March 1972

RESEARCH LETTER
OF THE
PARAPSYCHOLOGICAL DIVISION
OF THE

PSYCHOLOGICAL LABORATORY
UNIVERSITY OF UTRECHT
Varkenmarkt 2
Utrecht
Netherlands

CONTENTS

AN ATTEMPT TO CONTROL SCORING DIRECTION BY MEANS OF TREATMENT OF THE SUBJECTS.

by

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INTRODUCTION

In a study previously carried out by the senior author (1), a strong positive scoring was demonstrated (p= 0,013) under the condition when the subjects (N=13) were put in favourable mood and their responses had real-life implications whereas the same subjects, when put in a frustrating situation and harshly treated, obtained chance results. The outcome of the first experiment was according to prediction. As regards the second study, the author hoped to be able to demonstrate psi-missing. This prediction, however, was not substantiated.

In the study here reported[1]), the senior author suggested his co-author to carry out a small study in which subjects were differentially treated, in order to manipulate their scoring direction.

PROBLEM

Trying to manipulate the scoring-direction by

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[1]) It constitutes a part of the co-author's M.A. thesis in psychology. Completed in the summer of 1971, under the guidance of the senior author.

"optimized" favourable respectively "maximized" unfavourable treatment of the subjects.

PROCEDURE

A. Preparations and precautions

150 envelopes were given serial numbers. Six packs of ordinary ESP-cards were put into the numbered envelopes according to a list of random numbers by means of which the five ESP-symbols could be attributed to the serial numbers written on the envelopes.

The entry-points for the list on random number digits were determined by the throwing of two dice. Before the envelopes were sealed each of the cards was wrapped in aluminum foil, to rule out visual cues and the possibility of explaining away significant scoring in terms of optic-skin sensitivity and the like. All these preparations were carried out by two experimenter assistants[1]).

Copies of the lists attributed to serial numbers and ESP-symbols were sent to M.J. in advance of the experiments, carried out by G. Johannesson as the experimenter.

The experiments were carried out as a BM-test of clairvoyance. The key-cards were exposed to the subject and the experimenter whereas the 150 cards to be matched by each of the subjects were wrapped and sealed in the previously mentioned envelopes with the serial numbers.

The task each of the subjects had to carry out was to perform the matching of 150 envelopes. In this experiment p= 1/5 and Q= 4/5.

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[1]) Mrs. A. Cronqvist and Mrs. Britt-Inger Danielsson. Both have written their M.A.-thesis in parapsychology.

B. Description of and procedure of selection of the two groups

In each of the experimental groups (Group + denotes the group we hoped to be able to demonstrate positive scoring (=above MCE-scoring) and Group- denotes the one we hoped we could influence to manifest negative scoring or psi-missing). There were only six individuals. In Group+ there were 4 females and 2 males but in Group- 3 females and 3 males. Most of the subjects were students and no one was above 25 years of age.

Already from the beginning there were marked differences in attitudes towards ESP among the members of Group "+" and Group "-". The "positives" were eager to take part in an ESP-experiment (and a few had by themselves previously carried out informal psi-experiments) and had on the whole a comparatively good knowledge in the field. Quite to the contrary, individuals constituting the "negatives" were very ignorant of the field and by and large they did not believe in psi-phenomena.

Before the BM-experiment took place each individual had to answer a short questionnaire. The questionnaire surveyed the following areas:

1. their attitude towards the authenticity of psi-phenomena;
2. Did they believe that they were going to demonstrate psi capacity in the ESP test?
3. Did they have any kind of spontaneous ESP?

Five of the "positives" gave affirmative answers to all the questions. To be attributed as a "negative" they had to give denying answers to the three items in the questionnaire. The "positives" were all - in the strict sense of the word-enthusiastic volonteers - whereas the "negatives" had to be persuaded to take part in the experiment.

C. Situational factors utilized to influence the scoring behavior of the two groups

The means we used in order to effect the scoring behavior of the "positives" and the "negatives" can be listed as follows:

For the "positives"	For the "negatives"
1. The subjects were promised to be paid $ 3 for their contribution.	1. The subjects were not promised any kind of payment for their contribution.
2. In addition to the payment, they were informed that the one who obtained the highest numbers of hits would be given an award of $ 6.	2. No promise of any kind of rewards if scoring high.
3. The testing was carried out in a very friendly atmosphere in the experimenter's home.	3. The experiment was carried out in a very unpleasant looking and smelling closet at the Department of Psychology.
4. The subject was asked to be seated in a comfortable easy-chair.	4. The subject was left standing in the unpleasant room and was asked to wait a while since the experimenter had to find a chair. (The experimenter came back after 5 to 7 minutes and brought an unsteady stool.)
5. The subjects were given food and refreshments.	5. No refreshments were offered.

6. The subjects were given an introduction of some of the features of the experiment. (Took up to 20 minutes.)	6. No introduction was given.
7. The subjects were given relaxing suggestions from a gramophone record.	7. No relaxing suggestions were given. To the contrary the experimenter maintained a high-brow attitude; snapped questions, responded ironically and in an authoritarian way.
8. The subjects were permitted to carry out the blind-matchings in their own preferred speed.	8. The subjects had to carry out the blind-matching procedure at the rate of one matching every 15th second. The matchings had to be carried out immediately after the stereotyped grumble "Um-hmm" from the experimenter.
9. Breaks were permitted.	9. No breaks were permitted.

Comments

It was found that the treatment of the "negatives" was so unfriendly, so stereotyped and boring that most of the subjects were very close to the "breaking-point" at the end of the experiment.

When a subject had completed his matchings the experimenter kept a record of how the subject had distributed the envelopes with the serial numbers in relation to the five alternatives (corresponding symbols of the key-

cards). Copies of those protocols were sent to the senior author.

D. Evaluation of results

The evaluation of the results were carried out by Mrs. Cronqvist and Mrs. Danielsson and copies of their records were sent to M.J. for independent checking.

RESULTS

The outcome of the experiments are summarized in Table 1.

Table 1. OUTCOME OF THE MANIPULATIVE EXPERIMENTS WITH THE "POSITIVES" AND THE "NEGATIVES"

	Group+ (attempted positive scoring)		
Subject	Obs.No of Hits	Dev.from MCE	
1	23	- 7	
2	24	- 6	
3	36	+ 6	
4	30	± 0	
5	35	+ 5	
6	27	- 3	
	Total 175	- 5	According to MCE:180 Difference: not significant

Group	(attempted negative scoring)		
1	19	-11	
2	25	- 5	
3	19	-11	
4	26	- 4	
5	30	± 0	
6	24	- 6	
	143	-37	MCE: 180. The observed diff. gives a CR=3.08. p= .00208 (two-tailed)

DISCUSSION

For some reason we did not succeed in our manipulation of the subjects to obtain a positive scoring - something that worked in the previous study. (1). On the other hand we were successful in manipulating the subjects in the frustrating situation in such a way that a strong psi-missing could be demonstrated. The difference in outcome of the two studies may be an effect exerted by the experimenters. After all different experimenters functioned in the two studies.
Dissimilarities between the procedure utilized in the two studies may also account for the shift regarding the outcomes. By and large, the outcomes from both the studies are viewed as strongly encouraging.

Further investigations in which the technique of multiple-concerted criteria are used may lead to enhanced possibilities for efficient manipulation of subjects and to better predictions in parapsychological experiments.

In summerizing this investigation the following should be emphasized:

In the "manipulative" experiment that previously has been reported, the obtained difference between the two sub-experiments was as hypothesized - but only the above scores were significant. In the present experiment the difference was as hypothesized - but only the below-chance scores were significant. Both the experiments offer an interesting although a bewildering parallel, that suggests that a certain but not total control over factors influencing ESP scores might have been achieved.

REFERENCE

1. Johnson, M., An attempt to manipulate the scoring direction of subjects by means of control of motivation of the subjects, Research letter of the Parapsychological Division of the Psychological Institute of the University of Utrecht, December, 1-8.

A TEST OF CLAIRVOYANCE ESPECIALLY DESIGNED FOR CHILDREN.

A study on the Effect of the Experimenter-Subject Relationship on ESP-performance.

by

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INTRODUCTION

There is a concerted opinion among most parapsychologists that a subject's age has very little or nothing to do with his psi-ability. That doesn't imply, however, that a procedure of testing that has been demonstrated as successful for a certain age group, will also turn out to be suitable when used on subjects of a different age.

For all kinds of subjects situational as well as personality factors are thought of as important for the outcome of psi-experiments. And more and more during the last decades we have experienced the impact of the experimenter - subject relationship as well as the importance of the adequate choice of "suitable" targets for eliciting the exclusive psi-process in a subject. If we are carrying out experiments with children it is reasonable to assume that the experimenter-subject relation as well as the target-issue are still more crucial than when for instance carrying out experiments with adults. Experiments with children seem to offer several advantages, for instance their greater spontaneity should facilitate the occurence of psi. But to be:

able to elicit and utilize their spontaneity, the experimenter-subject relation as well as the procedure of testing - including the target characteristics - must be carefully considered to be able to maintain their enthusiasm and motivation through the entire test-session.

OBJECTIVE

To demonstrate psi in experiments with children, in a setting specially adapted to the children as regards general psychological atmosphere, a good experimenter-subject relationship in a challenging task. Considerations were given to the development of an instruction that could be easily grasped by the children. In addition a design was followed that could counteract the development of feedback-related non-random behavior among the subjects, for instance, that the target should be located in the same position in the trial after a hit.

POPULATION

52 children between the age of 3 and 7 were used as subjects, randomly distributed into the two groups P (Parent) and O (Outsider), with 26 individuals in each group.

PROCEDURE

Each of the children were exposed to 20 trials. One trial consisted of the presentation of a tray on which five yellow, opaque plastic tubes with screw tops were placed. The child had to decide in which of the five tubes the target was, by pointing towards the tube. After the tube had been indicated, the child was permitted to pick it up and open it. In each trial the p was 1/5 and the q = 4/5.

The children were given the following instruction:

"On the table in front of you there is a tray, and on it you can see five yellow tubes. In one of the

tubes there is a bookmark depicting Pippi Longstocking[1]). In the other tubes there are bookmarks depicting flowers. What you have to do is to guess in which of the tubes you will find your friend Pippi. Pleaseindicate your guess by pointing at it. After that you are permitted to pick it up and to remove the screw top. In that way you will be able to find out if your guess was correct or wrong. If you are successful you will also be given small rewards like candy, a pencil, a balloon etc. Have you understood what you have to do?"

In both the experiments the instruction was given by the main experimenter sitting in front of the child. During the test sessions there was also a controller sitting at the table. Both the main experimenter and the controller were responsible for recording the responses given by the child.

The preparation of a trial

During all the test sessions an experimenter-assistant was preparing each of the 20 trials for a subject in an adjoining room.

The experimenter-assistant was responsible for the preparation of the 20 trays with its five tubes on each of the trays. The locations of the target-tube on a tray was determined in advance according to a system based on random numbers. The location of the target in all the trials was individually determined for each of

[1]) Pippi Longstocking is a well-known and beloved character in Astrid Lindgren's books for children.

the children. The twenty possible positions are depicted in Fig. 1. (See p. 13)

The trays were presented one at a time and the trays were transported into the test-room by the experimenter-assistant.

HYPOTHESIS

It was assumed that the group that had one of their parents (usually their mothers) as the main experimenter (Group P) should obtain more hits than the group that had an outsider as their main experimenter.

RESULTS

The outcome of the two studies are summarized in Table 1.

Table 1. THE OUTCOMES OF THE EXPERIMENTS WITH THE TWO GROUPS OF CHILDREN WHEN THE MAIN EXPERIMENTER WAS A PARENT OR OUTSIDER RESPECTIVELY

Group	Total No of guesses	No.of Hits	MCE	Dev.	CR
Group P N = 26	520 (26 x 20)	127	104	23	2.84
		p= .005 (two-tailed)			
Group O	520 (26 x 20)	115	104	11	1.206
		(not sign.)			
Group P and Group O, Combined	1040 (52 x 20)	242	208	34	2.58
		p= .01 (two-tailed)			
	The difference in scorings between the two groups gives a CR_d=.93, which is not significant				

Fig. 1. Configurations of stimuli presented to the children (Positions of targets randomized for each of the subjects)

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Trial		Trial	
1.	x x x x x	11.	x x x x x
2.	x x x x x	12.	x x x x x
3.	x x x x x	13.	x x x x
4.	x x x x x	14.	x x x x x
5.	x x x x x	15.	x x x x x
6.	x x x x x	16.	x x x x x
7.	x x x x x	17.	x x xx x
8.	x x x x x	18.	x x x x x
9.	x x x x x	19.	x x x x x
10.	x x x x x	20.	x x x x x

DISCUSSION

Our hypothesis became substantiated that the group of children that had one of their parents as the main experimenter succeeded to a high degree and better than the group that had an outsider as their main experimenter. Even if the result from the study with an outsider as the main experimenter did not give statistically significant results, the observed deviation is in the expected direction. It is at least possible that the very design of the experiment and the choice of target have been successful. It should not, however, be taken for granted, that the observed deviation is a genuine effect of ESP. The weak link of the experiment is, no doubt about it, that the experimenter-assistant was permitted to enter the room with the target-material. Even if the experimenter-assistant had been instructed to stay in the background as much as possible, the fact cannot be denyed at least from a theoretical point of view, that there could have been some kind of sensory linkage between the experimenter assistant and the main experimenter and/or the children tested. It should, however, be observed that the children succeeded better in the situation with their mothers as the main experimenter, and that may speak in favour of the ESP-hypothesis. As an alternative explanation we can imagine that the presence of a mother could have facilitated the reception and interpretation of the hypothetic "cueing" from the experimenter assistant. This rather crucial question can only be answered by a repeated studies.

SUMMARY

52 children between 3 and 7, randomly distributed intro two groups of the same size, were given an individual test of clairvoyance, especially designed to be suitable for children. Children belonging to the "P-group" had one of their parents as the main experimenter, whereas children

in the "O-group" had an outsider as their main experimenter. Attention was paid to the problem of how to counteract the development of feedback related non-random behavior among the subjects. Based on previous findings as regards the effect of the experimenter-subject relationship on ESP-performance, tentatively it was assumed that children who had their parents (mostly mothers) as their main experimenters should obtain more hits than children who belonged to the group in which an outsider functioned as the main experimenter. Actual findings may give some support to this assumption, although an alternative explanation, based on "cueing" must be kept in mind.

A PSI EXPERIMENT WITH MICE IN A DUAL CHOICE DESIGN WITH POSITIVE REINFORCEMENT.

Sybo A. Schouten

INTRODUCTION

In 1968 Duval and Montredon (1968) published the results of an experiment which gave suggestive evidence that mice were able to use psi ability in an experimental design, in which they could avoid an electric shock by choosing the correct side of their cage. For each trial a random selector chose which of the two sides was to receive the electrical current. The test was completely automated and the recording device showed for each trial the position of the mouse at the moment the electrical current was delivered and the side which was electrified. Although the total results were not significant, it showed that in the so-called "random behavior" trials the mice chose to a very significant degree the non-shocked side of the cage. Random behavior trials are when the mouse jumped over to the other side after a trial, in which it had not received a shock and consequently had no reason to jump. This concept of random behavior trials was introduced, because in most trials the mice showed a very stereotyped behavior, for instance by jumping over to the other side after having received a shock and by remaining there until that side was chosen by the random selector and the mouse received a shock again.

The main advantage of this experimental design is its efficiency. There is no need for elaborate training of the animals, also the possible number of trials in each session is rather large compared to other types of animal experiments, and because of the automated design the experiment itself

takes up little of the experimenter's time. In addition the automatic recording device and the built-in controls for recording secure the avoidance of recording errors. A possible disadvantage of the design is the use of shocks as reinforcing stimuli. As the animal is not given any perceptual cue to discriminate between the side which will be electrified and the other side, and because it will experience a shock in approximately half of the trials, it can be expected that the animal will become rather frustrated and this can function as an inhibitive condition for eliciting psi.
An additional effect of using a shock as reinforcer will be that it enhances stereotyped behavior. It is reasonable to assume that the shock is a considerably stronger stimulus than the possible psi "stimulus". So, after receiving a shock an avoidance reaction is more likely than a response based on a psi stimulus, which tells it for instance to remain in the same side of the cage. The reverse will take place in the case when the animal did not receive a shock. This stereotyped behavior, weakens the efficiency of the test because each trial, in which the behavior of the animal is based on non-psi stimuli can be considered as lost with respect to the first aim of the experiment; to detect whether or not psi did influence the behavior of the mice.
Duval and Montredon solved this problem by introducing a distinction between "random" and "non-random" trials. This means however, that about three quarters of the number of trials have to be excluded from the evaluation. Moreover, the prevent loosing even more trials, the criteria for random or non-random trials are to be based on a very limited number of successive trials. Then it is clear that these criteria can only be considered as rather abitrary. If the mouse remains in the same side of the cage during for instance one hundred trials, and is shocked in nearly half

of the trials, then it can be considered as a statistically significant type of non-random behavior. But this does not imply that the behavior of the mouse, each time it remains in the same side in just two successive trials, can be attributed to the same mechanism. This becomes especially clear in the situation in which a mouse, which behaves fairly normally in all trials- it switches position in nearly half of the trials- remains on the same side after having received a shock in the previous trial. According to the criteria used by Duval and Montredon this behavior too is to be considered as non-random or "static" behavior.

The hypothesis that animals can show psi-ability deserves serious attention, not only because of the fact itself but also because of the possibility for opening new fields of research otherwise not accessible. If indeed mice can be utilized as "guinea pigs" for parapsychological research it would mean a considerable step forward in research. Moreover, mice have certain advantages over the "standard" animal for behavioral research, 'the rat'. Because of their size mice are for several reasons more convenient for experimenting, and their learning ability seems not to differ from those of rats (Reetz, 1957; v.Boxberger, 1959). So it seems worth while to try to validate the results of Duval and Montredon. For various reasons a different design was chosen to accomplish this aim. In the first place it seemed important to avoid some of the disadvantages of Duval and Montredon's design, especially those related to stereotyped behavior and frustration. A second consideration was that the value of mice as experimental animals for psi research depends also to a large extent on their ability to show psi in various test situations. The fact that they would be able to show psi ability in a different design would strengthen the validation itself.

A third reason was to create the possibility for investigating whether a telepathic relation

between mice is possible. If evidence could be found for the possibility of the existence of such a relation this would imply that a number of important parapsychological phenomena could be investigated by using mice as subjects.
In order to test a possible telepathic relation between mice it is necessary to choose a design in which one mouse can perceive the target and "knows" the meaning of it, while the other mouse is put in a choice situation in which it has to guess the target. In order to make such a test meaningfull for both mice a situation was created in which both participants are dependent on each other. If the "receiver" gives a correct response then both are rewarded, in the case of an incorrect response, neither receive the reward. In addition, as a possible relationship between the cooperating animals might have an influence, the same mice are always used to work together and each pair has been housed for some months previous to the test in a seperate cage.
A positive reinforcer- drops of water- was applied to avoid frustration and to minimize stereotyped behavior. The training was also performed in such a way that not only the animals learned the relation between targets and responses, but also to choose randomly.
In this training the animals learned that they could earn a reward by pressing a white lever when a light stimulus was given in the white painted section of the cage, or by pressing a black lever when the light shone in the black painted section of the cage. Both levers were placed in the section of the same colour.
Apart from the first sessions the sequence of the targets- white or black section of the cage- was fixed by a random selector. Light stimuli were chosen because there is ample evidence that the mouse has sufficient visual capacity to learn brightness discrimination (Bonaventure 1961) and because it excludes the risks of sensory cues. It is relevant to note, that the training was not directed at teaching the mice

to discriminate between black and white. In that case a different training procedure would have to be applied. The mice had to press the lever which was placed on the side which was illuminated. The sides were given particular colours only for further differentiation.
A small drop of water was used as a reward because previous studies had shown, that water is a more effective and convenient reinforcing stimulus than food.
In the actual experiment two similar cages were used, one containing the levers and the other the lights. The cages were placed in different rooms. The experiment was entirely automated; the only task of the experimenter was to place the animals in the cages; to start the experiment by pressing a button and to remove the animals after a fixed number of trials were carried out. The target sequence was fixed by a random selector and for each trial target, response and time between target and moment of response were punched on tape.
In order to be able to draw conclusions from the results about a possible telepathic relation it is necessary, since in the chosen design no distinction can be made between telepathy and clairvoyance, to include in the experiment a clairvoyance condition in which neither a mouse nor the experimenter could see the light in the "target cage". Only in case the scoring in this clairvoyance condition is significantly different from the scoring in the telepathic condition, can it then be assumed that the presence of a mouse in the target cage had an influence on the scoring. So in the experiment two conditions were run, one in which one mouse of the pair was placed in the target cage (the telepathic condition) and one in which no mouse was placed in the target cage (the clairvoyance condition). Apart from the "sender mouse" in the telepathic condition, no one could see the targets during the experiment.

One of the aims of the design has been to eliminate stereotyped behavior as much as possible, to avoid being forced to split up the trials into random and non-random behavior trials. As mentioned before, the criteria for this distinction, the pattern of a small number of successive trials, is rather weak for attributing the word "explanation" for the behavior shown in this pattern. For this reason it was decided to base the evaluation of the experiment on all trials. According to the aim of the experiment, to confirm the finding of Duval and Montredon that mice are able to show psi ability, and to see whether telepathy between mice is possible, the main evaluation will be focused on the total number of hits and on the difference in scoring in both conditions. Further statistical analysis will be carried out but is given in a separate section. Apart from the expectation that the scoring will show positive deviance from chance expectation, no hypotheses are formulated because there is as yet too little known about psi phenomena in animals.

Animals

C57Bl. mice were chosen mainly because they are internationally available, and because it has been shown, that compared to other strains C57Bl. mice are rated highest for explorative behavior (Thompson 1953), wheel activity (Bruell 1964) and operant lever bar pressing (Goodrick 1967). The before mentioned factors indicate that these mice will probably learn more rapidly than mice of other strains.
As the animals were to be housed in pairs in the same cage for some months, only females were taken because females are less aggressive and more stable in their behavior than males (v.Boxberger 1953). All ten animals were approximately 5 months old at the time of commencing training.

Housing

The ten animals were housed in five cages. An automated water delivery system took care of the availability of a drinking bottle in each cage for 25 minutes per day, during which period both mice could drink as much as they liked. The first pair could drink from 9.45 till 10.10 a.m., the second pair from 10.35 till 11.00 a.m. etc. Training or testing was always performed in the morning in the period from 9.00 - 11.00 a.m. in a sequence, similar to the sequence in which the pairs of mice received water.

Training

The animals were first trained in a grey-coloured cage, containing one grey lever in the middle of the long side of the rectangle, a water feeding system (a Ralph Gerbrands dipper system, type B, adapted for mice) exactly opposite the lever, and a buzzer. Pressing of the lever after the buzzer sounded, was automatically rewarded with a drop of water.
In the second training phase, the animals were trained in a cage of the same size, divided equally into a black and a white section. The cage contained a buzzer, a white lever in the white section and a black lever in the black section, and two bulbs, one mounted in the side-wall of the white, and the other similarly in the black section. The water delivery system was again in the middle of the back wall. After the buzzer sounded, one of the lights was switched on. The animals were trained to press the lever in the side where the light was shown. A correct answer was rewarded with a drop of water; touching the wrong lever was punished by turning the light off and by withholding reward. Each animal performed 25 trials a day. Apart from the first sessions, the black-white sequence was fixed by using a random selector.
This fixed procedure was not always followed however. If some mice showed special peculiarities in their choice-behavior, the sequence was chosen

in such a way that these peculiarities were extinguished first, in order to achieve the learning criteria as soon as possible. The training was finished after the animals gave 200 or more (80 percent) correct responses in each of two successive sessions.

Test Apparatus

The two cages used in the experiment were of the same size as the cages used in the training. The target cage contained a water feeding system, a buzzer and two bulbs, mounted in the side walls of the white and black section. The response cage contained a water feeding system, a buzzer and a white and black lever, each mounted in the section of the same colour. The position of all items of the system were exactly as they were in the training cage.
In the experiment, the two cages were put into different rooms, separated by two other rooms. The random selector, the puncher and the rest of the apparatus were placed in the room in which the target cage was situated.
After pressing the start button, the random selector made a choice and automatically the buzzer and one of the lights were switched on in the target cage. In addition the target was recorded on tape. Half a second later, the buzzer sounded in the response cage and the mouse could respond. Whatever response it gave, the lever which was pressed would switch on a relay in the main apparatus in the other room. This construction was preferred to the alternative, in which only a current in the case of a correct response was put through by the lever, to avoid the possibility of cueing, based on the fact that to only one of the switches, connected with a lever, a current was delivered. If the answer was correct then the water system in both cages would provide a drop of water. If the answer was incorrect, then no reward was given. In both cases immediately after the response the buzzer and light were switched off and the answer was punched.
Having recorded the target, the tape started to run at a constant speed and halted at the moment

the response was punched. So it became possible to deduce the response time from the lenght of the tape between target and answer. A new trial started automatically at the end of a fixed interval of 30 seconds after the response was given.

Test Schedule

The experiment consisted of 6 sessions, one session a day. Each of the 10 mice performed 25 trials a day, so there were in total 250 trials in each session. The telepathy sessions (T) and clairvoyance sessions (C) were alternated according to the sequence T.C.C.T.T.C. Two training sessions were run between the experimental sessions to check whether the learning criterion was still fulfilled and to counteract a possible tendency to develop non random choice behavior. In all sessions the mice took the test in the same sequence. It might be relevant to note that, contrary to the clairvoyance condition, in the telepathy condition each second mouse of the pair had already got some water before taking the test, because it had cooperated with the first mouse in the previous 25 trials acting as "sender".

Statistical evaluation of the experimental results

The random selector was tested after its completion for a possible bias both in respect of frequencies of the generated symbols and of sequential dependencies, and showed no sign of non random choice at that moment. It was suspected, however, after a check before the experiment, that the selector had developed a small bias in favour of one of the symbols. In addition, although the training was directed at teaching the animals to choose at random, one still has to reckon with the possibility that some of the mice will show a preference for one of the alternatives. As these response habits would be different for each mouse and because they were informed after each trial about the correctness of the response - which makes an

essential difference between this type of experiment and the average ESP experiment with human subjects - it was decided to evaluate the results for each mouse seperately under both conditions and to base this evaluation both on the distribution of the targets and on the distribution of the responses. From this the total result of the experiment can be evaluated by combining the results of the individual mice. In each of the two conditions the mice performed 75 trials each. If we call the number of white, target T_w, the number of black, target T_b, the number of response white R_w and the number of response black R_b, then the probability for each possible combination of target and response will be: $P_{ww} = T_w R_w / n^2$, $P_{wb} = T_w R_b / n^2$,

$$P_{bw} = T_b R_w / n^2 \quad , \quad P_{bb} = T_b R_b / n^2 \ .$$

From this it follows that the probability for a correct response is given by: $P_{hit} = P_{ww} + P_{bb}$, and the probability for a miss becomes $P_{miss} = 1 - P_{hit}$.

For 75 trials and in case the P_{hit} does not differ too much from the value 0,5 - in fact it must be between 0,3 and 0,7 - the binomial distribution associated with this probability and number of trials can be considered normal. So for each mouse it is possible to transform the number of hits into a CR value, based on the standard-normal distribution, and the results for each condition together with the total results can be evaluated by comparing the distribution of these scores with the theoretical distribution. In addition, the effect of the conditions can be evaluated by applying a t-test for related samples.
The results of the experimental sessions will be tested 'one-sided' because, with reference to Duval and Montredon's result, a positive deviation can be predicted. All other

evaluations will be tested two-sided as no predictions can be made, except for the evaluation of the random behavior trials carried out according to the criteria applied by Duval and Montredon.

Statistical evaluation of the random selector

A random selector can show two main types of non randomness. An unequal distribution of the frequencies of the symbols and a dependency between the successively generated symbols. The first type of non randomness is not vital, because this changes only the probabilities for the different symbols and can be coped with by applying a different distribution than the one which would be used in case all symbols had the same probability. The second type of non randomness, however, is crucial, because this type of error violates the basic characteristic of randomness, viz: that each possible outcome is independent of any previous outcome or, to put it in a different way, that for each choice the probability for each outcome remains the same. The difference between these two types of non randomness can be illustrated by the example of the closed decks.
A closed deck of 25 Zener cards, containing 5 cards of each symbol, is not random in its distribution of the frequencies of the symbols, because these frequencies will always be exactly equal, but should be random in the sequence of the symbols. If this sequence is random, it becomes possible to evaluate the number of hits by applying the variance given by Greville (1943). The value of the variance depends on the response pattern of the subject and this actually means, that the distribution on which the evaluation is based depends on this response pattern. In our experiment we are dealing with a similar situation.
From this it follows that in checking a random generator it is necessary to check the required independence between successive choices and that

it is not enough to check only the distribution of the frequencies of the generated symbols.

RESULTS

The target sequence

The evaluation of the generated target sequence to check on a possible dependency between successive outcomes is based on the distribution of all possible combinations of two successive outcomes. The target sequence can be considered as a sequence of T_w's and T_b's. Now from the observed frequencies of T_w and T_b it is possible to compute the expected values for the combinations $T_w T_w$ (target white followed by target white), $T_w T_b$ (target white followed by target black), $T_b T_w$ and $T_b T_b$.

For instance: $E_{ww} = P_{T_w} \cdot P_{T_w} \cdot n.$

The matrix of observed and expected values is evaluated by a Chi-square test. If there are any irregularities in the generator, these must show in this matrix. The results of the evaluation are given in the following table.

Table 1: analysis of the target sequence.

		followed by T_w	followed by T_b	
				P_{T_w} =0.5522
first generated	T_w	f=446 E=439.4	f=352 E=356.3	P_{T_b} =0.4478
	T_b	f=343 E=356.3	f=301 E=289	Chi-square= 1.17 df= 1

The observed values are quite close to the expected values. As the Chi-square is not significant, the conclusion can be drawn that the target

sequence was random and that the evaluation of the experimental results can be carried out according to the planned procedure. The size of the P_{T_W} value indicates that indeed the selector was biased in favor of T_w.

The experimental results.

For each condition the results of the individual mice are given in table 2 and table 3.

Table 2: Raw data and CR values for the clairvoyance condition.

mouse	T_wR_w	T_wR_b	T_bR_w	T_bR_b	n	Phit	E	CR
Ep	44	2	26	3	75	0.598	44.9	0.49
Karel	38	7	24	5	74	0.573	42.4	0.14
Jan	40	7	23	5	75	0.586	44.0	0.24
Jaques	24	3	36	12	75	0.416	31.2	1.12
Henk	29	9	25	12	75	0.502	37.7	0.76
Els	27	16	18	14	75	0.513	38.5	0.58
Tops	31	10	21	13	75	0.517	38.8	1.20
Lien	34	11	21	9	75	0.545	40.9	0.49
Frank	23	17	12	23	75	0.497	37.3	2.01
Liesbeth	9	23	20	24	76	0.519	39.4	-1.48

The distribution of the CR scores in the telepathy condition has a mean value of 0.377 and a s.d. of 1.076. Compared with the theoretical standard normal distribution by means of the Student t-test, the difference shows to be not significant. ($t = 1.05$; $df = 9$). The distribution of the CR scores in the clairvoyance condition has a mean value of 0.555 and a s.d. of 0.855. This distribution is slightly different from the theoretical distribution ($t = 1.95$; $p<.05$). The distribution of all scores is different from

Table 3: Raw data and CR values for the telepathy condition.

mouse	T_wR_w	T_wR_b	T_bR_w	T_bR_b	n	Phit	E	CR
Ep	50	7	17	1	75	0.703	52.7	-0.43
Karel	29	12	22	11	74	0.520	38.5	0.35
Jan	34	8	25	8	75	0.533	40.0	0.46
Jaques	27	14	21	12	74	0.516	38.2	0.18
Henk	29	13	21	12	75	0.518	38.9	0.48
Els	29	13	24	9	75	0.524	39.3	-0.30
Tops	21	11	28	15	75	0.477	35.8	0.05
Lien	35	10	17	15	77	0.529	40.7	2.15
Frank	16	29	16	14	75	0.485	36.4	-1.48
Liesbeth	20	18	10	28	76	0.500	38.0	2.31

the theoretical distribution at the .03 level ($t= 2.08$; $df= 19$).
The t-test for related samples, applied to the scores of the same mice under both conditions did not yield a significant t-value ($t= 0.29$; $df= 9$), so the distribution of the scores in both conditions can be assumed to be equal.
The sd-values of the scores in both conditions ($sd_t = 1.076$ and $sd_c = 0.855$) were compared by an F-test to the expected value ($sd= 1$). This result also showed to be not significant ($F_t = 1.16$; $F_c = 1.39$).
Out of the 20 scores, 16 had a positive sign and only 4 had a negative value. Compared with the expected distribution, the sign-test yields a value of $T= 2.45$, which is significant at the .01 level.

From these evaluations it can be concluded that the mice scored significantly above chance-level, but that the size of the deviations were rather

small; only the total result showed to be marginally significant. The conditions did not have any influence upon the scoring.

FURTHER ANALYSIS

Correlation between the scores in both conditions.

Since the distributions of the scores under the two conditions did not differ the conclusion can be drawn that the conditions did not have a systematical effect on the performance of the mice. However, it is possible that the conditions had an effect but that the effect was different in relation to the direction of scoring for each individual mouse. This would imply that some mice are more capable of scoring in the clairvoyance condition than in the telepathy condition, while the reverse is true for the other mice.
If the distribution of the results in both conditions is nearly equal in respect to mean score and variance, an effect of this kind might result in a negative correlation between the scores of the same mice in both conditions. The results of this analysis is given in the next table.

Table 4: distribution of and correlation between the scores obtained under the two conditions.

	mean score	sd	n	r	P
Telepathy	0.377	1.076			two-sided
			10	-0.76	.01
Clairvoyance	0.555	0.855			

The correlation shows to be negative and the size of the correlation is significant at the .01 level. This is an indication, that the conditions did influence the scoring, but that the direction of the effect is related to the individual mice.

Analysis of random behavior trials chosen according to the criteria of Duval and Montredon.

It was decided, in order to make it possible to compare the results of this experiment with the results of the experiment by Duval and Montredon, to carry out an analysis applying the same method as used by these authors. This implies the selection of random behavior trials based on their criteria. But when analysing these criteria their arose some doubt about their method of evaluation, which is based on the assumption that hits and misses in random behavior trials have an equal probability. Duval and Montredon define random behavior trials as:

"either the animal not having been caught in the wrong side of the cage in trial n-1, was caught in it in trials n, the lottery having again selected this same side ...

or the animal not having been caught in the wrong part of the cage during trial n-1 is not caught either in the other side during trial n".

This means that only these trials are evaluated in which the mouse, after a trial in which it was not shocked, jumped over to the other side of the cage. So the evaluation is based on trials in which the mice showed one specific type of behavior and therefore the result of the action must depend on the outcome of the random selector. Hence a specific action of the mouse is taken as the independent variable, whereas the outcome of the generator becomes the dependent variable.

In fact in such a case an interpretation of an excess of hits in the random behavior trials as regards psi ability, is not justified without further evidence, assuming equal probabilities for a hit and a miss. This can be illustrated by considering all possible situations involved in the experiment. These are given in table 5. M and S indicates the position in the left or right section of the cage for the mouse and the shock (respectively) in two successive trials.

Table 5: Possible events for two successive trials in Duval and Montrdon s experiment.

trial	n-1	n	n-1	n	n-1	n	n-1	n
L	MS	MS	MS	M	M	MS	M	M
R				S	S		S	S
poss.	A(miss)		B(hit)		C(miss)		D(hit)	

trial	n-1	n	n-1	n	n-1	n	n-1	n
L	MS	S	MS		M	S	M	
R		M		MS	S	M	S	MS
poss.	E(hit)		F(miss)		G(hit)		H(miss)	

trial	n-1	n	n-1	n	n-1	n	n-1	n
L	S	MS	S	M		MS		M
R	M		M	S	MS		MS	S
poss.	I(miss)		J(hit)		K(miss)		L(hit)	

trial	n-1	n	n-1	n	n-1	n	n-1	n
L	S	S	S			S		
R	M	M	M	MS	MS	M	MS	MS
poss.	M(hit)		N(miss)		O(hit)		P(miss)	

A hit in a random behavior trial is found in those trials, in which the mouse avoided a shock by actively moving to the other compartment without having received a shock in the previous trial. These are the possibilities G and J. In these trials the random selector generated the sequences RL and LR. Misses in random behavior trials occur in the possibilities H and I, in which the sequences RR and LL were generated. Hence in random behavior trials the evaluation consists of a comparison of the frequencies from the generated combinations RL and LR (alternations) versus RR and LL (repetitions) From this it follows that Duval and Montredon's significant result is caused by an excess of combinations RL and LR in the random behavior trials.
Now let us consider the remaining possibilities. A repetition leads in 4 cells to a hit (D,E,L,M), and in two cells to a miss (A,P). The alternations

LR and RL, however, lead in two cells to a hit (B,O) and in 4 cells to a miss (C, F, K, N). It can be shown, that in this situation a bias in the random generator, favouring combinations RL and LR, will tend to produce a significant number of hits in the random behavior trials, associated with a <u>not</u> significant number of hits, or even a negative deviation for the number of hits in the results of all trials. Therefore the evaluation of the number of hits in the random behavior trials should be based on the ratio of the frequencies of RL and LR versus RR and LL as was found in all trials. If this ratio turns out to be approximately one, which means that the selector is random in respect to the sequences of two successive outcomes, then a near MCE total result implies an excess of misses in the non random behavior trials, a phenomenon difficult to explain. If this ratio is nearly equal to the ratio found in the random behavior trials, an explanation in terms of a biased random selector is more likely.
As with Duval and Montredon, random behavior trials in this experiment can be defined as those trials, in which the mouse presses the other lever in trial n after a hit in trial n-1. In this situation a hit means, that in two successive trials the combination T_wT_b or T_bT_w was generated, and a failure means, that the combination T_wT_w or T_bT_b was generated. The distribution for hits and misses in these trials, together with the distribution of the observed frequenties for T_wT_b plus T_bT_w and T_wT_w plus T_bT_b, are given in table 6.

The probability for the sequence T_wT_b or T_bT_w is $P_{alt.} = \frac{69}{144}\frac{4}{1} = 0,4816$ (see table 6)

Hence the expected number of hits in the random behavior trials becomes $E_{hit} = 0,4816 . 264 =$ 127,1, and the deviation of hits shows to be d = 21,9

Table 6: Distribution of successive targets in random behavior trials and all trials.

	hits or T_wT_b plus T_bT_w	misses or T_wT_w plus T_bT_b	n
random behavior trials	149	115	262
all trials	694	747	1441

The distribution of hits and misses in the random behavior trials with p = 0,4816; q = 1-p = 0,5184 and n = 264 can be assumed to be normally distributed with a standard deviation sd=8.12. From this it follows that the observed deviation is significant (CR=2,70; p<.005 one-sided) and that the mice scored significantly more hits in these trials than could be expected by chance.

Response behavior of the mice.

In table 7 the observed and expected frequenties are given of successive responses of the mice.

Table 7: Successive responses of the mice.

	R_w	R_b	
first R_w	f 709 E 660,1	f 263 E 315,2	P_{R_w} =0,6768 P_{R_b}=0,3232
R_b	f 272 E 315,2	f 197 E 150,5	Chi-square= 32,5 df=1 p<.01

These data reveal two main features. In the first place it shows that the mice were biased in their choices in favour of R_w, probably caused by the bias in the selector for this colour. In the second place the mice showed a significant tendency to repeat their previous choice. This tendency could be explained by the assumption, that mice will repeat a choice after a hit and change their choice after a miss, hence in case of an excess of hits an excess of repetitions of the previous choice should be found. In order to be able to check this assumption the relation between a choice, and the previous choice, being a hit or a miss, was investigated. The data are given in table 8:

Table 8: Choice of the mice after a hit or a miss.

first	R_w	R_b
T_wR_w	f 427 E 381,7	f 136 E 182,3
T_wR_b	f 145 E 156,3	f 86 E 74,7
T_bR_w	f 278 E 276,1	f 130 E 131,9
T_bR_b	f 127 E 161,1	f 111 E 76,9

This data indicates that the afore mentioned assumption can not be maintained entirely. It shows that there is a strong tendency to repeat the previous choice after a hit, but that there is no relation between a miss and the successive choice. One might say that the mice showed random behavior after a miss, because the choice is independent of the previous one and the result of that choice. But this implies if random behavior facilitates psi ability it is to be expected that the mice scored better than chance after a miss. The results of this analysis are given in the next section.

Analysis of random behavior trials, chosen on the basis of the response behavior of the mice in the experiment.

If all trials after a miss are considered as a separate experiment, then the probability for a hit or a miss depends on the probabilities for each possible combination on target and response, based on the observed frequencies for targets and responses in these trials.
These probabilities are:

$P_{T_w} = 0,5461$ $\quad P_{R_w} = 0,6619$

$P_{T_b} = 0,4539$ $\quad P_{R_b} = 0,3381$

$P_{hit} = P_{T_w} \cdot P_{R_w} + P_{T_b} \cdot P_{R_b} = 0,5149$

The results of the analysis of the number of hits in these random behavior trials is given in table 9.

Table 9: Number of hits in trials following a miss.

n	hits	MCE	dev.	s.d.	C.R.	P
639	343	329	14	12,6	1,11	n.s.

Although a positive deviation is found, the size of the deviation does not show any significance. The mice did not score exceptionally in these random behavior trials. The implications of this finding will be discussed later on.

Randomness of the sequence of hits and misses.

In order to find indications for the nature of the variables, which might be of relevance for the phenomenon under investigation, an analysis was carried out to see whether there are any peculiarities in the sequence of hits and misses. For instance, one of these peculiarities could be an excess in the sequence of hits, which would suggest that psi ability is rather related with a

certain "state" of the animal than with randomly distributed sudden "flashes". Therefore the sequence of hits and misses was put to the same test as the target sequence. The data are given in the next table.

Table 10: Sequence of hits and misses in successive trials.

	hits	misses	
	f 457	f 347	
	E 444,8	E 355,8	$P_{hit} = 0,5556$
first			
	f 342	f 295	$P_{miss} = 0,4444$
misses	E 355,8	E 284,6	

Chi square=1,47 df=1

P = n.s.

The observed frequencies shows there to be no significant differences from the expected values, hence the sequence of hits and misses can be considered random.

Relation between response time and scoring

For each trial the time between commencement and the moment of response has been recorded, which enables one to investigate the relation between response time and number of hits and misses. The response time is divided into intervals of 1,25 seconds and for each interval the number of hits and misses were fixed. Both distributions are compared by applying the Kolmogorov-Smirnov test.

Table 11: Relation between number of hits and misses and time of response.

time in seconds	0-1,2	1,3-2,4	2,5-3,6
hits	425	240	98
Cp	0,5095	0,7972	0,9147
misses	355	164	85
Cp	0,5322	0,7780	0,9054

time in seconds	3,7-4,8	4,9-6,0	6,1-7,2	7,3-8,4	8,5
hits	37	11	9	3	11
Cp	0,9590	0,9721	0,9828	0,9863	1,0000
misses	35	12	6	5	5
Cp	0,9578	0,09757	0,9846	0,9920	1,0000

$D_m = 0,023$ n.s.

According to the Kolmogorow-Smirnov test, both distributions can be considered of no difference, which indicates that no relation exists between scoring and response time. As over 90 percent of the responses are given within 3,6 seconds, it can be supposed that the mice were well motivated when taking the test.

Discussion

As the total result of the experiment is significant in respect to the direction of the deviations, and marginally significant in respect to the size of the deviations, it can be stated tentatively that there is some evidence that psi exerted an influence on the behavior of the mice. Assuming that this is the case, the results of this experiment can be considered as a confirmation of

the results published by Duval and Montredon. This holds true especially as regards the finding that in so called random behavior trials, trials in which the mice showed a change in their choice after a hit, the mice will score significantly more hits than is to be expected by chance. As Duval and Montredon pointed out, this phenomenon was already noticed by Osis and Foster (1953). This confirmation is strengthend by the fact, that the design applied in this experiment differed considerably from the method used by Duval and Montredon.

For the interpretation of this phenomenon, however, it is important to point out that actually the term "random behavior trials" is not very appropriate for this type of behavior. The concept of randomness is always connected with a stituation in which more than one possibility of outcomes or actions is involved. Random behavior trials according to the criteria of Duval and Montredon are based on one specific act of the mouse, i.e. a change in its choice after a hit. Considered from the point of view of the mouse, these acts are part of a choice situation, changing the choice or not changing the choice after a hit; in which the mice showed, at least in this experiment, a very stereotyped behavior, namely a tendency to repeat the same choice. It is likely that the same tendency existed in Duval and Montredon's experiment because they wrote:

"In most cases, the animal behaved in an almost purely mechanical manner, it remained in one side of the cage until it was shocked; then it jumped to the other side until another shock caused it to jump one again". (Duval and Montredon 1968), so it seems more appropriate to give these trials a different name, not including the term "random behavior". For instance "deviant non random behavior trials". In the "Further analysis" section it was shown, that

the mice had chosen randomly in respect to the sequential order in the trials following a miss. It seems more logical to call these trials "random behavior" trials. The finding that the mice scored in these trials without significance, but did so in the deviant non random behavior trials, may have some important implications. If this difference in scoring in both type of trials becomes confirmed in further experiments, one is forced to conclude that a pure choice situation, in which the subject is invited to choose randomly inhibits for yet unknown reasons the psi ability. This conclusion would directly challenge the basis of the common type of psi experiments.

One of the aims of the design has been to avoid the rise of frustration in the animals. The fact that the mice showed random behavior in their choices after the misses, and that they were inclined to repeat their choice after a hit - which indicates that they attached more value to a hit than to a miss - and finally that they showed they were well motivated, can be considered as an indication that this aim was fulfilled.

That the conditions appeared to have no systematical effect on the scoring can be attributed to several factors. Judging from the rather large negative correlation between the scores in both conditions, it seems that the effect depends upon the individual mouse. But this would imply that telepathy between the mice took place; some "sender" mice exerted a positive influence on their partners, while the other mice exerted a negative influence. The latter could be explained by the fact that, contrary to their partners, the sender mice were in a rather frustrating situation. They could perceive the target but could not press a lever, as a consequence getting or not getting a reward depended on the behavior of the other mouse. Whether this explanation is true could be investigated by

including a special training to teach the mice to adapt themselves to this situation.
If telepathy took place this would imply that telepathy can take place without any intention on the part of the "sender", because it is highly improbable that the sender mouse had any idea about the existence of the other mouse in the other room. This suggests that probably the motivation of the sender mouse is a sufficient condition to give rise to telepathic "transmission". The latter idea is reminiscent of a well known phenomenon in spontaneous cases, that very often a sender, facing a special situation, for instance involving danger, accidents, etc. seems responsible for a telepathic impression in a receiver for whom this person and the situation is important, without any intention of doing so.

Considering the small CR values on which the correlation is based however, the possibility of this result being an artifact can not be excluded. If this is the case then the conclusion would be, that the mice scored at the same level in both conditions. This implies either that telepathy between animals is not possible or that the necessary and sufficient conditions to bring about telepathy was lacking. The first assumption can never be proven but acceptance of this assumption would lead one to adopt special models on which to base future experiments, in which only variables related to the physical stimulus situation or to the acting mouse are involved. If the second assumption holds, a possible variable could be that the mice acted independently of each other without understanding their situation. It could be worthwile then to try to find a type of training method which gives them more insight into their situation.
To sum up, it can be concluded that the results

of this experiment indicate the possibility of psi ability in mice. They do confirm the finding of Duval and Montredon that mice will score significantly in those trials in which they change their choice after a hit, and the results give suggestive evidence for the possibility of telepathy between mice. This leads to several assumptions, on which future experiments can be based.

ABSTRACT

In this experiment it was attempted to confirm the results of Duval & Montredon, that mice can be used as successful subjects in psi experiments. Positive reinforcement was applied to minimize frustration and stereotyped behavior in the animals. Furthermore the design was chosen in such a way that it became possible to test, whether mice are able to show a telepathic relation between each other. The total results of the experiment, based on the distribution of the scores of the mice, were marginally significant. The finding that mice score higher in "random behavior" trials was confirmed, although the evaluation is based on a different method, as it was thought that the method applied by Duval and Montredon was not entirely correct. Suggestive evidence was found for the possibility of telepathy between mice.

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