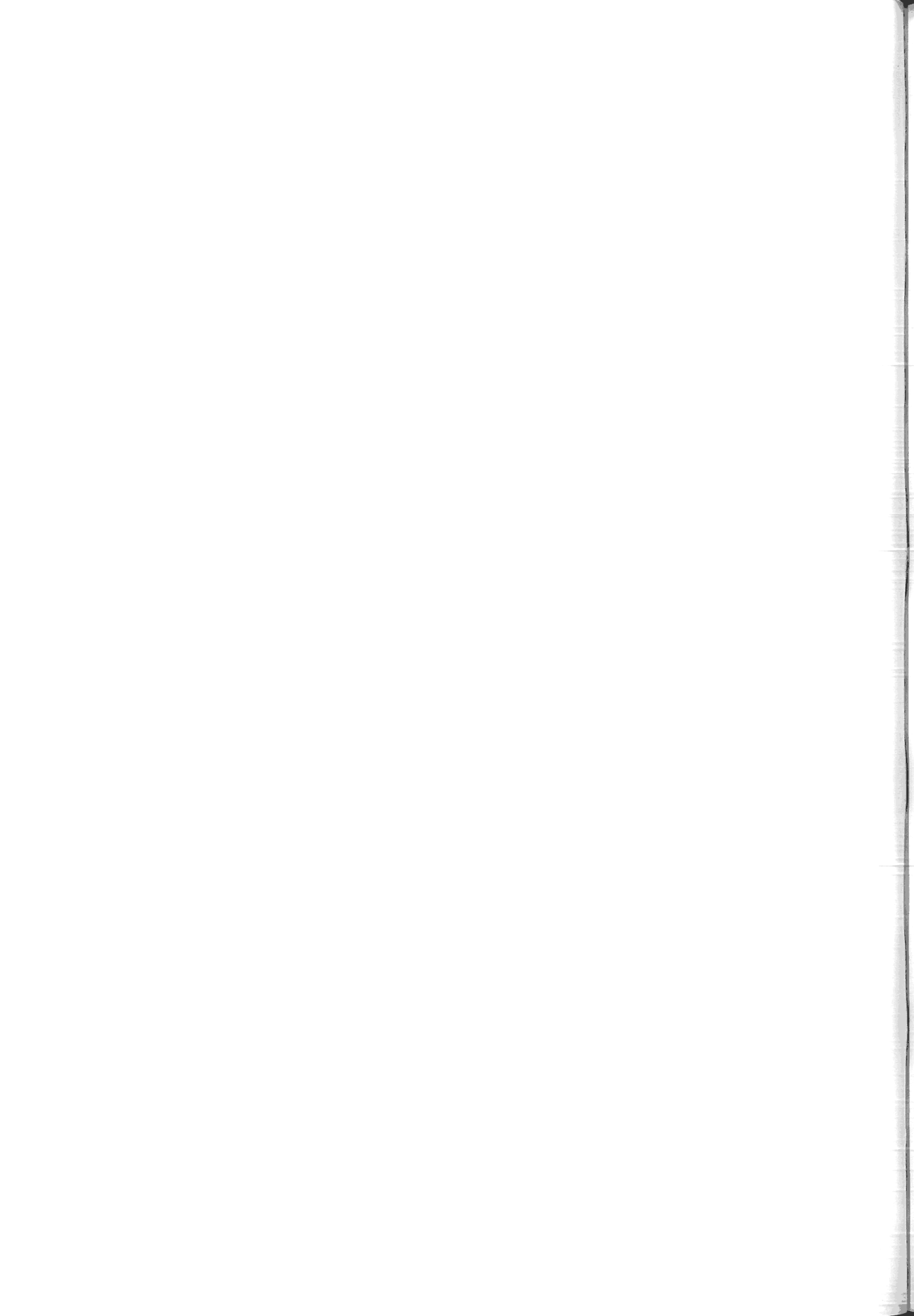
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PSI IN MICE: REPORT ON SEVERAL ANPSI EXPERIMENTS

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In the first anpsi experiment in which positive reinforcement was applied (Schouten, 1972), it showed that under the experimental conditions presented, the mice scored significantly above chance-level. This experiment was based on the work of Duval and Montredon (1968). The purpose of this study was not to replicate their experiment in every detail, but to try to replicate the main finding obtained by them: namely the possibility of mice being able to show psi ability. In my opinion this purpose was best served by applying a different design, because a confirmatory result while applying different conditions adds additional weight to the value of replication; it shows that the result can not be an artefact due to some unknown errors in the design of the first experiment. Besides this, I feel that a significant result in itself yields little information; it is the process responsible for the extra-chance scoring which is of interest.

The design differed in some important aspects from the experimental set-up of Duval and Montredon. Instead of negative reinforcement, positive reinforcement was applied, since I felt that this would reduce the amount of frustration in the animals and consequently would probably increase their scoring. Secondly, the animals were conditioned to associate the pressing of a lever and the earning of a reward - a drop of water - while in the Duval and Montredon experiment the mice received no training at all regarding the relation side of the cage and reinforcement. Thirdly, my design permitted investigation of a possible telepathic relation between the animals.

Moreover, since I felt that the method of evaluation applied by Duval and Montredon was not entirely convincing (see Schouten, 1972), I based the evaluation on empirical probabilities and on the performance of the individual mice. Assuming that the mice would show response preferences, which could be of a different strength and in a different direction for each mouse, and because the animals received feedback after each response, the results were evaluated for each mouse separately and based on both the

distribution of the targets, and on the distribution of the responses. A detailed description of the statistical evaluation of the experimental results is given in the above mentioned publication.

The apparatus and the design are also described in Schouten 1972. A dual choice task with positive reinforcement was applied. The animals were at first trained to respond to a light, showing either in the white or black painted section of the cage, by pressing the corresponding lever of the same color placed in the same section. A correct response was rewarded by giving the animal a drop of water. In the experimental sessions, two identical cages were used: the response cage containing the levers, the target cage containing the lights.

In the Telepathy Condition one mouse was placed in the target cage. In each trial a light indicated which one of the two sections of the cage was the target for that trial. In the response cage another mouse had to choose the target by pressing one of the two levers. In the case of a correct response both mice were rewarded with a drop of water. In the case of a wrong response no reward was given. In the Clairvoyance Condition the apparatus functioned as in the Telepathy Condition, but no mouse was placed in the target cage. Both cages were separated by at least two rooms. The whole sequence of events was automatically recorded on tape.

Two main results emerged from this first experiment. The significant deviations from chance expectation in the scoring suggested that psi had probably influenced the behavior of the mice, and consequently the experiment confirmed Duval and Montredon's result. Secondly, it was clear that the Telepathy and Clairvoyance Conditions yielded different scoring; a rather large negative correlation between the scores of the same mice in both conditions was found. However, this influence was only related to the performance of the individual mice. It did not result in systematically larger deviations in one of these conditions.

Based on this result a number of experiments were carried out which are reported in this paper. The main aim of these experiments was to investigate the role of some important variables and to obtain an estimation of the effectiveness of this research method.

It is probably true that hitherto most of the parapsychological investigations have yielded merely chance results. This may explain why research in parapsychology is mainly directed at finding the relevant variables with which to create a test situation which enhances psi. Due to our ignorance regarding the influence of most variables on ESP and due also to the fact that our methods of measuring the variables themselves (especially those related to the mental process of the subject) are rather

scanty, it seems at present unrealistic to expect an absolute repeatability in the sense, that in every experiment of the same type the same results will show up. Thus, even in the case of one knowing that a variable exerts influence on the psi ability, one can not say that the effect of the variable will be manifested in the results of the next experiment. There is only a certain likelihood that the effect of the variable will be apparent. Hence it can be argued that the influence of a variable, or the effectiveness of a certain research method, can probably be better judged when based on the ratio of significant and non-significant experiments showing the effect of the variable, than when based on the size of the deviation or the rate of scoring in one experiment. By rate of repeatability this ratio of significant and non-significant is meant. Since no further specifications are made related, for instance, to degree of standardization, length of experiments, etc., this concept of rate of repeatability is rather a vague one. Although therefore the rate of repeatability gives only a rough impression of the effectiveness of a certain research method, knowledge of the rate of repeatability may still be an important factor in connection with research policy decisions. This is especially relevant to animal research, since this type of research demands a relatively high investment of time and money.

In the following experiments I have decided to concentrate on the role of the target. As I have pointed out elsewhere (Schouten, 1974) the first aim of research is to establish the effect of various variables on the phenomenon under investigation. Only then can we arrive at the stage of constructing models and theories to describe the process underlying the phenomenon. The latter should be taken into consideration when selecting the type of variables which one plans to manipulate. If possible they should be chosen in such a way that, if the outcome of the experiment gives a clear indication of the effect of the variable, it becomes possible to draw conclusions regarding the acceptability of certain simple, mutually exclusive models.

Taking this into account I felt that more exact knowledge about the role of the target could provide some solutions to the following problems, the first being related to the concept of telepathy. Here a basic distinction between models is whether the 'sender' 'sends' information in any way whatsoever to the percipient, or whether the sender only has a directing effect on the percipient. With the latter I mean that the sender in some way draws the attention of the percipient to a specific source of information, very often related to his own situation, but that the sender has nothing to do with the transmission of the information itself. If this hypothesis is true, it would imply that in telepathy two basically different and independent processes are

involved.

A second problem which is of interest, is related to the concept of clairvoyance. We normally describe a situation in terms of sensorially perceivable attributes. Hence in experiments targets are always discriminated by way of differences in visual (or auditory) aspects, and consequently the percipient is forced to do the same. Now it is rather difficult to discriminate aurally between for instance Zener cards, and this we take for granted. However, suppose there exists another faculty like ESP. By the same token it is unreasonable to assume a priori that this faculty must be able to discriminate between aspects, which by nature are related to other faculties, in *casu* sensory mechanisms. Hence it might be possible that in every situation some ESP attributes exist inherently not detectable by sensory mechanisms, to which the ESP faculty reacts. Normally we present targets in ESP experiments which differ in sensorially perceivable attributes, but if the above stated hypothesis is correct, we ought to present targets which differ in ESP attributes. It seems to me that at present there is only one way to obtain support for the possible correctness of this hypothesis. Since we cannot detect these hypothetical psi attributes with sensory mechanisms, we can only infer their possible existence by showing that different sensory attributes do not effect the outcome of a psi experiment. To be specific, suppose we carry out a clairvoyance experiment in which a mouse has to press a white lever when the white target area in the target cage is illuminated. However, suppose that during the experiment we change the relation between color and reinforcement, e.g. the mouse is now rewarded when he presses the white lever while the black target area is illuminated. If, regardless of this change in relationship between target and response, the animal still continues to obtain very significant positive scores, it would suggest - assuming that other alternative explanations are excluded - that the sensorially perceivable attribute of the target, i.e. the color, is not relevant with regard to psi discrimination. Consequently, since the animal's behavior indicates a psi influence in both conditions, one is inclined to believe that other non-sensorially detectable attributes play a role. Without elaborating on these possibilities it can be stated that these considerations have influenced the selection of the type of experiments carried out and reported below.

I THE ROLE OF THE TARGET LIGHT

In this experiment the effect of indicating the target area by presenting a light stimulus was investigated. In Duval and Montredon's experiment, as well as in several experiments with human subjects, the target was simply chosen by the RNG (random number generator). No training was carried out in order to condition the animal to a specific relationship between the choice of the RNG, side of the cage to be put under current, and their own response by selecting a specific side of the cage before the onset of the trial. However, in my experiment the animals were conditioned to the relationship between target light, response lever, and reinforcement. Hence the question was raised whether the presentation of the target light in the experiment was essential to the performance of the mice.

Besides the Telepathy and Clairvoyance Conditions, two conditions were applied. In the TL Condition the target light functioned properly, for every trial a target light indicated in the target cage the section of the cage which was the target area. In the NTL Condition no target lights were applied, the target cage contained only a light indicating the start of the trial.

Seven of the mice, C57BL females (nrs. C1 - C7) of the batch used in the first experiment (Schouten 1972) were available for this experiment. Three new mice (C11, C12, C13) were included to bring the total to ten subjects. All the mice were trained until at least 80% correct responses were obtained in the last two training sessions. In both the Telepathy and Clairvoyance Condition each of the mice performed approximately 25 trials per day. The conditions were systematically randomized over the days involved. The time between the trials was fixed at 6 seconds.

Results and discussion

The analysis of the target sequence is presented in table I-1. The results of the individual mice are given for each condition in

TABLE I-1
Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	757	711	$P_W = .519$
	Black	692	659	$P_B = .481$
				$\chi^2 = .02 \quad df = 1$

TABLE I-2

Raw data and CR values for the TL Telepathy Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C1	15	16	18	25	.509	.56
C2	18	17	18	17	.500	0
C3	26	21	16	12	.515	-.14
C4	36	10	23	6	.565	-.09
C5	25	12	27	9	.503	-.63
C6	16	24	15	16	.492	-.69
C7	22	16	21	14	.503	-.16
C11	18	25	13	19	.487	.12
C12	16	19	21	19	.500	-.58
C13	14	19	22	20	.502	-.86

TABLE I-3

Raw data and CR values for the TL Clairvoyance Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C1	18	21	20	15	.501	-.93
C2	13	21	15	25	.510	.07
C3	16	26	13	19	.485	-.21
C4	23	12	28	10	.492	-.68
C5	21	20	19	15	.503	-.39
C6	27	10	18	19	.500	2.09
C7	19	8	16	6	.522	-.17
C11	18	20	16	21	.499	.37
C12	18	21	13	21	.495	.68
C13	29	11	19	14	.515	1.26

Note: Mouse C7 took only part in two sessions

TABLE I-4

Raw data and CR values for the NTL Telepathy Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C1	23	15	24	13	.502	-.38
C2	22	17	15	20	.500	1.16
C3	31	13	13	18	.515	2.41
C4	25	15	25	9	.514	-.93
C5	28	10	25	11	.506	.37
C6	13	21	28	12	.496	-2.72
C7	37	9	23	6	.568	.09
C11	19	20	16	20	.499	.37
C12 _v	20	21	25	9	.509	-2.13
C13	20	14	18	21	.498	1.08

TABLE I-5

Raw data and CR values for the NTL Clairvoyance Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C1	24	19	18	12	.513	-.35
C2	15	18	23	17	.498	-1.01
C3	25	17	18	14	.511	.28
C4	26	13	17	19	.503	1.69
C5	28	12	24	10	.516	-.05
C6	19	16	21	19	.498	.16
C7	27	15	17	15	.513	.95
C11	18	21	23	14	.501	-1.40
C12	13	22	18	22	.506	-.67
C13	13	13	23	26	.506	.23

TABLE I-6

Student t-values of the distributions of CR values

	Telepathy		Clairvoyance	
	TL	NTL	TL	NTL
M	-.25	-.07	.21	-.02
sd	.44	1.54	.92	.91
t	1.69	.13	.68	.06
df	9	9	9	9

tables I-2, I-3, I-4 and I-5. In table I-6 are given the results of the comparison between the distribution of the CR scores of the animals in the various conditions and the theoretical standard normal distribution by means of a Student t test.

The results of table I-1 show that no first order dependencies existed in the target sequence and hence, since the targets are produced by a sequential process one after the other, no higher order dependencies can exist either. Therefore the target sequence can be considered as being sufficiently random. No significant preference for either white or black was apparent.

None of the distributions of the CR scores in the four conditions seem to differ significantly from the expected distribution (see table I-6). A similar non-significant result was obtained when the distribution of all the scores was compared with the standard normal distribution ($t = .19$; $df = 39$). As in the previous experiment, the scores per mouse in the Telepathy and Clairvoyance Condition correlated negatively ($r = -.50$; $n = 10$) but not to a significant degree.

The scoring rate in the RBT trials, defined as those trials in which the mouse presses the other lever in trial n after a hit in trial $n-1$, showed to be non-significant ($n = 608$, $p = .498$, $d = -4.5$, $CR = -.37$).

Since the TL Telepathy and the TL Clairvoyance Condition were identical to the conditions run in the first experiment it can be concluded, that the results of the first experiment were not confirmed. Since none of the conditions showed a significant result, no conclusions can be drawn as regards the effect of the target light. Although the correlation between the Telepathy and Clairvoyance Condition again showed to be negative, no importance can be attached to this result, since the correlation did not reach

the required level of significance, and because no other indications of a possible psi influence were found. However, the results indicate once more that neither of these conditions tends to increase the scoring in respect to the other condition. Therefore it was decided, in view of the amount of work involved, to omit one of these conditions in the next experiments. In the following two experiments only the Telepathy Condition was applied.

II THE ROLE OF THE SPATIAL POSITION OF THE TARGET SECTION

In this experiment the same problem - what constitute the relevant aspects of the target - was approached in a different way. Normally the target and response cage are placed in the same spatial position. If the white section of the target cage faces in a northerly direction, for instance from the mouse's viewpoint to the left of the water feeding system, then the same will apply for the response cage. By reversing the spatial position of the target cage, it becomes possible to find out whether the spatial position is a relevant aspect of the target. The latter is a probable assumption, since the training is mainly directed at learning the relationship between the section of the cage in which the light shows and the lever situated in the same section of the cage.

Only the Telepathy Condition was applied. Each of the ten mice, again C1 - C7, C11, C12, and C13, performed approximately 75 trials with both cages in the normal (equal) spatial position, the NSP Condition, and about 75 trials with the target cage in a reversed spatial condition, the RSP Condition. All other aspects of the experiment were similar to those of the previous experiments.

Results and discussion

Table II-1 presents the data of the analysis of the target sequence.

TABLE II-1

Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	346	353	$P_W = .492$
	Black	352	361	$P_B = .508$
		$\chi^2 = 0$		$df = 1$

TABLE II-2

Raw data and CR values for the NSP Condition

Mouse	$T_{W^R W}$	$T_{W^R B}$	$T_{B^R W}$	$T_{B^R B}$	P_{hit}	CR
C1	22	23	19	10	.512	-1.37
C2	21	24	18	12	.504	-1.11
C3	13	15	26	19	.492	-.91
C4	27	16	25	4	.543	-1.92
C5	22	14	24	13	.498	-.33
C6	20	17	17	18	.500	.47
C7	19	11	22	18	.488	.69
C11	13	18	21	21	.505	-.68
C12 ^b	15	26	17	17	.493	-1.15
C13	23	18	16	18	.502	.79

TABLE II-3

Raw data and CR values for the RSP Condition

Mouse	$T_{W^R W}$	$T_{W^R B}$	$T_{B^R W}$	$T_{B^R B}$	P_{hit}	CR
C1	18	16	19	20	.499	.35
C2	14	20	16	22	.505	-.07
C3	18	17	18	21	.501	.47
C4	20	20	23	12	.505	-1.37
C5	22	14	21	14	.501	.09
C6	22	14	25	12	.498	-.54
C7	17	20	23	13	.500	-1.52
C11	17	18	23	17	.498	-.76
C12	13	27	16	18	.491	-1.23
C13	18	23	17	16	.497	-.65

The sequence is found to be sufficiently random and no significant preference is observable for either white or black. Table II-2 and II-3 present the data for the NSP and RSP Condition respectively. The distribution of the scores in the NSP Condition yields a non-significant t value ($t = 1.78$, $df = 9$), the distribution of the scores in the RSP Condition is found to be marginally significant ($t = 2.19$, $df = 9$, $p = .05$, two-tailed). The distribution of all scores is found to deviate nearly significant from the theoretical distribution ($t = 2.54$, $df = 19$, $p = .02$, two-tailed). The difference between the two distributions of both conditions is not significant ($t = .1$, $df = 18$). The distribution of hits and misses in the RBT trials yields a non-significant deviation ($n = 303$, $p = .5$, $d = -13.5$, $CR = -1.55$).

It is surprising and also difficult to explain that in this experiment the significant result of the distribution of all scores is based on negative deviations. If this result is interpreted as an indication for the operation of ψ , then it must be concluded, since there is no difference in scoring between the two conditions, that the spatial position of the target section is not a relevant aspect of the target. If this is true, and if this result can be applied to experiments with human subjects, then this conclusion is of consequence for the interpretation of the results of those experiments with human subjects, in which the ESP task consists of guessing positions. At least the results indicate that in itself position does not constitute a dominant aspect of the target.

III ROLE OF RESPONSE BIAS

In Duval and Montredon's experiment the significant result showed to be based on RBT's, trials in which the mouse jumped over to the other section of the cage after a trial in which it had not been shocked. The evaluation based on all the trials showed to be non-significant. As I have argued elsewhere (Schouten, 1972) I consider this RBT criterion as rather loose, amongst other things because it draws a conclusion about a type of behavior related to the mouse which is only based on behavior shown in two consecutive trials. It would seem more proper to show that the mouse's behavior deviated in a systematic way from randomness, based on the animal's behavior throughout the entire experiment.

Another method of manipulating response bias is by conditioning the animal to a specific type of response bias. The latter method ensures that the animal is indeed inclined to behave non-randomly. By applying this method it becomes possible to validate the correctness of Duval and Montredon's selection of their RBT criterion, by showing that a strong response bias tends to decrease ESP scoring. Therefore, and because the problem of the effect of

response bias on psi is of great importance, in view of the numerous guessing type experiments still carried out - in which response bias undoubtedly plays a role - it seems worthwhile to investigate the effect of response bias on the psi ability of mice.

The investigation is based on the effect of manipulating zero order response bias. This type of bias involves a preference on the part of the subject for specific responses; the subject chooses the alternatives with significantly different frequencies. Zero order response bias should be distinguished from sequential response bias, which is related to dependencies between successive trials.

Duval and Montredon's RBT criterion seems to involve sequential response bias, the next choice of the mouse depending upon the choice in the former trial, but there is an essential difference with regard to the nature of the response. It is a form of alternating behavior, since only those trials are considered in which the animal had no obvious reason for alternating his choice. Other trials in which the animal alternated it's choices, yet having received a shock in the previous trials, were considered non-random. Therefore the fact that the animal switched sides 'for no apparent reason' is crucial for Duval and Montredon's concept of random behavior. With positive reinforcement the equivalent of this behavior, switching sides for no apparent reason, can be found in the criterion for RBT trials, as applied in Schouten 1972. On the other hand, if the animals are trained to show response preferences, then their behavior in the experiment will as a whole be dictated to a larger extent by response preferences than when they are trained to choose the alternatives randomly. In such a situation choosing the non-preferred lever can be considered equivalent to switching for no apparent reason.

In the following experiment two possible effects of random or non-random behavior on ESP scoring will be studied: a) whether the animals when trained to choose randomly score higher with regard to their total score than when trained to show response preferences; b) whether they score higher in the 'normal' RBT's, those trials in which the mouse presses the other lever in trial n after a hit in trial n-1.

The same batch of animals C1-C7, C11, C12, and C13 were subjects in this experiment. Again only the Telepathy Condition was applied. In the NRB Condition (no response bias), the animals were trained in the usual way, which means that during the training a random target sequence was presented. In the experiment the target sequence was of course also random. After carrying out approximately 75 trials per mouse in the NRB Condition, the animals received a training lasting two days in which the frequencies of

the white and black lever as target was fixed at a ratio of 3 : 2. After this, the animals each carried out 75 trials in the RB Condition (response bias). In the RB Condition the ratio of the white and black targets remained fixed at 3 : 2. After completion of the RB Condition the animals received a three-day training in which a target sequence of white and black choices was again presented with equal probabilities for both colors. Again 75 trials were run in the NRB Condition. The other aspects of the experimental conditions were identical to those in the previous experiments.

Results and discussion

Table III-1 presents the analysis of the target sequence in the NRB Condition. Table III-2 presents the same analysis for the RB Condition.

TABLE III-1

Analysis of the target sequence in the NRB Condition

		Followed by target		
		White	Black	
Target	White	372	369	$P_W = .556$
	Black	365	358	$P_B = .438$
		$\chi^2 = 0$		$df = 1$

TABLE III-2

Analysis of the target sequence in the RB Condition

		Followed by target		
		White	Black	
Target	White	337	165	$P_W = .675$
	Black	170	76	$P_B = .325$
		$\chi^2 = .21$		$df = 1$

TABLE III-3

Probability for R_W in First NRB, RB, and last NRB sessions

Mouse	First NRB	RB	Last NRB
C1	.527	.743	.676
C2	.487	.467	.333
C3	.662	.646	.622
C4	.641	.649	.520
C5	.603	.808	.789
C6	.558	.584	.440
C7	.577	.649	.627
C11	.461	.564	.548
C12	.423	.434	.508
C13	.610	.545	.573

TABLE III-4

Raw data and CR values for the NRB Condition
First part

Mouse	T_{W^R}	T_{W^B}	T_{B^R}	T_{B^B}	P_{hit}	CR
C1	25	19	14	16	.505	.84
C2	19	22	18	17	.499	-.44
C3	32	10	19	16	.515	1.92
C4	20	13	30	15	.478	-.52
C5	28	18	19	13	.518	.14
C6	19	13	24	21	.490	.53
C7	20	19	25	14	.500	-1.13
C11	19	17	16	24	.502	1.10
C12	15	26	18	19	.496	-1.07
C13	23	15	24	15	.499	-.09

TABLE III-5

Raw data and CR values for the RB Condition

Mouse	$T_{W^R}^R$	$T_{W^R}^B$	$T_{B^R}^W$	$T_{B^R}^B$	P_{hit}	CR
C1	34	14	21	5	.572	-.77
C2	26	25	9	15	.488	1.02
C3	35	18	16	10	.550	.36
C4	36	20	14	7	.568	-.16
C5	44	9	19	6	.610	.56
C6	28	15	17	17	.510	1.30
C7	37	17	13	10	.560	.90
C11	29	21	15	13	.518	.36
C12	26	33	7	10	.464	.18
C13	29	24	13	11	.517	.05

TABLE III-6

Raw data and CR values for the NRB Condition
Last part

Mouse	$T_{W^R}^R$	$T_{W^R}^B$	$T_{B^R}^W$	$T_{B^R}^B$	P_{hit}	CR
C1	23	16	27	8	.509	-1.56
C2	18	18	6	30	.500	2.83
C3	23	12	23	16	.493	.58
C4	23	14	16	22	.500	1.74
C5	35	7	25	9	.530	.85
C6	19	20	14	22	.498	.85
C7	26	16	21	12	.515	-.14
C11	20	21	20	12	.506	-1.15
C12	13	17	26	21	.499	-1.00
C13	20	14	23	18	.493	.23

In view of the non-significant chi-square values in both cases, the sequence of targets can be considered as being random. However, in the NRB Condition the frequencies of the white and black targets are not approximately equal as they should have been. On the contrary it can be seen that the RNG selected the white target section significantly more often than the black target section. Hence the difference between the two conditions as regards the zero order effect was not as great as it could have been, since the behavior of the animals will to a certain extent be influenced by the actual target distribution in the experiment. Probably because of this, and perhaps also because of the relative shortness of the training period, the training did not yield the expected results. Table III-3 shows the probabilities for a response white in both conditions for each animal. It shows that only seven animals increased their preference for target white from the first NRB Condition to the RB Condition, and that eight animals decreased this preference from the RB Condition to the last NRB Condition. An inspection of the data informs, that even this statement gives an inflated impression of the real situation, since the differences in increase and decrease are relatively small. Hence it can be concluded that the expectations of the design were insufficiently realized in this experiment.

None of the distributions differ significantly from the expected distributions (First NRB: $t = .39$ $df = 9$; RB: $t = 1.88$ $df = 9$; Last NRB: $t = .71$ $df = 9$). The distribution of all scores taken

TABLE III-7

ESP scoring in relation to maximal and minimal response preferences

Mouse	CR of scoring in condition where response preference was		
	maximal	minimal	
C1	-.77	.84	$t_{\text{max.pref.}} = 1.44$ $s = 1.21$
C2	2.83	-.44	
C3	1.92	.58	
C4	-.16	1.74	
C5	.56	.14	$t_{\text{min.pref.}} = .79$ $s = .91$
C6	1.30	.53	
C7	.90	-1.13	
C11	.36	1.10	$t_{\text{dif.}} = .63$
C12	-1.07	-1.00	
C13	-.09	.05	

TABLE III-8

CR scores of the mice in all conditions of four experiments

Mouse	:Schouten 1972 :		Experiment I				: II :		: III :		
	C1	Tel	C1	C1	Tel	Tel	Tel	Tel	Tel	Tel	Tel
C1	.49	-.43	-.35	-.93	-.38	.56	-1.37	.35	.84	-.77	-1.56
C2	.14	.35	-1.01	.07	1.16	0	-1.11	-.07	-.44	1.02	2.83
C3	.24	.46	.28	-.21	2.41	-.14	-.91	.47	1.92	.36	.58
C4	1.12	.18	1.69	-.68	-.93	-.09	-1.92	-1.37	-.52	-.16	1.74
C5	.76	.48	-.05	-.39	.37	-.63	-.33	.09	.14	.56	.85
C6	.58	-.30	.16	2.09	-2.72	-.69	.47	-.54	.53	1.30	.85
C7	1.20	.05	.95	-.17	.09	-.16	.69	-1.52	-1.13	.90	-.14
C8	.49	2.15									
C9	2.01	-1.48									
C10	-1.48	2.31									
C11			-1.40	.37	.37	.12	-.68	-.76	1.10	.36	-1.15
C12			-.67	.68	-2.13	-.58	-1.15	-1.23	-1.07	.18	-1.00
C13			.23	1.26	1.08	-.86	.79	-.65	-.09	.05	.23

together also shows a non-significant difference ($t = 1.49$ $df = 29$). The RBT's yielded no significant scoring in either condition (NRB: $n = 336$, $Phit = .501$, $d = 15.6$, $CR = 1.70$; RB: $n = 162$, $Phit = .448$, $d = 4.5$, $CR = .79$).

Since the expectation that the strongest response preferences regarding a zero order effect would be manifested in the RB Condition was not fulfilled, it was decided to compare the scoring for each mouse in the condition where it showed it's strongest zero order effect, with it's scoring in the condition where it's zero order preference was minimal. Table III-7 presents the results. There appears to be no difference between the conditions ($t = .63$ $df = 9$). The only indication to be found, but which is contradictory to the notion that random behavior would increase the ESP scoring, is the fact that the two significant scores are both found in the condition with maximal response preference.

Again the data of the experiment give no indication of a possible psi influence, hence no conclusions can be drawn regarding the effect of introducing zero order response bias.

Since the same batch of animals had by now acted as subjects in four experiments, the data of all these experiments could then be compared in order to investigate whether some animals produced a consistent scoring pattern. This data is presented in table III-8. Each CR value is based on approximately 75 trials. It clearly shows that none of the mice are consistent in their scoring. A new batch of mice were chosen to act as subjects in the following experiments.

IV THE ROLE OF THE RELATION BETWEEN TARGET LIGHT AND TARGET LEVER

Assuming that the spatial position of the target is of no importance, it then becomes worthwhile to investigate the relation between target light, target section and target lever. In the experiment discussed previously, in which the spatial position of the target section was varied, the relationship between target light and target lever remained unchanged. If the light showed in the white section of the cage, the white lever had to be pressed to earn the reward. In the present experiment the relation between target light and target lever was varied. In the NR Condition (normal relation) the usual procedure was followed. The color of the side of the cage which was indicated by the target light matched the color of the lever which had to be pressed. In the RR Condition (reversed relation) this relationship was reversed. If the light in the target cage indicated the white section of the cage, the reward was given when the animal in the response cage pressed the black lever and vice versa. If the animal in the response cage responds by means of psi to the relationship between light and

color of the section of the target cage, then it can be expected that the sign of the deviation in the scoring of both conditions will show to be opposite. If such an effect is found, it becomes necessary to investigate to what extent the animals have learned to discriminate between the colors. As has been pointed out before, during the training the animals are in principle only conditioned to the relationship between the section of the cage and the lever in that section of the cage; not on color discrimination. But it is quite possible that the animals have learned to discriminate to a certain degree between black and white, as a by-product of the training, and that would of course be of relevance if a relationship between target light and target lever were found.

The ten animals, again C57Bl females, received the training as described in Schouten 1972. Because this was a new batch of animals it was decided to include the Telepathy as well as the Clairvoyance Condition in the experiment, in order to be able to compare the results of this experiment with the results of previous ones. In each of the four conditions (Telepathy versus Clairvoyance and NR versus RR) each animal performed approximately 75 trials. The conditions were systematically varied over the length of the experiment. Each animal performed 25 trials a day. The time between the trials was again fixed at 6 seconds. As in the other experiments the order in which the animals took part in the experiment remained the same for each session, starting with the lowest numbered animal (C14) and ending with the animal with the highest number (C23).

Results and discussion

Table IV-1 presents the analysis of the target sequence for the

TABLE IV-1

Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	583	550	$P_W = .516$
	Black	533	510	$P_B = .484$
				$\chi^2 = .01 \text{ df} = 1$

TABLE IV-2

Raw data and CR values for the Telepathy NR Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C14	16	19	11	31	.513	1.70
C15	27	16	24	10	.519	-.66
C16	9	26	15	24	.509	-1.09
C17	28	18	20	9	.532	-.67
C18	17	25	12	21	.486	.35
C19	22	19	13	21	.497	1.32
C20	17	25	12	21	.486	.35
C21	17	21	14	23	.499	.60
C22	20	22	19	14	.502	-.85
C23	21	17	23	15	.500	-.46

TABLE IV-3

Raw data and CR values for the Clairvoyance NR Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C14	11	17	22	25	.515	-.60
C15	32	7	27	10	.507	.80
C16	15	24	13	23	.495	.21
C17	22	11	29	13	.478	-.21
C18	17	22	15	21	.497	.16
C19	11	25	12	28	.510	.05
C20	14	25	18	18	.497	-1.22
C21	16	28	18	15	.491	-1.55
C22	21	16	31	7	.497	-2.15
C23	30	14	22	6	.549	-.83

TABLE IV-4

Raw data and CR values for the Clairvoyance RR Condition

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C14	16	22	9	26	.493	1.40
C15	31	14	23	7	.544	-.65
C16	11	23	18	23	.510	-.99
C17	26	14	23	11	.513	-.23
C18	15	18	19	22	.504	-.07
C19	11	27	15	22	.498	-.99
C20	16	29	13	17	.477	-.65
C21	19	24	19	13	.501	-1.29
C22	20	14	23	18	.493	.23
C23	19	17	23	16	.498	-.53

investigated conditions. The tables IV-2, IV-3, and IV-4 give the scores of the mice in three of the four conditions. Unfortunately the data related to the second and third session of the fourth condition (Telepathy RR Condition) were lost. In view of the small number of trials remaining it was decided to drop this condition from the evaluation. Only in the clairvoyance NR Condition did a marginally significant result emerge. In the other conditions the CR score distributions did not deviate to a significant extent from the expected standard normal distribution (Telepathy NR: $t = .18$, $df = 9$; Clairvoyance NR: $t = 1.76$, $df = 9$; Clairvoyance RR: $t = 1.46$, $df = 9$). All 30 scores yielded a $t = 1.72$, $df = 29$; a non-significant value. A comparison of the Clairvoyance NR and RR Conditions yielded a $t = .37$, $df = 9$; showing that no difference can be assumed between the conditions with regard to scoring. The RBT trials resulted in a non-significant negative deviation ($n = 511$, $P_{hit} = .498$, $N_{hit} = 244$, $CR = -.91$).

Although the mice had a marginally significant score in the Clairvoyance NR Condition, it is hard to draw any conclusions, since in the other conditions no psi influence effected the behavior of the animals. Moreover, the marginally significant result is found to be based on a negative deviation in scoring. Since the deviations in the Clairvoyance RR Condition are also mainly negative, the most one can conclude is that the results of this experiment do not give any indication that the relationship

between target light and target lever might be of importance.

The experiments reported here were nearly all concentrated on the role of the target. To state general conclusions based on the outcome of these experiments as regards this aspect of the experimental situation is difficult, since most of the experiments yielded non-significant results. The only conclusion, and perhaps rather a negative one is, that the efficiency of this type of animal experiment is rather low. In so far as marginally significant results were obtained in some experiments, my impression is, that the visual aspects of the target do not play an important role. Further, my impression is that the role of the sender is more related to motivational aspects than to transmission of information. But in both cases it is merely a subjective impression, and these remarks should not be considered as carefully formulated conclusions, based on experimental data.

The following experiments were more directly aimed at raising the efficiency of these experiments by trying to establish the optimal values of some variables related to the experimental situation. The variables involved were the time between the trials and the motivation of the animals. Since no differences have been found as regards magnitude of ESP effect between Clairvoyance and Telepathy Conditions, these experiments were all carried out for convenience sake in the Clairvoyance Condition.

V THE EFFECT OF VARIATION IN TIME BETWEEN TRIALS

The normally applied rate of time between trials of 6 seconds - with time between trials I mean the time which elapses between the moment a response is given and the onset of a new trial - is rather a fast rate. Especially in the beginning of a session, when the motivation of the animals is comparatively strong, they tend to respond rather quickly. In Schouten 1972 it was found (see table 11) that in 79% of the trials the response was given within 2.5 seconds. In that experiment a new trial commenced 30 seconds after the response to the preceding trial was given. In the experiments described above this rate was changed to 6 seconds. Since the first experiment turned out to be rather successful as regards ESP scoring compared to the following experiments, I decided in the present experiment to investigate the effect of different values of time between response and moment of onset of the new trial. The conditions applied were TBT6, TBT20, and TBT30, in which the time between trials amounted to 6, 20, and 30 seconds respectively. The same batch of mice took part in the experiment.

Results and discussion

Table V-1 presents the analysis of the target sequence. No deviations from randomness are apparent.

TABLE V-1
Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	486	482	$P_W = .507$
	Black	483	474	$P_B = .493$
		$\chi^2 = 0$		$df = 1$

In the tables V-2, V-3, and V-4 the raw data and CR values of the performance of the individual mice in the TBT conditions are given.

TABLE V-2
Raw data and CR values for condition TBT6

Mouse	T_{WW}^R	T_{WB}^R	T_{BW}^R	T_{BB}^R	P_{hit}	CR
C14	12	29	19	15	.492	-2.29
C15	34	9	20	12	.532	1.41
C16	19	27	12	17	.480	0
C17	28	19	24	13	.514	-.48
C18	17	21	17	20	.499	-.09
C19	19	22	16	18	.497	-.07
C20	25	17	22	11	.515	-.60
C21	17	17	19	23	.503	.41
C22	17	12	25	20	.485	.26
C23	24	8	28	15	.472	.83

TABLE V-3

Raw data and CR values for condition TBT20

Mouse	$T_{W^R}^R$	$T_{W^R}^B$	$T_{B^R}^W$	$T_{B^R}^B$	P_{hit}	CR
C14	19	15	8	7	.520	.14
C15	20	7	12	11	.511	1.53
C16	11	17	14	8	.500	-1.69
C17	7	11	8	24	.556	.91
C18	16	9	14	12	.498	.73
C19	14	10	12	15	.499	.98
C20	8	14	12	15	.509	-.54
C21	12	11	16	13	.495	-.22
C22	18	9	11	12	.506	1.33
C23	11	18	11	11	.490	-.84

TABLE V-4

Raw data and CR values for condition TBT30

Mouse	$T_{W^R}^R$	$T_{W^R}^B$	$T_{B^R}^W$	$T_{B^R}^B$	P_{hit}	CR
C14	19	29	21	13	.498	-1.95
C15	22	13	20	13	.503	.19
C16	23	8	19	19	.489	2.00
C17	17	19	15	16	.498	-.10
C18	22	15	20	14	.504	.05
C19	7	23	12	22	.512	-.95
C20	21	10	24	14	.484	.39
C21	14	16	21	19	.500	-.48
C22	18	15	19	20	.499	.50
C23	21	14	26	8	.502	-1.37

None of these conditions yielded a significant deviating distribution of scores (TBT6: $t = .16$, $df = 9$; TBT20: $t = .67$, $df = 9$; TBT30: $t = .47$, $df = 9$). The distribution of all 30 scores proved to be equally non-significant ($t = 0$, $df = 29$), and the same applies to the differences between the conditions. Again the RBT trials were found to result in a non-significant number of hits ($n = 456$, $Phit = .497$, $Nhit = 223$, $CR = -.35$). Hence no conclusions can be drawn as regards the effect of time between trials on ESP scoring.

VI THE EFFECT OF MANIPULATING MOTIVATION

In all experiments hitherto reported in this paper, the animals carried out approximately 25 trials in a daily session. After completion of the session the animal was put back into its own cage, after which water was provided to enable the animal to drink as much as it wanted for about 25 minutes. When this drinking period was over the animal was then deprived of water until the experimental session commenced the next day. Even when no experiment or training was carried out, the animals still only received water once a day. Only now and then was this fixed schedule interrupted, amongst other things it depended on the weather, when they were to be given enough water for a week in order to balance possible negative effects from this deprivation schedule. The room where the animals were housed had no climate control facilities.

As regards the strength of the motivation of the animals when taking part in an experiment some considerations are of importance. Strength of motivation can be expressed or operationalized in different aspects of the animal's behavior, for instance average time of response speed, number of responses within a fixed time interval, etc., but all these behavioral aspects are also influenced by other variables. Therefore even when applying a strict deprivation schedule, there appears to be a considerable inter- and intra-individual variation in the strength of motivation. In my case this variation was exaggerated because of the lack of climate control regarding housing facilities.

In the case when the animals are free to continue an experimental session as long as they are willing to respond, applying as a criterion for terminating the session that the response time should not exceed 30 seconds, the average number of trials amounts to approximately 50. However, towards the end of such a session their behavior becomes very irregular, now and then they respond without taking the reward, and whether they respond within 30 seconds also becomes to a certain degree dependent on such variables as for instance distracting noises, the animal's distance

from the levers at the moment of the onset of the trial, etc.. Besides, even when it appears that they accept the reward, this in itself is found sometimes to be conditioned behavior; they move to the water feeding system but they only partially drink the available amount of water or no water at all.

For all these reasons it is difficult to give objective criteria regarding the motivational state of the animals at the beginning of an experimental session. In addition, it is understandable that the strength of the motivation will gradually decline in the course of the session. Whether this decline follows a linear curve or not is unknown. It is of course possible to obtain much more insight into the strength of motivation of the animals and how this varies, both in the course of an experimental session and over longer periods. However, that requires a much stricter control of the variables involved, as for instance knowledge about the exact amounts of food and water intake, and also a lot of experimental work in order for instance to establish the variation in motivational strength as a function of the animal's activity, elapsed time, and amount of reward accepted in an experimental session. Such an investment seems to me only warranted, if it can be shown that motivation plays an important role regarding the extent of ESP scoring.

In order to get some indication regarding the possible influence of this variable an experiment was carried out, in which the deprivation time was varied from two days to a situation with no deprivation at all. The latter condition was included because we do not know what kind of relationship exists between motivation and ESP scoring. In general the performance of subjects tends to increase when their motivation is strengthened, but too strong a motivation can also produce a negative effect. Hence it is in principle possible, that even a weak motivation has an inhibiting effect on the ESP ability of the animals. Therefore it was considered necessary to include a condition in which the animals were as little motivated as possible. This situation was created in two ways.

In Condition I the animals were subjected to the usual deprivation schedule of one day, but they were allowed to continue the session after the 25 trials were completed. The session was terminated when the animal did not respond within 30 seconds after the trial had commenced. It was decided to evaluate both the total score of the session per mouse as well as the scoring in the last 20 trials. It was assumed that their motivation in these last trials was minimal. In Condition II the animals were provided with a bottle of water, and consequently could drink as much as they liked in the 24 hours previous to the session. The session was ended either after the completion of 25 trials or again, when the

animal did not give a response within the 30 seconds. In Condition III the animals were deprived 24 hours before the session started, the number of trials being limited to about 25. This experimental condition is similar to the situation in the experiments discussed earlier. In Condition IV the deprivation period amounted to 48 hours, again with 25 trials per experimental session.

The same batch of mice, C14 - C23, acted as subjects. The time between the trials was fixed at 10 seconds. Each condition consisted of three sessions per animal. The conditions were systematically randomized over the sessions. A new apparatus was introduced in which the target was fixed after the animal had made its choice. Thus any explanation of a possible significant result in terms of sensory cues is a priori eliminated. Again the recording was fully automated.

I should add that I have never found any indication in one of my previous experiments that sensory cues might have affected the results. All these experiments were carried out with the apparatus described in Schouten 1972. This apparatus was constructed in such a way that, after the target was chosen by the RNG, no electronic activity took place apart from the stimulation of the target cage which was located next to the electronic equipment, until the mouse in the response cage located a couple of rooms away, had responded. But in view of the meagre results obtained so far, I considered it desirable, in the case of a significant result being obtained, to be able beforehand to eliminate the well known objection of possible sensory cues.

Since the RBT's in previously discussed experiments failed to result in significant scoring, it was decided to drop this analysis.

Results and discussion

The analysis of the target sequence, presented in table VI-1, shows no irregularities regarding the randomness of the target sequence.

TABLE VI-1
Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	948	944	$P_W = .500$
	Black	949	942	$P_B = .500$
		$\chi^2 = 0$		$df = 1$

TABLE VI-2

Raw data and CR values for Condition I

Mouse	$T_{W W}^R$	$T_{W B}^R$	$T_{B W}^R$	$T_{B B}^R$	P_{hit}	CR
C14	60	51	45	50	.501	.95
C15	42	43	47	35	.501	-1.02
C16	34	56	44	55	.504	-.91
C17	46	55	42	51	.498	.05
C18	49	53	49	50	.500	-.21
C19	28	37	25	34	.496	.07
C20	41	47	33	56	.500	1.27
C21	36	54	40	42	.497	-1.15
C22	47	30	44	48	.497	1.71
C23	45	36	53	42	.495	.03

TABLE VI-3

Raw data and CR values for Condition II

Mouse	$T_{W W}^R$	$T_{W B}^R$	$T_{B W}^R$	$T_{B B}^R$	P_{hit}	CR
C14	16	11	16	13	.497	.31
C15	13	9	10	14	.500	1.18
C16	11	16	14	12	.499	-.95
C17	12	11	8	18	.506	1.49
C18	18	12	20	14	.494	.09
C19	10	23	15	29	.525	-.33
C20	17	24	10	22	.484	.86
C21	19	25	14	26	.495	.75
C22	21	19	11	25	.496	1.91
C23	18	11	19	17	.493	.74

TABLE VI-4

Raw data and CR values for Condition III

Mouse	$T_{W,W}^R$	$T_{W,B}^R$	$T_{B,W}^R$	$T_{B,B}^R$	P_{hit}	CR
C14	22	15	16	19	.501	1.17
C15	25	16	19	8	.530	-.74
C16	18	20	12	21	.495	.92
C17	19	18	21	14	.502	-.73
C18	12	26	15	22	.498	-.78
C19	16	27	19	20	.496	-1.04
C20	19	21	25	17	.499	-1.09
C21	17	18	17	21	.501	.33
C22	25	14	28	10	.502	-.84
C23	23	13	21	10	.512	-.31

TABLE VI-5

Raw data and CR values for Condition IV

Mouse	$T_{W,W}^R$	$T_{W,B}^R$	$T_{B,W}^R$	$T_{B,B}^R$	P_{hit}	CR
C14	19	13	20	19	.495	.68
C15	20	12	28	12	.481	-.63
C16	22	24	11	18	.486	.81
C17	22	14	16	19	.500	1.30
C18	26	15	12	16	.510	1.65
C19	11	15	14	28	.531	.70
C20	9	18	20	27	.529	-.74
C21	21	13	14	20	.500	1.70
C22	11	24	11	25	.503	.07
C23	20	14	25	8	.503	-1.39

TABLE VI-6

Raw data and CR values of the last 20 trials of Condition I

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
C14	13	15	16	16	.501	-.28
C15	18	13	19	10	.504	-.58
C16	16	14	16	14	.500	0
C17	15	20	10	15	.486	.22
C18	14	12	19	15	.493	-.15
C19	16	18	11	15	.493	.36
C20	18	19	9	14	.488	.70
C21	6	27	12	15	.480	-2.02
C22	14	17	15	14	.499	-.51
C23	15	7	27	11	.447	-.21

The distribution of the scores in the various conditions is presented in the tables VI-2 to VI-5. The distribution of the CR values based on the last 20 trials of Condition I is presented in table VI-6. None of the distributions are found to differ significantly from the expected distribution (Condition I: $t = .24$; Condition II: $t = 2.13$; Condition III: $t = 1.13$; Condition IV: $t = 1.18$; last 20 trials of Condition I: $t = 1.01$; in all conditions $df = 9$). The distribution of all 40 scores yielded a $t = 1.28$; with $df = 39$ a non-significant value. No conclusions can be drawn regarding the effect of manipulating the strength of the deprivation of the animals.

VII AGAIN THE EFFECT OF MANIPULATING MOTIVATION

Instead of starting a new experiment in which, as is usual, a new variable is tested, it was decided in view of the negative results obtained so far, to repeat the above described experiment. The main reasons for this were the following: a) As a result of the non-significant outcome of most experiments, it is not possible to get any indication about the most favorable test situation eliciting psi. As long as this type of information is lacking, each experiment merely remains a gamble, with apparently, as is shown by the results of the previous experiments, the odds heavily against success. b) Since we know that we can not always expect significant scoring in an experiment, a possible experimentation

strategy is to repeat a certain experiment until a significant result is obtained. Of course this procedure resembles optional stopping, and it is therefore not permitted to use the results to prove that a certain variable has a certain influence on psi. But if one accepts as a working hypothesis the model which involves, due to the influence of a number of uncontrollable and unknown variables, the possibility of psi influencing the outcome being inhibited in most experiments, then it is just not reasonable to expect significant scoring in each experiment. In such a case the above mentioned strategy becomes unavoidable in the developmental phase of research, and one just has to accept the disadvantage that some significant results will necessarily be meaningless due to optional stopping. In fact this strategy enables us to trace indications regarding favorable conditions for ESP, and the application of a number of such indications might raise the probability of successful experimental work.

c) A third reason is related to the problem of what the explanation is of the successful break-down of data in the animal experiments, reported by Levy et al (Levy, et al, 1971; Levy, McRae 1971; Levy, 1972; Levy, Davis, Mayo, 1973; etc.). By splitting up the RBT trials in high versus low-jump, and after-shock versus after-nonshock trials it was found, that the most significant scoring took place in the low-jump and after-nonshock condition. This might be due, amongst other things, to motivational aspects.

The apparatus used in the present experiment was modified in order also to be able to record the behavior of the animals between the trials. This made it possible to analyse the results in a way analogous to the analysis of low- and high-jump trials as has been done in the American work.

The effect of the after-nonshock and low-jump condition has been analysed for three sets of data. In the American work the analysis is based on RBT's only. Although equally defined, these RBT's differed regarding operationalization from the 'French' RBT's. Since the French could not monitor the behavior of the animals between the trials, they were forced to base their criterion, whether the animal had displayed random behavior, on the position of the animal at the start of the two successive trials. Hence, only the position of the animals at the start of a trial was of importance, not their behavior between the trials. The RBT criterion applied in my experiments described above is analogous to this French concept of RBT's, and is also based on the behavior of the animals as shown in the trials. Unfortunately, except for the first reported experiment (Schouten 1972) there was never a significant scoring observed in these trials. Moreover, one can raise certain objections about this concept of random behavior

(see Schouten 1972, p.273). These RBT's are based on one specific type of the animal's behavior, switching sides after a hit, and hence do not involve a choice element for the animal any more.

The American RBT concept is not subject to this objection. They recorded the behavior of the animals continually. They defined, like the French, the RBT's as those trials in which the animal jumped for no apparent reason, but since jumps made between the trials were also included the majority of their RBT's still left the animal a choice between the two halves. In fact, they considered all behavior during the shock period as non-random, and all behavior operationalized as switching sides, between the termination of the shock period and the onset of the next trial, as random. Therefore they could operationalize the definition of an RBT as "any change of side after the five-second shock period qualified the following trial as random" (Levy et al, 1972, p.3). This explains why it is possible that in the American work the concept of after-shock RBT's emerges, an impossibility when considering the French RBT's.

As stated above, the French RBT criterion was hitherto applied in our studies. In the present study it became possible to apply the American operationalization of RBT's. Hence the high-low jump and after shock-nonshock conditions could now be analysed. The latter analysis is only possible with the American RBT concept, since all the French are per definition after-nonshock. Therefore in the analysis based on the French RBT criterion only the high and low-jump conditions are considered. Because this experimental setup with positive reinforcement differs from the American setup with negative reinforcement, the same analyses were also made based on all the trials of the experiment.

d) In the present experiment special attention was given to the possible effect of deprivation on the behavior of the animals. In the time between the experimental sessions training sessions were held, preceded by periods of deprivation equal to those preceding the experimental sessions. Before the experiment commenced all animals had reached the 80% level. This means that in the training cage each animal had responded correctly in at least 80% of the trials to the randomly presented binary targets by pressing the correct lever. Whether the number of correct responses would vary with the amount of deprivation was investigated, to see if this effect would correlate with a possible effect of the different deprivation periods on ESP scoring.

In the first condition the mice were deprived of water for 24 hours preceding the experimental (Condition ESP-I) or training (Condition T-I) session. In the other condition (Conditions ESP-II and T-II) the deprivation period lasted 48 hours. Only five trained mice of the N strain (females) were available as subjects. The

time between trials was set at 10 seconds. As usual one session consisted of 25 trials a day for each mouse. The four conditions were systematically randomized over the experiment.

Results and discussion

Table VII-1 presents the analysis of the target sequence, the tables VII-2 and VII-3 the scoring of the mice in the Conditions ESP-I and ESP-II, and table VII-4 the percentage of incorrect responses in the Conditions T-I and T-II.

TABLE VII-1
Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	208	174	$P_W = .529$
	Black	171	160	$P_B = .471$
				$\chi^2 = .45 \quad df = 1$

TABLE VII-2
Raw data and CR values for Condition ESP-I

Mouse	T_{WW}	T_{WB}	T_{BW}	T_{BB}	P_{hit}	CR
D1	25	17	17	16	.507	.68
D2	19	18	13	26	.502	1.57
D3	22	20	16	19	.499	.58
D4	21	13	23	22	.492	.93
D5	15	12	14	11	.502	-.03

TABLE VII-3
Raw data and CR values for Condition ESP-II

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
D1	21	18	15	18	.500	.71
D2	15	21	12	13	.490	-.48
D3	19	19	27	12	.499	-1.69
D4	25	13	21	15	.503	.65
D5	23	24	12	16	.492	.49

TABLE VII-4
Percentage incorrect responses
in Conditions T-I and T-II

Mouse	Condition	
	T-I	T-II
D1	20	17.3
D2	18.7	22.7
D3	20	18.7
D4	22.7	16
D5	24	18.7

From table VII-1 it appears that the RNG was biased in favor of the white target section. The sequence of targets can be considered as random. None of the t values of the ESP score distributions reach a significant level (Condition ESP-I: $t = 2.57$, $df = 4$, $P = .06$ two-tailed; Condition ESP-II: $t = .12$, $df = 4$). The same applies to the t value of all scores ($t = 1.14$, $df = 9$). From table VII-4 it can be seen, that the difference in deprivation period had not much influence on the percentage of incorrect responses in the Conditions T-I and T-II, although there seems to be a slight tendency towards better performance in the T-II Condition. From this it can be at least concluded that the long deprivation period of about 48 hours did not seriously impair the animals ability to perform. That this longer deprivation

period only slightly increased the animal's performance in the training condition might be due to the fact that, given the absence of negative reinforcement when pressing the wrong lever, the score of about 80% correct responses already constitutes an optimal scoring level.

The results of the scoring in the after-nonshock and after low-jump conditions based on all trials are presented first. Since when all trials are considered a trial is either after-shock or after-nonshock, and also either after high-jump or after low-jump, this implies that in both cases the scoring in the two operationalizations of the condition are mutually dependent. Excessive scoring in for instance the high-jump condition implies, given a nonsignificant overall scoring, a related equally excessive scoring in the low-jump condition. Therefore in this case only the after-nonshock and after low-jump conditions are analysed.

TABLE VII-5
Scoring in the trials following a hit

Mouse	$T_{W^R W}$	$T_{W^R B}$	$T_{B^R W}$	$T_{B^R B}$	P_{hit}	CR
D1	23	19	17	19	.501	.66
D2	16	24	15	18	.493	-.46
D3	12	24	19	15	.498	-1.89
D4	22	13	26	19	.488	.45
D5	16	22	14	22	.497	.28

TABLE VII-6
After low-jump ($R_{W^R B} = R_{B^R W} = 0$) trials

Mouse	$T_{W^R W}$	$T_{W^R B}$	$T_{B^R W}$	$T_{B^R B}$	P_{hit}	CR
D1	16	15	13	12	.502	-.03
D2	17	13	14	13	.502	.36
D3	19	13	22	12	.496	-.43
D4	24	17	24	18	.499	.13
D5	10	14	13	15	.504	-.34

TABLE VII-7

After low-jump (frequency R_W or R_B is 0-4) trials

Mouse	$T_{W^R_W}$	$T_{W^R_B}$	$T_{B^R_W}$	$T_{B^R_B}$	P_{hit}	CR
D1	22	19	15	20	.499	.94
D2	22	23	20	24	.500	.32
D3	17	14	19	14	.498	-.22
D4	27	20	28	23	.498	.25
D5	16	20	22	20	.501	-.70

TABLE VII-8

High and low-jump "French" RBT trials

	N	P_{hit}	N_{hit}	CR
All RBT's	151	.488	67	-.99
Low jump trials $R_W R_B = R_B R_W = 0$	88	.488	38	-1.07
High jump trials	65	.488	29	.67
Low jump trials R_W and/or R_B less than 5	113	.488	56	.15
High jump trials	38	.488	11	2.47

TABLE VII-9

RBT's based on the "American" criterion

	N	N_{hit}	E	CR
All RBT's	550	277	275	.17
Low jump	366	186	183	.31
After hit	294	138	147	-1.05
low jump-after hit	248	119	124	-.63

TABLE VII-10

Number of trials after a hit or a miss in relation
to frequency of switches

no. switches	after hit	Perc.	after miss	Perc.	T
1) low jump	115	39.1	58'	18.5	173
2)	133	45.2	118	37.6	251
3	46	15.6	138	43.9	184

' Note: Non-RBT's

The equivalent of the after-nonshock condition, the scoring in the trials following a hit, is presented in table VII-5. The t-value of this distribution is found to be non-significant ($t = .37$, $df = 4$).

In the positive reinforcement test situation two equivalents of the low and high-jump criterion are possible. The first concerns the number of times that the animal presses the levers in between two trials; the second is the number of times that, when pressing the levers between two successive trials, the animal switches from one lever to the other. Table VII-7 presents the analysis based on the application of the first criterion, the number of times that the animal presses one of the levers. Only the low-jump trials are considered, meaning in this case those trials preceded by 0 to 4 between trial responses.

In table VII-6 the scoring of the animals is analysed according to the other criterion, i.e. the number of times that the animal switches to the other lever when giving responses between the trials. Again the low-jump condition is analysed, in this case meaning those trials preceded by no switch at all. As can be seen from the tables, in all cases no extra-chance scoring took place (VII-6: $t = .38$, $df = 4$; VII-7: $t = .38$, $df = 4$).

The splitting up of the trials into low and high-jump in the analyses described above has been based on the median, in order to obtain as equal a division of the trials as possible over both conditions. Therefore the split lies between 0 and 1 in the case when the number of alternations in the between-trial responses are considered, and between 4 and 5 responses given when the number of responses between the trials are considered.

The same criteria are applied when the equivalent analysis is made for RBT's according to the French criterion. The results, including an analysis of all RBT's, are presented in table VII-8. Here the data of both low and high-jump conditions are presented.

The data from table VII-8 show that nearly all analyses yielded a non-significant result, except for the analysis of one high-jump condition, where the result is found to be marginally significant. However, this result contradicts the American findings which show a significant positive scoring, instead of as here a negative scoring, in the low-jump condition.

Considering the total number of RBT trials it can be seen, that the number of low-jump trials is relatively higher with RBT's than with all trials (see tables VII-6 and VII-7).

As regards the RBT's according to the American operationalization the analyses on the effect of the conditions is limited to the after low-jump and after-hit conditions. The latter can be regarded as the equivalent of the after-nonshock condition in the case of negative reinforcement. In the American studies only these conditions yielded a consistently significant scoring. As in the American work, we imply with number of jumps the number of times the animal switches from one lever to the other. This includes the situation when the animal did not respond between two successive trials, but switched sides and pressed the other lever in the next trial. Switching one time after a miss is also considered "mechanical" behavior, and consequently these trials are excluded from the RBT's.

The data are presented in table VII-9 (low-jump: no. of switches is 1 to 2). Not surprisingly the number of RBT's is much higher than the number of RBT's based on the French criterion.

Unfortunately in all conditions, even when low-jump and after-hit trials are combined, a non-significant scoring is found. Hence the results of this experiment do not confirm the American findings. It is of interest to observe, as is shown by the data in table VII-10, that the animals show a marked difference in behavior after a hit or after a miss. On average the number of jumps is much lower after a hit, which indicates that the animals are less nervous and more at ease after a hit than after a miss.

We must conclude that this experiment again failed to provide an answer to the problem of the effect of a difference in deprivational state on the ESP scoring. In addition, the American findings that the animals score higher in after-nonshock and after low-jump RBT's, was not borne out by the results of this experiment.

VIII AGAIN THE EFFECT OF DIFFERENCES IN DEPRIVATIONAL STATE AND RBT'S

That animals tend to behave less actively after a hit, as shown in the experiment reported above, indicates a relationship between the two conditions after-hit and after low-jump. Since it has been shown that both conditions tend to increase the ESP scoring it is

reasonable to assume, that a common variable is responsible for both the low activity after a hit as well as for the increase in scoring.

If such a variable exists the question is how to manipulate it in order to raise the level of ESP scoring. There are several possibilities. If we assume, that as a consequence of not being shocked or making a hit the animal becomes quieter, then it could possibly be that the low activity in itself creates a mental state favorable to ESP scoring. On the other hand, it is possible that the relationship between the variable and low activity is not mutual. Perhaps the effect of the variable results in low activity - and higher ESP scoring - but a change in activity does not have any influence on the variable concerned. In this case manipulating the activity level will not affect the scoring level; only manipulating the variable can do this. Now at least one variable is known which will probably have an influence on the animal's activity level, and that is motivation. However in general, motivation increases the response speed and the number of responses. The problem whether there exists a relationship between motivation and the number of jumps still has to be investigated. If such a relationship can be established, and if it shows that low activity in itself does not increase ESP scoring, then it can be argued that the level of ESP scoring in the RBT's is related to the motivational state of the animal. If no relationship is found between motivation and number of jumps, then at least we know that we have to look elsewhere for the explanation of the effect of the low-jump condition on ESP scoring.

Hence the main aim of the present study was a) to investigate whether low activity is a sufficient condition to obtain significant ESP scoring and b) to study the relationship between motivational state and the jumping activity of the animals.

Motivation is again varied by manipulating the deprivation periods. Three levels of deprivation were applied, in Condition A 12 hours, in Condition B 24 hours, and in Condition C 48 hours. In order to study the effect of manipulating the activity level of the animals it was decided, in view of the non-significant results obtained in the experiments carried out before, to create an excess of low activity trials. To this end the animals were trained to reduce their activity between the trials. If low activity does in itself increase ESP scoring, then at least one could expect significant scoring in RBT's in this experiment.

Twelve N strain mice were used in this experiment. None of them had taken part in other experiments. They received the usual training until they satisfied two requirements. In the first place they should respond by pressing the correct lever in at least 80% of the trials per session, and in the second place they should

not respond more often than 5 times between two trials. The time between two trials was fixed at 10 seconds. Again the testing apparatus was completely automated. The conditions were randomized over the sessions. In each condition three sessions, each of 25 trials were run, making a total of 75 trials per mouse in each condition.

Results and discussion

The target sequence generated during the experiment showed a satisfactory degree of randomness (see table VIII-1).

TABLE VIII-1

Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	625	617	$P_W = .500$
	Black	623	632	$P_B = .500$
				$\chi^2 = .09 \quad df = 1$

The distribution of the scores of the mice yielded for Condition A: $t = .30$, Condition B: $t = .63$, and for Condition C: $t = .61$. With 11 degrees of freedom none of these t-values reach a level of significance (see tables VIII-2 till VIII-4). The t-value for the distribution of all scores is $t = .26$, $df = 35$.

The scoring in the trials after a hit yielded a $t = .27$ (see table VIII-5); the scoring in the low-jump trials, based on the number of switches between trials, yielded a $t = .53$ (see table VIII-6); and the scoring in low-jump trials, based on the number of responses between trials, yielded a $t = .07$ (see table VIII-7). Again none of these t-values reach a significant level.

Table VIII-8 presents the data of the scoring in the RBT's, based on the French operationalization. Neither in the RBT's as a whole, nor in any of the individual conditions is a significant scoring observed.

Table VIII-9 presents the data of the RBT's based on the American operationalization. Since the number of low-jump trials is relatively high, the split between low and high-jump trials is made

TABLE VIII-2

Raw data and CR values for Condition A

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
E1	24	11	23	15	.494	.68
E2	22	14	16	24	.500	1.84
E3	18	12	20	25	.496	1.29
E4	24	9	29	12	.476	.17
E5	20	14	31	9	.484	-1.60
E6	17	19	23	13	.500	-1.41
E7	12	30	12	16	.468	-1.15
E8	26	8	26	12	.488	.68
E9	13	22	23	17	.501	-1.76
E10	35	10	25	6	.553	-.24
E11	17	20	22	13	.501	-1.43
E12	20	16	9	16	.495	1.48

TABLE VIII-3

Raw data and CR values for Condition B

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
E1	20	18	16	19	.500	.59
E2	21	15	17	21	.500	1.17
E3	9	20	20	25	.523	-1.10
E4	30	11	24	7	.535	-.35
E5	19	19	18	11	.507	-.97
E6	26	13	21	15	.505	.74
E7	13	18	12	27	.516	.92
E8	26	6	30	9	.471	.36
E9	18	18	22	13	.501	-1.08
E10	35	5	23	10	.528	1.51
E11	17	17	19	21	.501	.21
E12	15	20	17	23	.505	.03

TABLE VIII-4

Raw data and CR values for Condition C

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
E1 b	20	22	24	8	.513	-2.31
E2	14	13	9	14	.497	.89
E3	15	25	13	21	.487	-.06
E4	25	8	30	9	.478	-.09
E5	18	11	27	15	.468	-.18
E6	21	14	23	15	.430	-.04
E7	16	22	17	19	.498	-.44
E8	27	9	29	9	.493	-.11
E9	17	19	21	19	.469	-.46
E10	31	8	32	2	.532	-1.25
E11	23	19	18	14	.507	-.13
E12	22	18	11	23	.496	1.94

TABLE VIII-5

Scoring after a hit

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
E1	30	22	30	19	.503	-.36
E2	26	26	27	32	.501	.44
E3	16	24	31	39	.520	-.42
E4	32	16	40	14	.488	-.75
E5	22	15	34	17	.478	-.66
E6	28	21	36	20	.493	-.73
E7	20	29	20	28	.499	-.08
E8	43	12	43	7	.515	-.80
E9	18	19	28	16	.494	-1.34
E10	49	10	44	11	.511	.33
E11	30	26	24	22	.603	.14
E12	30	26	25	31	.500	.94

TABLE VIII-6

Scoring in after low-jump trials ($R_{W B}$ or $R_{B W} = 0$)

Mouse	$T_{W W}$	$T_{W B}$	$T_{B W}$	$T_{B B}$	P_{hit}	CR
E1	46	36	43	31	.504	-.25
E2	46	37	34	45	.500	1.58
E3	28	36	43	51	.510	-.24
E4	54	18	68	17	.477	-.63
E5	34	31	60	28	.483	-1.92
E6	54	35	55	37	.498	.12
E7	29	39	28	35	.498	-.21
E8	61	20	63	26	.489	.59
E9	31	36	41	30	.499	-1.35
E10	84	16	69	9	.544	-.59
E11	44	42	49	36	.500	-.85
E12	47	39	34	48	.500	1.71

TABLE VIII-7

Scoring in after low-jump trials (R_W or R_B less 5)

Mouse	$T_{W W}$	$T_{W B}$	$T_{B W}$	$T_{B B}$	P_{hit}	CR
E1	53	40	52	30	.506	-.85
E2	49	38	34	52	.500	2.21
E3	28	33	43	47	.506	-.22
E4	59	19	64	19	.492	-.19
E5	39	32	48	23	.500	-1.51
E6	53	44	51	37	.503	-.45
E7	32	43	33	46	.502	.11
E8	54	15	59	17	.487	.08
E9	37	46	54	40	.499	-1.71
E10	63	12	53	13	.520	.44
E11	47	43	41	38	.501	.04
E12	47	40	28	51	.498	2.39

TABLE VIII-8

High and low-jump RBT trials

	N	P_{hit}	N_{hit}	CR
All RBT's	547	.497	281	.80
Low jump trials				
$R_{WB} = R_{BW} = 0$	425	.497	222	1.06
High jump trials	122	.497	59	-.29
Low jump trials				
R_W and/or R_B less than 3	359	.497	185	.71
High jump trials	188	.497	96	.38

TABLE VIII-9

RBT's based on the "American" criterion

	N	N_{hit}	E	CR
All RBT's	1042	522	521	0
After hit	723	361	361.5	0
Low jump-After hit	503	252	251.5	0

TABLE VIII-10

Number of trials after a hit or a miss in relation to frequency of switches

no. switches	after hit	Perc.	after miss	Perc.
1	503	69.6	537	62.7
2	159	22	267	31.1
3	61	8.4	53	6.2

TABLE VIII-11

Relationship between motivation and number of switches

Mouse	Condition			Mouse	Condition		
	A	B	C		A	B	C
1	1	3	2	7	2	3	1
2	2.5	2.5	1	8	1	3	2
3	1	2	3	9	2	1	3
4	1	3	2	10	1	3	2
5	1	3	2	11	2	1	3
6	1	2	3	12	1	2	3
				N	16.5	28.5	27.0

between one and two switches. Consequently, the low-jump condition coincides with the after-hit low-jump condition, since all after-miss trials with 1 switch are considered non-random, "mechanical" behavior. In all conditions the number of hits was found to be nearly equal to the expected number of hits, hence all conditions failed to enhance ESP scoring.

It can be concluded that the training was successful in so far as a strong increase in the number of low-jump trials related to the number of high-jump trials was found. This follows from a comparison of tables VIII-10 and VII-10. However, this increase in low-jump trials did not raise the ESP scoring level. It is also of interest to observe, that training strongly reduced the effect of a relationship between number of high and low-jump trials after a hit or a miss, as was found in the experiment previous to this one. Table VIII-10 shows, that in this experiment the relationship has almost disappeared. This was confirmed by an analysis based on the performance of the individual mice.

Finally table VIII-11 gives an impression of the relationship between level of deprivation and number of switches. The distribution of the rank-ordering shows, that only in Condition A (12 hours of deprivation) is a tendency to avoid jumping noticeable. There appears to be no difference between Conditions B and C with regard to this phenomenon. Hence one should observe care before relating a difference in jumping activity to a difference in motivation.

IX LENGTH OF THE SESSION

In all experiments up till now the session length has been kept relatively short, approximately 25 trials per mouse. This length was decided upon when taking into consideration the expected decrease in motivation during the session, and in view of the possibility that a long session might reinforce stereotype behavior. However, one can not rule out the possibility beforehand, especially with animals, that a certain amount of time and trials will be required before the animal can develop and apply its psi ability. It might be that the model, viewing ESP as a kind of information acquiring process, implicitly applied in the experiments described above, is not appropriate. One can speculate that ESP is not a matter of acquiring information, but rather is a process which synchronizes two, in principle independent, sequences of events. Such a model could satisfactorily apply to most experimental research, especially that carried out using the standard-method (e.g. card-guessing, PK dice-tests), and would for instance provide an easy explanation for displacement effects. Moreover it could gather together the main psi phenomena, providing an explanation in terms of the same process.

Based on this model I planned a study in which the animals had to carry out a large number of trials. It was hoped that in this experiment they would gradually be able to synchronize their response pattern with the target sequence. For this purpose an apparatus was constructed, consisting of 10 cages arranged in a circle, which revolved slowly round a common central point. Outside the circle, a panel was mounted consisting of two levers, a light to indicate the onset of the trial, and a water-supply system. When a cage was located in such a position that this panel was directly in front of it, the rotation ceased and after the onset of the light the animal housed in that cage could respond by pressing one of the levers. After pressing the lever a target was selected and depending on the given response the animal was presented with the reward. After 6 seconds to allow the animal to consume the water, the cage started to rotate again until the next cage faced the panel. In the case of an incorrect response or when the animal did not respond at all within 30 seconds, the light which indicated that the trial was on went out, and without further delay the system started to rotate again.

Hence all 10 cages passed the panel successively and as a maximum, if no other animal responded, one particular animal had to wait about 5 minutes before the next trial commenced.

The recording was automated. A target was only generated after the animal had responded. If no response was given this was indicated by punching a special code onto the tape. The beginning of each

revolution for the ten cages, starting with cage 1, was also indicated on the tape.

The RNG was checked for randomness and appeared to show no deviation from randomness. The subjects were 10 N-strain mice, which had received the usual training. The length of the experiment was fixed at 3 days or 72 hours. During the experiment ample food was provided.

Results and discussion

The data of the target sequence based on sequences of targets uninterrupted by trials in which no response was given, is presented in table IX-1. That only uninterrupted sequences are

TABLE IX-1
Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	390	442	$P_W = .494$
	Black	447	440	$P_B = .506$
				$\chi^2 = 1.99 \quad df=1$

TABLE IX-2
Raw data and CR values

Mouse	$T_{W W}$	$T_{W B}$	$T_{B W}$	$T_{B B}$	P_{hit}	CR
2	220	39	211	27	.516	-.83
3	105	43	120	38	.492	-.87
4	173	19	125	23	.549	1.03
5	6	198	15	229	.540	-.68
6	51	89	53	86	.500	-.28
7	100	151	126	164	.506	-.83
8	103	130	120	120	.500	-1.26
9	45	164	63	150	.502	-1.65
10	52	156	65	150	.504	-1.08

considered explains why the total number of trials in table IX-1 is less than the actual total number of trials. The target sequence appears to be sufficiently random. It should be noted that even when this target sequence showed some non-random properties, the target sequence would still be highly unpredictable for each individual mouse, as there could be a range of one to nine other targets generated between two successive trials for any one mouse.

Table IX-2 presents the analysis of the scoring of the mice. Since mouse 1 died on the first day of the experiment, the data of nine mice are available. On average 414 trials were carried out per mouse, or about 138 trials per day. None of the mice scored significantly. However, the distribution of the scores for all mice shows a marginally significant deviation from the expected distribution ($t = 2.68$, $df = 8$, $P < .05$ two-tailed). This effect is mainly based on the phenomenon that, apart from one, all deviations showed to be negative.

As could be expected in the course of the three days, the mice developed a strong tendency to respond in a stereotype way. This is I am afraid unavoidable as long as no negative reinforcement is applied to discourage a wrong response, or if no interim training sessions are used to reinforce a random response pattern. The outcome of this experiment indicates that strong response preferences do not always inhibit significant scoring. However, since the significance is based mainly on the sign of the deviation instead of on the size, the results of this experiment would suggest that response preferences may possibly associated with a tendency to psi-missing. This is a relationship for which, as far as I know, no other evidence has yet been presented, and therefore this data should be treated with caution.

X A COMPARISON OF TWO DIFFERENT TEST PROCEDURES

Encouraged by the results of the experiment reported above, I decided to continue with experiments following the same line. However, in order to avoid excessively strong response preferences the length of the experiment was reduced.

A possible objection to the design of the previous experiment is that one random target sequence is applied for all mice. This implies that if all the mice respond in all trials, the target sequence for each mouse is a partial sequence, successive targets being separated by nine other elements of the real target sequence. In reality this pattern becomes even more complicated as in many trials the mice do not respond at all. Hence, the target sequence for each mouse is a rather irregular part of the entire sequence, the pattern of which depends on the response behavior of the other mice. This might have an influence on the effectiveness of an ESP

process, which synchronizes the response pattern with the target pattern.

In order to investigate a possible negative effect inherent in this property of the test apparatus, an experiment was carried out in which the same animals were tested both with the apparatus described above and with a different test cage. This testcage was basically similar to the other. It contained two levers, a water-supply system in the middle of the front panel, and a target could only be generated after the animal had responded by pressing a lever. The main difference between this and the revolving test cage was, that it was only possible to test one mouse at a time. Consequently, the mouse being tested could respond continually and was presented with an uninterrupted target sequence.

Ten mice of the Wv-strain received training and took part in this experiment. Altogether the mice were tested for 24 hours in the revolving cage test-apparatus (Condition ITS, interrupted target sequence), and individually for 48 hours in the test cage, presenting a continuous target sequence (Condition CTS).

Results and discussion

The analysis of the target sequence, generated by the new test equipment in Condition CTS, is presented in table X-1. The sequence appears to be sufficiently random.

The scores of the mice in Condition ITS are presented in table X-2. None of the scores of the individual mice reach a level of significance, and the distribution of the scores does not appear to differ from the theoretical distribution ($t = .20$, $df = 8$). It can be observed that the number of trials is considerably

TABLE X-1

Analysis of the target sequence in Condition CTS

		Followed by target		
		White	Black	
Target	White	1475	1506	$P_W = .493$
	Black	1508	1562	$P_B = .507$
		$\chi^2 = 1. \quad df = 1$		

TABLE X-2

Raw data and CR values in Condition ITS

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
1	31	18	27	14	.513	-.24
3	18	14	23	23	.495	.53
4	8	31	5	38	.517	.80
5	9	22	11	21	.503	-.42
6	5	11	5	21	.562	.74
7	33	15	33	16	.498	.14
8	17	34	19	32	.500	-.40
9	16	17	28	21	.493	-.75
10	19	4	25	5	.456	-.05

TABLE X-3

Raw data and CR values in Condition CTS

Mouse	T _W R _W	T _W R _B	T _B R _W	T _B R _B	P _{hit}	CR
2	187	406	187	406	.500	0
3	71	294	84	313	.512	-.47
4	347	113	307	113	.511	.69
7	386	59	388	60	.499	.04
8	299	44	331	66	.474	1.03
9	392	31	432	29	.481	-.31
10	263	94	273	83	.500	-.81

smaller than the average number of trials per day in experiment IX. This might be due to the difference in strain of mice. Furthermore it shows that response preferences begin to become rather strong in about 24 hours of continuous experimenting.

Table X-3 presents the data of the scoring of the mice in

Condition CTS. Three mice died before this part of the experiment was completed. None of the CR scores of the mice appears to be significant, and the same applies to the t-value associated with the distribution of these scores ($t = .09$, $df = 6$).

It is striking to observe that the average number of trials in this condition is much higher compared to the average number of trials in Condition ITS. Since the same mice acted as subjects in both conditions, strain differences can not be the cause of the difference in activity. Apart from the fact that a mouse can perform more trials in the CTS condition because it does not have to wait until the other mice have finished their turn, it is most probable that the animals are to a certain extent conditioned to respond, even when not motivated by a deprivational state. From this it follows that in the CTS condition most trials must have been presented when the animal was little motivated. Hence the results contradict a popular notion, which has been applied in most American anpsi studies, namely that a weak motivational level just high enough to motivate the animal is the most optimal level.

Another conclusion that can be drawn from the results of experiment IX and this experiment is, that experiments in which the animal has to choose actively between alternatives are not well suited to test an animal over a long time-span as a consequence of the emergence of strong response preferences. In fact in these experiments we are dealing with partial reinforcement, and it is known that especially with partial reinforcement, extinction of a learned behavior pattern is rather slow.

XI THE EFFECT OF TRAINING THE ANIMALS

A main distinction between the work carried out hitherto with negative reinforcement and the experiments with positive reinforcement, lies in the fact that in the experiments with positive reinforcement a dual choice task was applied, in which the animal had to select one of the alternatives by performing an action, for instance by pressing one of the levers. This implies that in order to activate the animals in to pressing one of the levers after the onset of the trial, it is necessary to condition the animal to the relationship between pressing a lever and obtaining a reward. Therefore in these experiments the animal had some knowledge about the relationship between its own behavior and the possibility of obtaining reward.

It is doubtful whether the latter also applies to the experiments with negative reinforcement, where the animal 'chooses' one section of the cage which, at the moment of onset of the trial is decisive for its receiving or not receiving a shock. Moreover, in the experiments with positive reinforcement the animals were not only trained

as regards the relationship between lever and reward, but also as regards the relationship between the light showing in one of the sections of the cage and pressing the lever of the same color mounted in the same section. In the beginning this training was applied in order to be able to carry out clairvoyance and telepathy experiments in the classical way, more or less similar to the design of experiments with human subjects. Later on, when running experiments of the precognition type, this training was maintained since it also conditions the animal to respond randomly, and hence counterbalances the animal's tendency to develop a zero order response preference for one of the alternatives.

It should be observed that although a tradition seems to be growing in anpsi experiments of combining negative reinforcement with a response mechanism which requires no training, and positive reinforcement with a response mechanism which involves training the animals, in principle both aspects, type of reinforcement and type of response mechanism, are independent. One could combine negative reinforcement with a dual choice task involving pressing levers, and vice versa, positive reinforcement with a design as applied in the French and American work.

Since in all experiments described above the animals were trained it was decided to investigate the possible effect of the training of the animals on the ESP scores. Fifteen animals of the Wv-strain acted as subjects. Ten animals received the usual training as described in Schouten 1972, in which they were conditioned to the relationship between side of the cage and pressing the correct lever. They will be referred to as trained animals. The remaining five animals were only trained as regards the relationship between pressing a lever and receiving a reward. In this case for each trial both levers in the training cage activated the water-supply system. The only aim of this training was to motivate the animal to press the levers when taking part in the experiment. They will be referred to as untrained animals.

Each animal took part in six sessions, one session per day. Each session amounted to about 30 trials. The deprivation period was about 23 hours. For the experiment the same cage was used as applied in experiment X in the CTS condition. Hence the experiment can be classified as being of the precognition type.

Results and discussion

Table XI-1 presents the analysis of the target sequence, which appears to be sufficiently random. Table XI-2 presents the data of the trained animals, and table XI-3 presents the data of the five untrained animals.

Of the 15 animals, the scoring of two animals proves to be significant at the 5% level (two-tailed). For both groups of

TABLE XI-1
Analysis of the target sequence

		Followed by target		
		White	Black	
Target	White	733	745	$P_W = .497$
	Black	724	739	$P_B = .503$
				$\chi^2 = 0$

TABLE XI-2
Raw data and CR values of the trained animals

Mouse	$T_{W W}$	$T_{W B}$	$T_{B W}$	$T_{B B}$	P_{hit}	CR
1	56	45	60	39	.500	-.73
2	42	55	53	59	.503	-.58
3	45	56	53	44	.500	-1.42
4	62	49	59	31	.511	-1.36
5	76	28	67	42	.496	1.69
6	76	33	57	34	.515	.99
7	53	50	45	71	.503	1.87
8	84	32	83	22	.513	-.98
9	70	26	61	38	.497	1.58
10	62	33	53	46	.498	1.63

TABLE XI-3

Raw data and CR values of the untrained animals

Mouse	$T_{W^W}^R$	$T_{W^B}^R$	$T_{B^W}^R$	$T_{B^B}^R$	P_{hit}	CR
11	62	27	58	47	.490	2.00
12	56	43	64	52	.495	.20
13	42	48	50	51	.501	-.39
14	70	31	78	23	.500	-1.13
15	68	26	62	23	.511	-.08

TABLE XI-4

Zero order response preference in both conditions

Mouse	R_W	Rank	Mouse	R_W	Rank
1	.580	6	11	.619	9
2	.455	2	12	.558	5
3	.495	4	13	.482	3
4	.602	8	14	.733	13
5	.671	11	15	.726	14
6	.665	10			
7	.447	1			
8	.756	15			
9	.672	12			
10	.593	7			

subjects, the distribution of the scores is shown to be non-significant (trained: $t = .58$, $df = 9$; untrained: $t = .21$, $df = 4$). The t-test for two independent samples also yielded a non-significant value ($t = .24$).

In table XI-4 the probability of a response white is given for each animal of both groups. A Mann-Whitney test shows that the null hypothesis stating no difference between the two sets of data has to be accepted. This is of interest, as it shows that, contrary to expectation, the training in this experiment did not decrease the zero order preferences. As a consequence of this finding it follows that in a precognition experiment in which the animals have to respond by pressing one of two possible levers, the training can be restricted to conditioning the animal to the relationship between pressing a lever and obtaining a reward.

Furthermore, it can be concluded that an absence of training does not increase the ESP scoring.

CONCLUSIONS

In general it can be stated that the results of this series of experiments are rather disappointing. Little evidence was found for the hypothesis that animals are able to show psi ability.

Furthermore, if the animals appeared to score significantly in a particular condition, a significantly different scoring between this condition and one of the other conditions was nowhere manifested. In principle this does not have to be viewed as a disadvantage, as the knowledge that certain variables do not influence the phenomenon under investigation can be very useful. However, there is a problem here because, given a non-significant difference between the conditions, assuming an ESP influence in the significant condition implies that one assumes that the subject's behavior was also influenced to a certain, but not significant, degree by ESP in the condition which yielded a non-significant result. It depends on the model which one applies, and on the supporting evidence for the correctness of the model, whether such an assumption is acceptable. As regards ESP I feel that as so few consistent facts are known, one ought to be careful in making such an assumption.

Some objections to the experiments reported above can obviously be made. In many experiments some of the variables were not as rigidly controlled as they could have been. The number of trials in a session is but one example. Since the events were recorded on punch-tape and evaluated only after the experiment was concluded, the experimenter, who normally left the room during the experimental session, had no knowledge about the performance of the mice. After some time near the end of the session the experimenter returned,

and if the number of trials was close to 25 or if the number of trials was in excess of 25, the session was terminated. Hence, the difference in number of trials can not be considered as a form of optional stopping. This system gave the experimenter time to perform other duties while the experiment was proceeding. As with this variable a strict control of most variables would require a considerable investment in time, which I felt was quite premature as long as the experiments yielded such meagre results regarding the ESP scoring. For the same reason I never carried out extensive control investigations regarding the effect of some variables, as for instance the training on the behavior of the animals, unless the data of an ESP experiment permitted an analysis of this nature. I thought it a better strategy, which however clearly failed, to first try to create a difference in ESP scoring before starting to investigate what exactly the effect of the particular condition had been on the behavior of the animals.

Another objection which might be raised concerns the method of evaluation. This is not applicable to the fact that the evaluation is based on empirical probabilities, which would seem to me more appropriate than theoretical probabilities, but to the procedure of testing the difference between the observed distribution of CR values and the theoretical standard-normal distribution. In most cases this probably yields a more conservative estimate of significance than when the evaluation is based on the total score of all animals. Judging by the literature, the latter seems to be common practice in anpsi experiments.

However, I feel that such a procedure is only justified when one can assume that no intra-individual differences between the subjects exist. In animal experiments especially, this assumption is difficult to justify, as animals often display response preferences which can vary from animal to animal both as regards direction as well as strength. In addition, although we can not tell as yet, there might also exist differences in ESP ability. For both reasons, I feel that for the time being it is preferable to base the evaluation on the performance of the individual mice. Here again, much depends on the model one applies.

It can be concluded that the efficiency of anpsi experiments with positive reinforcement involving a dual-choice task, is rather low. No animals produced consistently significant scores, nor did any of the three strains of mice tested appear to perform better than the others.

ABSTRACT

Eleven anpsi experiments are reported, applying a dual-choice task and positive reinforcement. The experiments involved telepathy, clairvoyance, and precognition tests. The effect of a number of variables has been investigated, the main variables being different aspects of the target, motivation, and number of trials per session. Mice of three different strains acted as subjects. Nearly all experiments yielded non-significant results. No conclusions can be drawn as regards the effect of the variables on the ESP scoring, except perhaps the conclusion that none of the variables consistently increased the ESP scoring to a significant degree. The finding that significant results are found with RBT's in the after-nonshock and after low-jump condition was not confirmed. No difference in the performance of the different strains of mice were observed as regards ESP scoring.

REFERENCES

- Duval, P. ESP experiments with mice.
Montredon, E. J. Parapsychology, 32, 1968.
- Levy, W.J. The effect of the test situation on
precognition in mice and jirds: A
confirmation study.
J. Parapsychology, 36, 1972.
- Levy, W.J. An improved method in a precognition test
Davis, J.W. with jirds. J. Parapsychology, 37, 1973.
Mayo, L.A.
- Levy, W.J. Two possible sources of ESP information in
Davis, J.W. the rodent precognition work.
Terry, J.C. J. Parapsychology, 37, 1973.
- Levy, W.J. A precognition test with hamsters.
Terry, J.C. J. Parapsychology, 37, 1973.
Davis, J.W.
- Levy, W.J. Repetition of the French precognition
et. al. experiments with mice.
J. Parapsychology, 35, 1971.

Contents of previously published Research Letters by the
Parapsychology Laboratory, University of Utrecht.
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 direction of subjects by means of control
 of motivation of the subjects.
- Schouten, S.A. Coding of targets in a clairvoyance test.
- Johnson, M.U. An attempt to effect scoring behavior in a
 group test of precognition by means of
 manipulation of motivation and by the use
 of individually assigned emotionally loaded
 target material.

No 2, March 1972

- Johnson, M.U. An attempt to control scoring direction by
Johannesson, G. means of treatment of the subjects.
- Johnson, M.U. A test of clairvoyance especially designed
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- Schouten, S.A. A psi experiment with mice in a dual choice
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No 3, June 1972.

- Johnson, M.U. Three papers on the token-object phenomenon.
 -- Theoretical problems.
 -- An outline of a methodology.
 -- A pilot-study with the tracer technique.
- Schouten, S.A. Correction of some figures.

No 4, November 1972.

- Beloff, J. The place of theory in parapsychology.
- Johnson, M.U. A new technique of testing ESP in a real-life
high-motivational context.
- Schouten, S.A. Response preferences in generating random
choices: The equal chance theory.

No 5, February 1974.

- Chari, C.T.K. A note on some research design.
- Johnson, M.U. ESP and subliminality.
- Schouten, S.A. The standard-method as instrument for
parapsychological research.