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Manipulation of the Magnitude of Incentive Variable and Runway Performance

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To the Graduate Council:

I am submitting herewith a thesis written by David Mason Wildasin entitled "Manipulation of the Magnitude of Incentive Variable and Runway Performance." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

Ernest Furchtgott, Major Professor

We have read this thesis and recommend its acceptance:

William H. Calhoun, Donald H. Mc Burney

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

August 26, 1965

To the Graduate Council:

I am submitting herewith a thesis written by David Mason Wildasin entitled "Manipulation of the Magnitude of Incentive Variable and Runway Performance." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Psychology.

Major Professor

We have read this thesis and recommend its acceptance:

Accepted for the Council:

Dean of the Graduate School

MANIPULATION OF THE MAGNITUDE OF INCENTIVE VARIABLE AND RUNWAY PERFORMANCE

A Thesis

Presented to

the Graduate Council of

The University of Tennessee

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

David Mason Wildasin

August 1965

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CHAPTER I

INTRODUCTION

Incentive magnitude and its effect on performance and learning is of great importance to psychologists. The effect of the incentive magnitude variable on animal learning and performance was thoroughly reviewed by Pubols in 1960. This introduction will, therefore, draw upon the conclusions of the review and it will be extended to the more recent experimental findings. The major emphasis will be on the analysis of studies using solid food incentives since the present experiment dealt with a problem arising from the use of such incentives.

This discussion will be further limited to the literature that is pertinent to the "absolute" method of incentive presentation. In the"absolute" method the animal receives only one incentive value during the experiment as opposed to the "differential" method of incentive presentation in which each animal experiences more than one incentive value during the course of the experiment.

One of Pubols' major conclusions based on experimental evidence was that quantitative variations in incentive value have no apparent effect on the rate of learning, but they do affect performance. This conclusion was based on evidence from numerous studies in which variations in incentive

magnitude did not affect the rate of approach to an asymptotic level of performance, but did affect the final level of performance, with the animals receiving the larger incentive functioning at a higher maximum level than the animals receiving the smaller incentive value.

The effectiveness of the larger incentive was attributed by Pubols to the consummatory response of the animals. Basically the "mechanism seems to be amount of consummatory activity", (Pubols, 1960, p. 112). The greater the amount of consummatory activity, the greater the maximum level of performance. According to Spence (1956) the total time in the goal box rather than the amount of food consumed is the major determiner of performance. One of his students Czeh (1954) varied magnitude of reward and duration of consummatory time independently by allowing rats with the larger reward time in the goal box equivalent to that of the animals receiving the smaller reward, but then allowing them to finish the food elsewhere.

Pubols emphasized the importance of the choice of the dependent variable in the analysis of performance, such as running time, start box latencies, and goal box time which are time dependent measures, rather than errors or trials to criterion both of which are unaffected by incentive magnitude.

The literature since the review of Pubols is rather limited. Studies by Wagner (1962), DiLcllo (1964), Hill, Cotton and Clayton (1962), Hill and Spears (1962, 1963), Pavlik and Reynolds (1963), Yarczower, Freygold and Blum (1962), and Reynolds and Anderson (1961) tend to support the conclusions of Pubols without extending the information concerning the effect of incentive magnitude on learning and performance.

Wagner (1961) varied the magnitude of reward (0.08 gm. or 1.0 gm.), reinforcement schedule (50 per cent or 100 per cent), and the number of acqusition trials (16 or 60) in a runway. After only 16 trials he found that the start box latencies and the running time for the two incentive groups were significantly different with the group receiving the 1.0 gm. pellet having the shortest start box latency and the fastest running time. No reliable difference was noted between the 16 trial group and the 60 trial group.

Pavlik and Reynolds (1963) using a straight runway and five trials per day for eighty trials with two conditions deprivation (6 or 30 hrs.) and two conditions of reward (two of five 0.045 gm. pellets) found on analysis of the last five training trials that the running speed for both incentive magnitude and deprivation time to be significant with respective $\underline{F}$ values of 26.58 and

12.31 ($p < .001$).

There are four experiments which are of special importance in the context of the present study. One is mentioned in Pubols' review and the other three have appeared since the review.

Wolfe and Kaplon (1941) used three groups of chicks between the ages of 41 and 73 days at the beginning of the experiment. Three levels of incentive were employed: (1) one large grain of popcorn, (2) four quarter pieces of popcorn equal to one grain, and (3) one-fourth of one grain. The chicks were run in a runway for seven experimental sessions with each session consisting of five trials. The data indicate that the animals receiving the four small pieces of popcorn which required four pecks to consume ran the fastest, the animals receiving the one large grain were slower, and the group receiving the one small grain were the slowest. The latter two groups required only one peck to consume their reward. Wolfe and Kaplon concluded that:

> amount is thus a factor in the effectiveness of reward. Amount of consummative activity is also a factor; the chickens which were given four small pieces of food per run surpassed (in running speed)* those given the same amount but in only one piece. That amount of consummative activity was more effective than amount of reward was apparent (Wolfe and Kaplon, 1941, p. 356).

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* The parenthesis are the author's.

This last conclusion was based on the fact that the subjects (Ss) in the group receiving the four pieces of popcorn ran faster than did the group receiving the one large grain of popcorn.

In the first of two experiments Dyal (1960a) was interested in the effect of perceptual factors on the performance of rats in a runway. He used a runway with interchangeable black and white start and goal boxes. Two experimental groups were used. One group received the large incentive when the start and goal boxes were black and the small incentive when they were white. For the second experimental group the reverse was true. The trials for the large and small incentive were counterbalanced for both experimental sessions and days for each of the Ss. The large incentive consisted of 250 5 gm. bricks of lab chow. The small incentive consisted of one 5 gm. brick of lab chow. The consummatory time was held constant for the two groups with all Ss being given 30 seconds eating time in the goal box upon completion of each trial.

Analysis of the data showed that for both conditions within each experimental group the running times were almost identical for both incentive levels. However, analysis of the start box latencies showed that by the eleventh day of training the Ss receiving the large reward in the black goal box and the small reward in the white goal box had begun to

discriminate so that the starting times on the trials when the large incentive was present were significantly shorter than on the trials when the small incentive was present. Further analysis indicated that the Ss in the group receiving the large reward in the white goal box and the small reward in the black goal box did not learn to discriminate.

Dyal explained the results of the group that did learn to discriminate in terms of Spence's theory of incentive motivation (K) (Spence, 1956). Dyal could not interpret the data in terms of the effect of r_g because the time in contact with the incentive was constant for both the high and low reward trials. Dyal attributed the results to the difference in perceptual factors associated with the smaller incentive, as opposed to those associated with the large incentive.

> Thus the most reasonable interpretation of these results, within Spence's system, is that the perception of a large amount of food induces a more vigorous consummatory response and that the apparent size of the incentive is a variable determining K along with other physical characteristics of the incentive such as quality, sweetness, hardness, etc. (Dyal, 1960a, p. 37).

The second experiment was basically an extension of the first with a few changes in the basic design. Four experimental groups instead of two were used in this experiment. For groups 1 and 2 the large incentive (50 bricks) was in the black goal box and the small incentive (1 brick) was in

the white goal box. The reverse of the above was true for groups 2 and 4. One further modification was employed. For groups 1 and 2 the runway itself was black and for groups 3 and 4 the runway was white. Again, as in the first study, the total consummatory time was held constant for each S on every trial.

Analysis of the dependent variables, running time, latency, and goal time, indicated that all four groups learned to discriminate significantly better than chance. Further analysis indicated that there were slight group differences in the speed of the acqusition of the discrimination. Also, it was indicated that the number of trials required before a dependent variable was significant differed for the experimental groups, but analysis failed to show any signifiance in these differences.

The third study of interest was reported by Hall and Kling (1960). They tested four groups of rats in a brightness discrimination apparatus. Group 6L received 6 drops of sucrose in one cup; group 6H received 6 drops of sucrose in 6 cups; group 12L received 12 drops of sucrose in two cups and group 12H received 12 drops of sucrose in 6 cups. In terms of errors and number of trials to criterion the 6L group was superior to the 6H group and the 12L group to the 12H group. There were no differences between the 6H and the 12H, and the 6L and 12L groups, respectively.

Median latencies, mean running speeds or mean choice times did not significantly differentiate the groups. The mean number of laps was higher for the 6H than the 6L groups and for the 12H than the 12L groups, but the 6H group had more laps than the 12L group. The authors concluded that bodily movements in the goal box are the major variable determining discrimination.

From the studies that were presented in the introduction and from the conclusions that were drawn by Pubols in his earlier review it is evident that a number of factors are related directly to the magnitude of the incentive variable affecting the performance of animals. The specification of these factors and their effect on different performance variables is presently not completely understood. Does the incentive variable affect running time, and/or the latency directly? How is consummatory activity to be defined?

The purpose of the present study was an attempt to replicate the findings of Wolfe and Kaplon (1941) using rats and somewhat more precise measurements of the dependent variables. Both the former study and Dyal's work indicate that specification of the amount of reward in terms of the weight of the food is insufficent. Specifically, the effect of presenting the same amount of food in one unit as against presenting it in five units was investigated.

CHAPTER II

METHOD

Subjects

The subjects (Ss) were thirty-six experimentally naive male albino rats of a Wistar strain which were obtained from the Budd Mountain Rodent Farm of New Jersey. Their ages ranged from ninety to one hundred days at the begining of the experiment.

Apparatus

The apparatus consisted of a runway constructed of unpainted pine wood. The runway was fifty-eight inches long, three-and-one-half inches high, and three inches wide. The first eight inches of the runway formed the start box which was separated from the remainder of the runway by a plywood drop-door operated by the experimenter (E). The last ten inches of the runway formed the goal box which was also separated from the rest of the runway by a plywood drop-door. The entire runway had a plexiglass top. There were three photocells located six inches, twenty-six inches, and forty-eight inches from the start box, respectively. These photocells were connected to three timing devices. The bulbs of the cells provided the only source of illumination in the runway.

Timing Circuits. They were designed to provide a measure of starting latency and running time. When the start box door was lifted two Hunter Klock-Kounters (Model 120A) and one Standard Timer (type S-1 A) were activated and each continued to operate until the photocell controlling the timer was interrupted by the passage of the S along the runway. The three timers indicated the start box latency, the time to reach the approximate center of the runway, and the time to traverse the entire runway.

Procedure

Drive Establishment. Five days prior to the first pre-training trial food was withheld from the Ss for twenty-two hours each day. Each S was then given two hours access to Purina Lab Chow. This schedule of deprivation and feeding was maintained throughout the remainder of the experiment. Water was always available in the home cage.

Experimental Groups. The experiment was conducted in three consecutively run replications. The replications were procedurally identical. All of the data were combined and analyzed as a single treatment. Since Ss were lost in two of the three replication the Ns per replication were unequal. This made difficult, therefore, the use of a randomized block design in the analysis of variance. The Ss were randomly assigned to one of two experimental groups on the first day

of pretraining. The two groups will be designated as follows. Group L received one 0.5 gm. Noyes food pellet. Group M received five 0.1 gm. Noyes food pellets. There were eighteen Ss in each group.

Pretraining. All Ss were given eighteen days of pretraining to familiarize them with the apparatus and the reinforcement, and to assure that the eating latencies had stabilized for the Ss of each group. Eighteen days was chosen because a search of the literature on eating behavior had shown that in general by eighteen days of eating latencies are stabilized.

Pretraining trials were as follows. Each S was remov- from his home cage and placed in a twelve section carrying cage and taken to the experimental room. The experimental room was maintained at a temperature between 72-74^{o} F. The room was sound shielded and two overhead fans provided a masking noise. The Ss were given five minutes to adapt to the experimental room prior to each trial. The same procedure continued throughout the experiment. On each of the eighteen pretraining trials the S was removed from the carrying cage and placed in the goal box and allowed to eat one pellet in the case of the L group or five pellets in group M. If the S had not eaten in ten minutes, he was removed from the apparatus and returned to the carrying cage. On each of the pretraining trials for both experimental

groups two times were recorded: (1) latency- the time before the S picked up a pellet and began to eat, and (2) eating time- the total time that the S was engaged in eating. If the S refused to eat on four consecutive days he was removed from the experiment. Six Ss in the first replication and four Ss in the second replication were eliminated on this basis. No Ss were lost in the third replication. The Ss were handled extensively between trials.

Experimental Training. The Ss in each of the two groups were run in the same order each day so as to maintain a constant time interval between feeding and training. All Ss received their two hour feeding period thirty minutes after each training session so that the Ss could be trained at the same time each day.

All Ss received one trial per day for thirty consecutive days. A trial began by the S being placed in the start box and the lid closed. The start box door was manually lifted when the S faced it starting the timers. When the animal left the box, the door was lowered to prevent any retracing. The rest of the procedure was automatically controlled except for the eating time which E kept with a stop watch. After each trial S was removed from the goal box and returned to the carrying cage. Since each trial was reinforced S was allowed to finish eating the pellet(s) before being removed to the carrying cage. There was one exception

to this. If the S had not eaten in ten minutes he was removed from the goal box and returned to the carrying cage and no eating time was recorded. This happened only once during the entire experiment.

CHAPTER III

RESULTS

The pretraining data were analyzed in terms of: (1) eating latencies and (2) eating times. The training data were analyzed in terms of: (1) starting latency, (2) total running time, and (3) eating time. Data on running time to the center of the runway were not analyzed separately since an inspection of the data indicated that they were essentially similar to the total running time.

Figure 1 presents the median latencies in seconds during pretraining for the two experimental groups. To test for possible differences between the two groups the data were subjected to a repeated measurement analysis of variance (Edwards, 1964, pp.227-230). Table I provides a summary of the analysis. The F value for the trials main effect was highly significant ($p < .001$), but the group main effect and the interaction both failed to reach an acceptable level of significance. The trials time treatment interaction F (2.16), however, approached significance at the .05 level ($p_{.05} = 2.27$).

Figure 2 and Table II present the pretraining eating times. By inspection of Figure 2 a treatments by trials interaction effect is indicated. The summary of the analysis of variance presented in Table II shows the F value of the

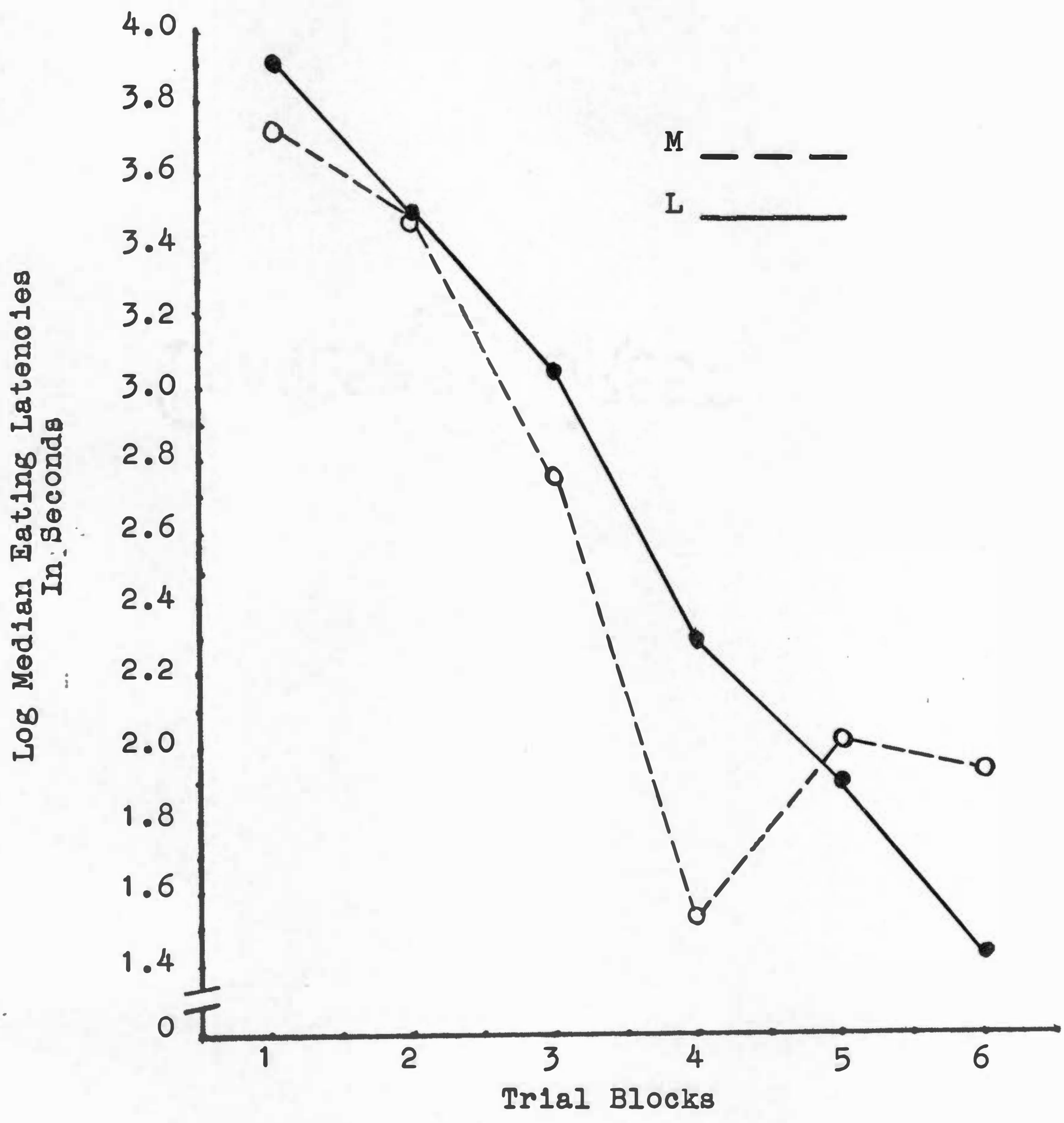

Figure 1. Eating latencies during pretraining for the two experimental groups in blocks of three trials.

Table I

Summary of the Analysis of Variance of the Pretraining Eating Latencies

Source	df	MS	F	p
Between SS	35			
Treatments (I)	1	65,104.16	2.39	>.05
Error (b)	34	27,272.69		
Within SS	180			
Trials (T)	5	776,069.57	48.89	<.001
T x I	5	34,323.56	2.16	>.05
Error (w)	170	15,871.69		
Total	215			

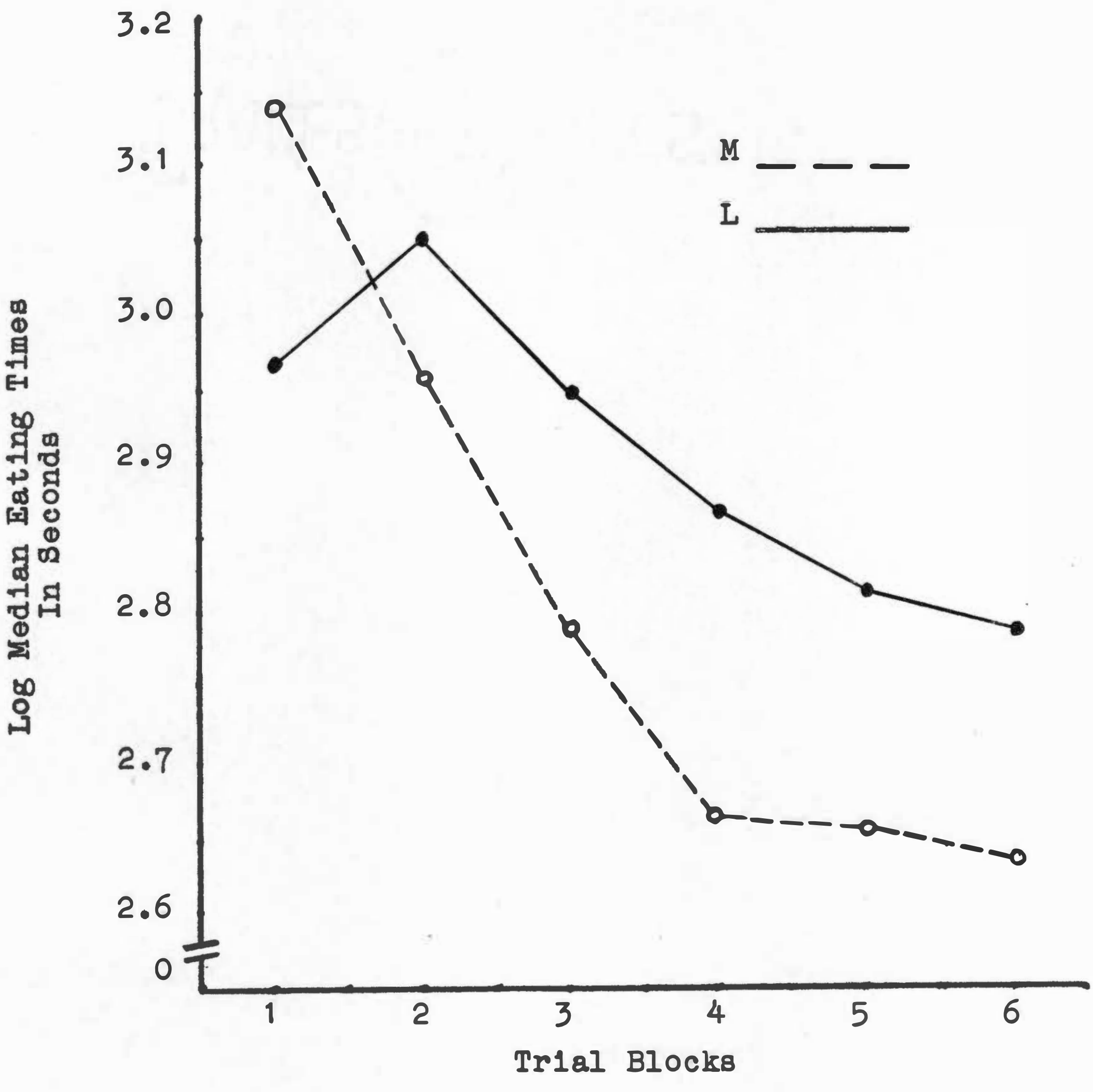

Figure 2. Pretraining eating times for the two experimental groups as a function of blocks of three trials.

Table II

Summary of the Analysis of Variance of the Pretraining Eating Times

Source	df	MS	F	p
Between SS	35			
Treatments (I)	1	2,185.04	2.56	$>.05$
Error (b)	34	854.11		
Within SS	180			
Trials	5	7,612.96	43.38	$<.001$
T x I	5	2,076.19	11.83	$<.001$
Error	170	175.49		
Total	215			

interaction effect to be significant ($p < .001$). The *F* value of the trials main effect was highly significant ($p < .001$). The failure of the treatment main effect to show significance (Table II) merely indicates that over the total pretraining the groups did not differ. To test for the difference in eating time at the end of the pretraining period a *t*-test was performed on the last block of three trials. The resulting *t*-value was 1.86 ($p < .10$). This would indicate that at the end of the pretraining period the *L* group tended to spend more time eating than the *M* group.

Figure 3 presents the eating times during the thirty runway trials for the two groups. The summary table of the analysis of variance (Table III) shows that there is a significant treatment effect ($p < .05$). The *F* value for the trials effect (2.32) and for the interaction (0.88) failed to reach significance. Further analysis of the eating times comparing the pretraining and training data for the two groups indicate that there was a significant difference between the pretraining and training eating times, and also a significant difference between the two experimental groups. The data are presented in Table IV. Table V presents a summary of the analysis of variance. Inspection of Table V indicates that the *F* value for the two experimental groups was significant ($p < .01$). Inspection also indicates that the *F* value for the pretraining and training was significant.

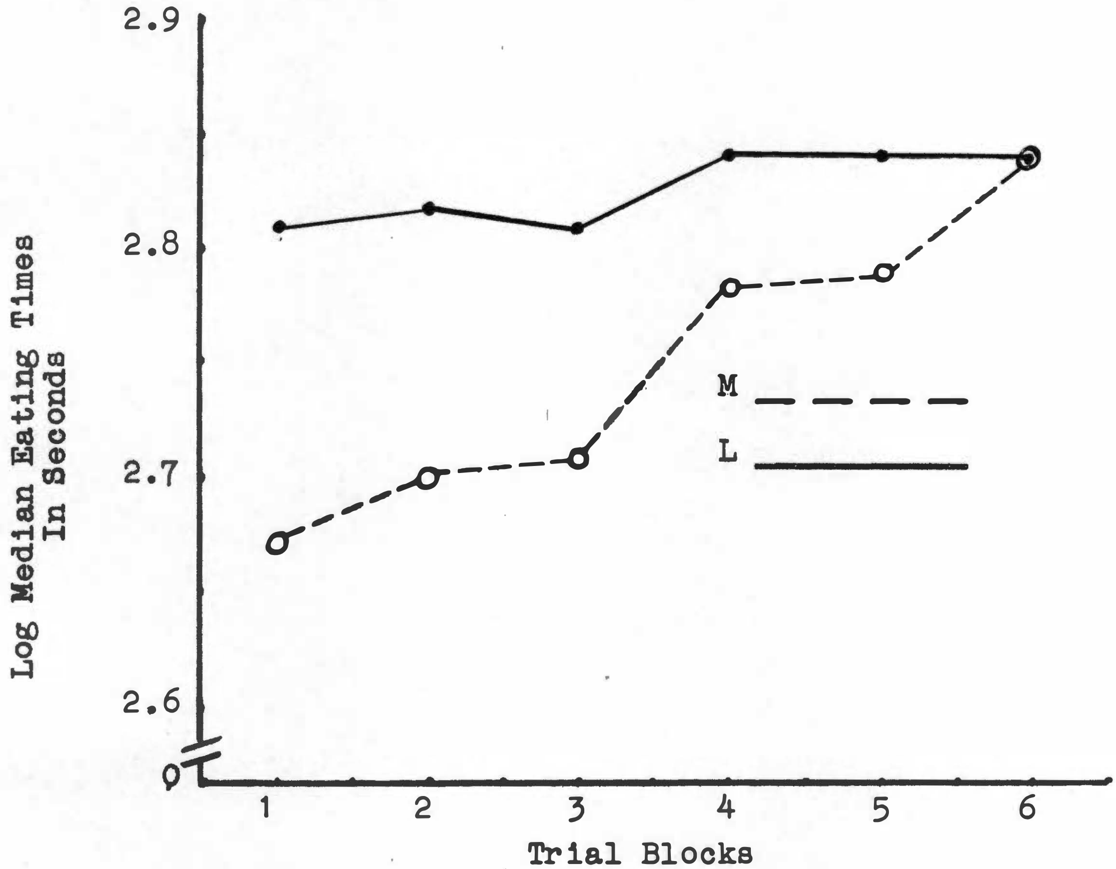

Figure 3. Training eating times in seconds for the two experimental groups as a function of blocks of five trials.

Table III

Summary of the Analysis of Variance of the Runway Eating Times

Source	df	MS	F	p
Between SS	35			
Treatments (I)	1	1,836.33	4.42	$<.05$
Error (b)	34	415.15		
Within SS	180			
Trials (T)	5	333.26	2.32	$>.05$
T x I	5	127.23	0.88	
Error (w)	170	143.47		
Total	215			

Table V

Summary of the Analysis of Variance of the Pretraining and Training Eating Times

Source	df	MS	F	p
Between SS	35			
Treatments (I)	1	1,605.55	8.02	$<.01$
Error (B)	34	200.07		
Within SS	36			
Trials (T)	1	747.56	12.84	$<.001$
T x I	1	129.89	2.23	
Error (w)	34	58.22		
Total	71			

Analysis of the running times (Figure 4 and Table VI) shows that there was no significant difference between the two experimental groups. The *F* value of 3.16 ($p < .10$) is not significant at the usually accepted level, although there was a tendency for the *L* group to run faster. The trials effect was highly significant with an *F* value of 27.17 ($p < .001$). The significance of the trials effect only indicates that the animals in both groups improved their performance during the experiment.

Figure 5 presents the runway latencies. It will be noted that the group receiving the one large pellet consistently had the shorter latencies. Analysis (Table VII) indicates that the treatment effect is significant with an *F* value of 8.60 ($p < .01$). The analysis also indicates that the trials and the interaction of the trials and the treatment effects are significant with *F* values of 37.70 and 4.70 with ($p < .001$), respectively (Table VII).

When the data for the start box latencies and the runway times were combined a slightly different picture appears (Figure 6). The summary of the analysis of variance (Table VIII) indicates that the treatment main effect is still significant with an *F* value of 6.73 ($p < .05$). Further analysis also indicated that the trial, and the interaction of the trials and treatments are again significant having *F* values of 49.99 ($p < .001$) and 4.01 ($p < .01$), respectively.

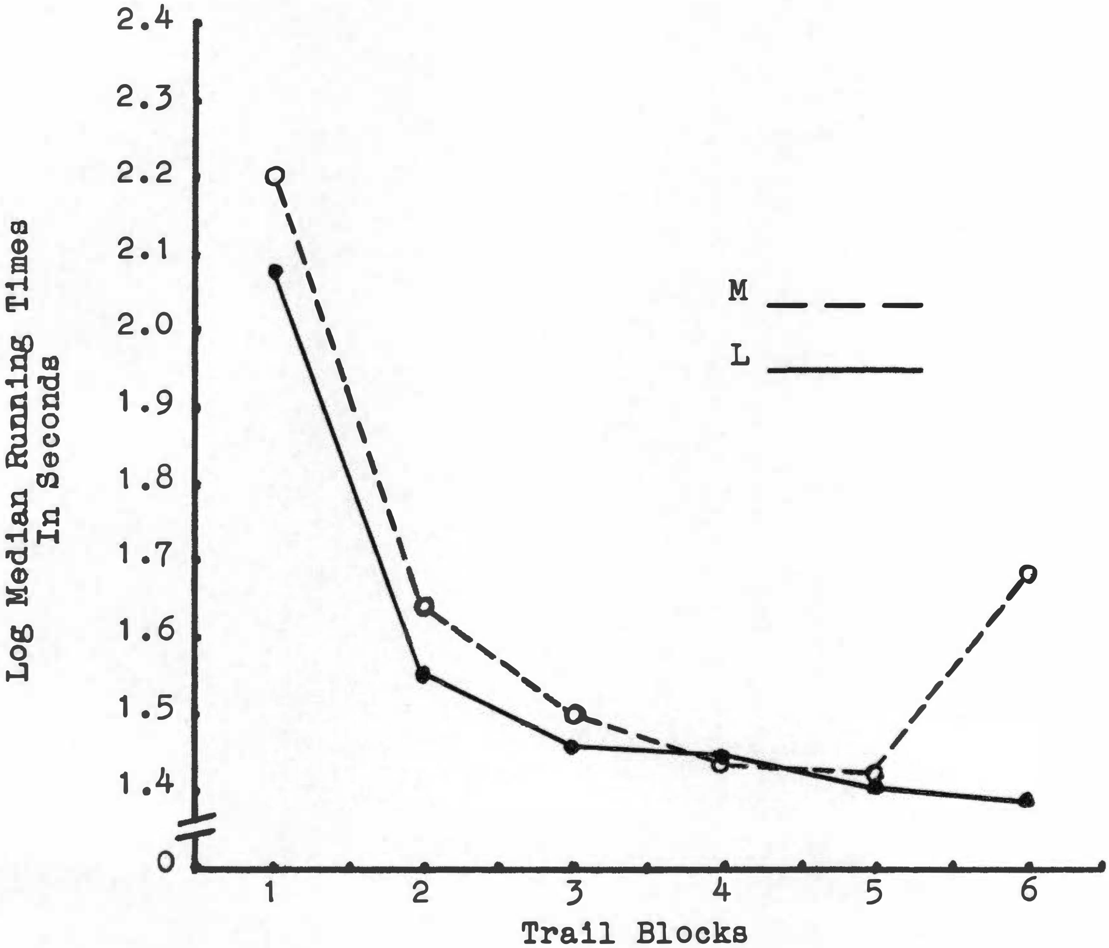

Figure 4. A comparison of the running times in seconds for the two experimental groups as a function of blocks of five trials.

Table VI

Summary of the Analysis of Variance of the Runway Running Times

Source	df	MS	F	p
Between SS	35			
Treatments (I)	1	29.85	3.16	$<.10$
Error (b)	34	9.44		
Within SS	180			
Trials (T)	5	232.31	27.17	$<.001$
T x I	5	4.86	1	
Error (w)	170	8.55		
Total	215			

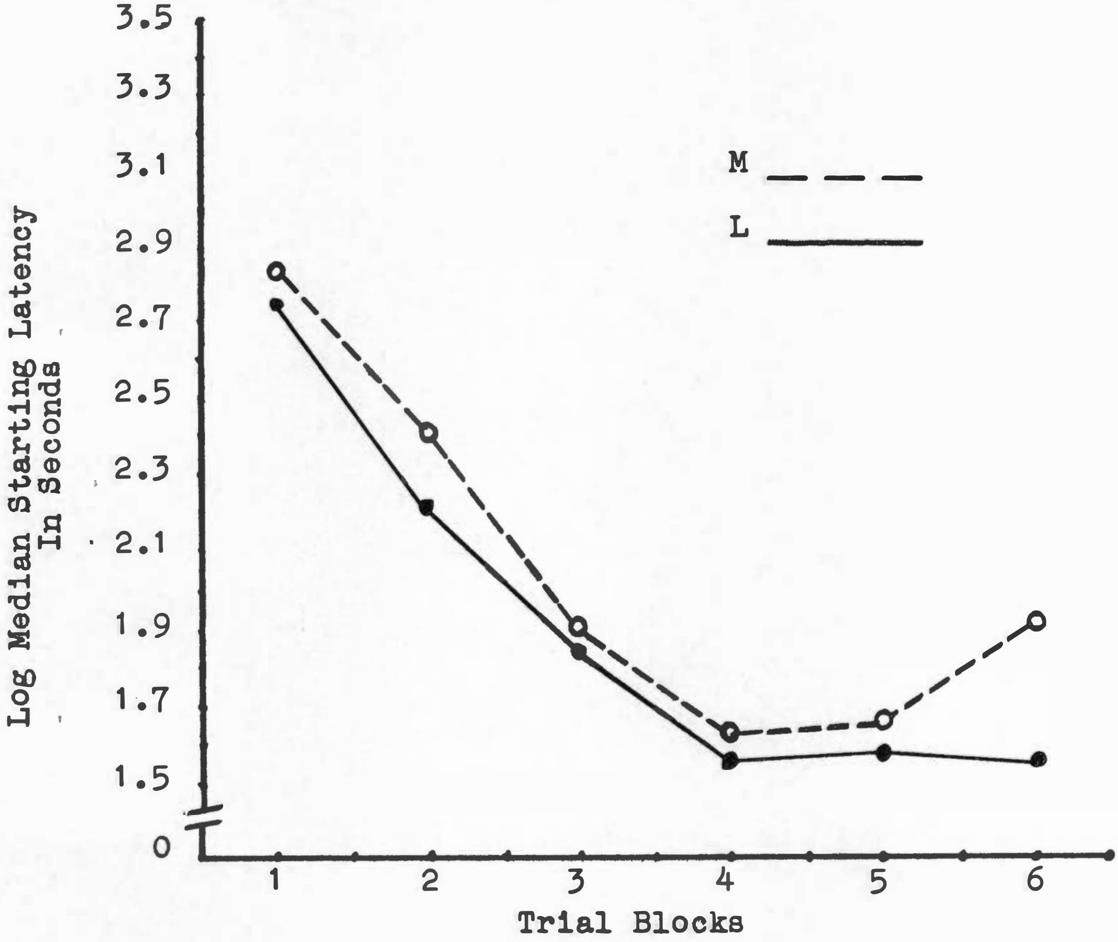

Figure 5. A comparison of the starting latencies in seconds for the two experimental groups as a function of blocks of five trials.

Table VII

Summary of the Analysis of Variance of the Runway Running Latencies

Source	df	MS	F	p
Between SS	35	354.39		
Treatments (I)	1	2,504.99	8.60	$<.01$
Errors (b)	34	291.13		
Within SS	180	619.41		
Trials (T)	5	11,003.08	37.70	$<.001$
T x I	5	1,372.61	4.70	$<.001$
Errors (w)	170	291.85		
Total	215			

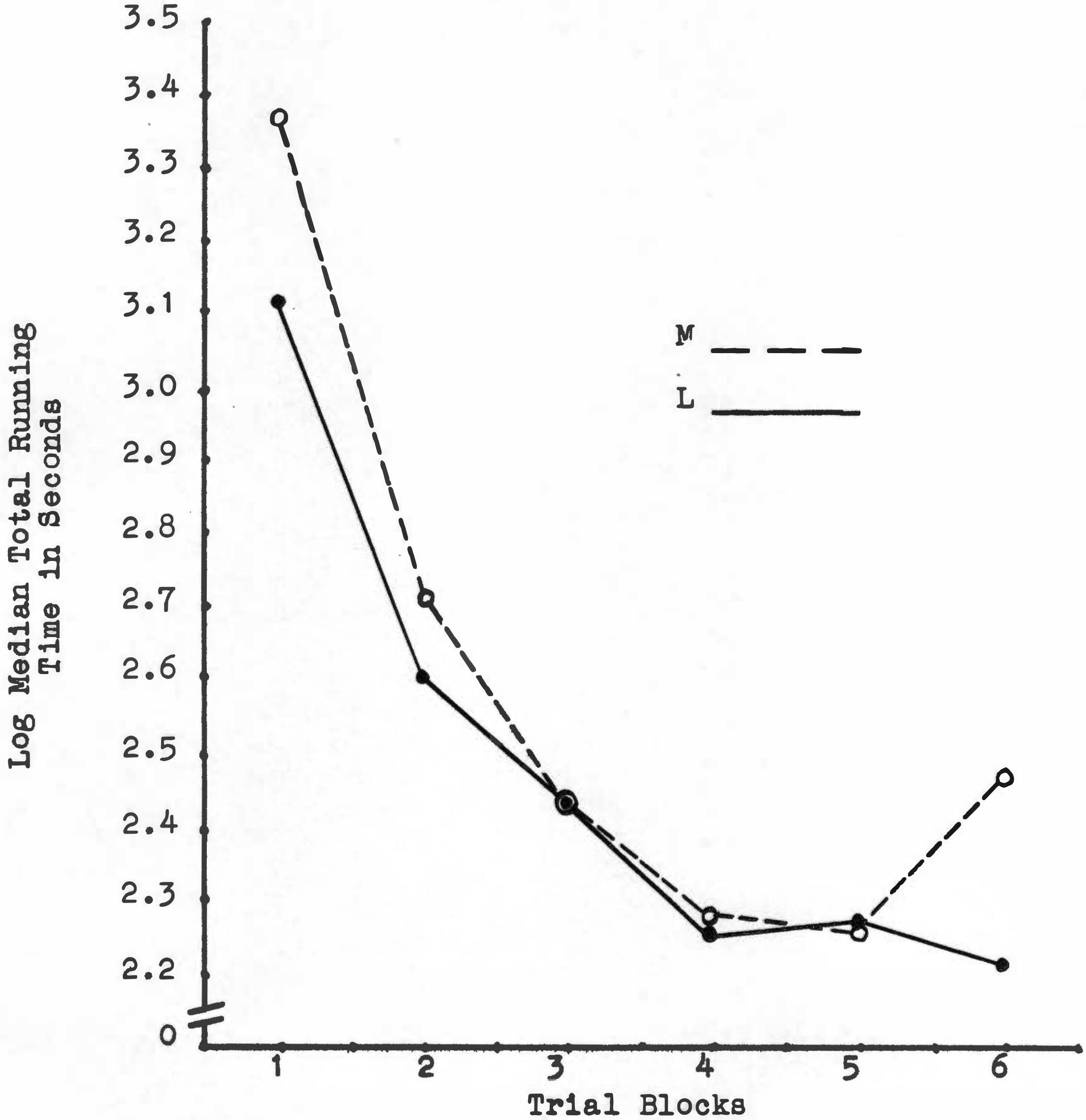

Figure 6. A comparison of the total running time in seconds for the two experimental groups as a function of blocks of five trials.

Table VIII

Summary of the Analysis of Variance of the Total Runway Time

Source	df	MS	F	p
Between SS	35			
Treatments (I)	1	7,692.23	6.73	$<.01$
Error (b)	34	1,143.45		
Within SS	180			
Trials (T)	5	45,916.96	49.99	$<.001$
T x I	5	3,686.26	4.01	$<.01$
Error (w)	170	918.53		
Total	215			

CHAPTER IV

DISCUSSION

The present study differs from the majority of previously reported studies on incentive magnitude in terms of the pretraining given to the Ss prior to the initial runway training. This was done to determine whether eating behavior *per se* is affected by magnitude of incentive factors and to insure that the Ss had reached an asymptotic level of eating prior to the runway trials. If the eating behavior had not stabilized prior to the runway testing, the value of the food incentive during the thirty testing trials would have changed while Ss became conditoned to the magnitude of the incentive.

Figure 2, p. 17, and Table II, p. 18, show, that although the final level of eating was not different at the usually acceptable level of significance, there was a tendency for the L group to spend more time in the goal box. Initally the one large pellet group ate more rapidly than did the M group. One may speculate that the Ss in the latter group had to learn that after they consumed one or more pellets additional pellets were still available. Although all the pellets were placed close together by E during the initial eating trials, it is possible that the S "scattered" the pellets and then it required some time for the S to gather

them together. The experimenter, unfortunately, made no specific observation on this phenomenon.

In terms of eating latencies during the pretraining sessions no differences could be detected between the two groups (Table II, p. 18 and Figure 2, p. 17).

Wolfe and Kaplon (1941) concluded that the chicks receiving the four small pieces of popcorn ran more rapidly than did the group receiving the one large grain of popcorn. Analysis of the runway times in the present study, on the other hand, showed no significant differences between the two groups (Table VI, p. 26). In fact, the curves are almost identical from trials 6 to 25 (Figure 4, p. 25). On the other hand, the latencies (Table VII, p. 28) were statistically different with the group receiving the 5 small pellets having the longer latencies (Figure 5, p. 27).

Unfortunately, Wolfe and Kaplon did not separate running time and starting latency. Their reported running time is a composite score of both. Combining the starting latencies with running time produced results which are similar to those of Wolfe and Kaplon. They found that the animal taking the longest to consume the pellet would run faster. This is what the present study indicates. The group receiving the one large pellet took longer to consume the reward, spent more time in the goal box during the runway trials, and it also had shorter latencies (Table VII, p. 28 and Figure 6,

p. 29). The present experiment would seem to indicate that Wolfe and Kaplon's (1941) results are best accounted for in terms of the longer latencies rather than actual differences in running time. This contention is not without experimental support.

Dyal's first study (1960a) reported that the Ss which had the larger number of incentives in the goal box did have significantly shorter start box latencies, but the running times of the two groups were not significantly different. The present experiment produced essentially similar results. However, in his second study (Dyal, 1960b) the start box latencies as well as the runway running times were significantly different for the two experimental groups. Dyal (1960b) accounts for the discrepancy between his first and second experiments in terms of the number of training trials given the Ss during the runway training. In the second study the Ss were given a total of 144 runway trials where as in the first study only 108 trials were given.

An alternative explanation for the lack of differences in running time was that in some previous studies which report differences in runway performances as a function of incentive magnitude (Metzger, Cotton and Lewis, 1957; Goodrich and Zaretsky, 1962; and Yamaguchi, 1961), starting latencies were combined with running times. If as Pereboom and

Crawford (1958) hypothesized, the major factor contributing to the incentive magnitude effect is the "competing response tendencies", then for a short runway it is plausible to assume that the competing response tendencies occur in the start box and are reflected by the latency measure and that once the S starts, there is but little difference in his running time. It should be noted also that in a runway situation Kobrick (1956) found that latency appeared to be a much more sensitive and constant measure of amount of reinforcement than was running time.

The present findings can be adequately fitted into Spence's system (1956). In this system the consummatory activity which includes the total time spent in the goal box is the major determiner of incentive magnitude. Since group L spent more time in the goal box it had more consummatory activity than group M. The present study improved upon Czeh's (1954) experiment which also attempted to measure starting latency as a function of consummatory time since in the present experiment the Ss could not carry the food back to the carrying cage.

One interesting result of this study is that it appears that runway behavior actually interfers with consummatory behavior of the Ss. Table V, p. 23, gives a summary of the analysis of variance for the pretraining and training. data. The F value of the pretraining and training eating

times was highly significant ($p < .001$). Table IV, p. 22, shows the difference for the pretraining and training eating times for groups L and M, respectively. It will be noted that almost without exception the training eating times are higher than the pretraining eating times. This is contrary to what one would expect. If at the end of pretraining the Ss had not reached an asymptotic level of eating, the eating times during the runway performance should continue to decrease until an asymptotic level is reached; but this is not the case. They increase for almost every individual S. On the other hand, if eating performance had reached an asymptotic level by the end of pretraining, one would expect the eating time during the training trials to be relatively stable for the individual animals, but as noted above this definitely not the case. This, as mentioned above, definitely tends to indicate that runway performance does, indeed, interfere with consummatory behavior at least when the Ss are given a substantial period of pretraining. One reason as to why this has not been noted earlier is the fact that in the majority of studies investigating incentive magnitude the Ss have only been given a short pretraining period, and the eating performance during pretraining and training were not measured.

Another finding of interest is that running time failed here to discriminate between the groups. Psychologists

for years have used running time as a dependent variable in the runway situation. As was noted earlier in this discussion there is a certain amount of ambiguity concerning the results of studies reported using running time as their measure of the dependent variable. Some of these studies have reported significant differences in the running times for the various experimental groups (Wagner, 1961; Pavlik and Reynolds, 1963), but others have reported no significant difference in the running times (Dyal, 1960a; Goodrich and Zartesky, 1962). In previous studies total running time was found to be associated with incentive magnitude or latency as well as running time. In no case was running time, but not starting latency found to be a good index of incentive magnitude. It will be recalled that Dyal attributed this failure of the running time to reach significance to the number of trials given to the animals. If this is actually the case, then it can be said that running time as a dependent variable in a short runway is not a good measure. Generally, in a short runway situation once the animal starts he continues to run unless there is some distracting disturbance from the outside. In this present experiment this E did not notice an occassion where the S stopped, groomed, etc. responses which are typically considered to be competing responses in a runway situation such as the one employed in the present study.

However, it is entirely possible that a completely different situation would prevail if the <u>S</u>s were run in a somewhat longer runway. This posibility is important enough to deserve further experimental investigation.

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of the present study was an attempt to replicate and extend the findings of Wolfe and Kaplon (1941) who found that chicks which received four quarter grains of popcorn ran faster in a runway than Ss which received one whole grain. In the present study rats and a somewhat more precise measurement of the dependent variables were used. Two groups of animals were employed. Each group received eighteen pretraining trials followed immediately by thirty runway trials. Each S was given one trial per day. Group L received one 0.5 gm. Noyes Lab Pellet at the end of each pretraining and training trial. Group M received five 0.1 gm. Noyes Lab Pellets at the end of each trial. Analysis of the data indicated: (1) group M spent less time in the goal box eating, (2) group L which spent a longer time in the goal box had significantly shorter start box latencies, and (3) running time did not differentiate the two experimental groups in this short runway. This is in accord with previous studies which have shown that running time is not necessarily a good index of rat performance. The data were explained in terms of Spence's (1956) hypothesis that it is not the weight of the food that is consumed that is important, but it is the length of time spent in the goal bcx

that is the important variable determining performance in a runway situation.

It was also noted that runway behavior affected the eating behavior of the animals. Almost without exception the eating times during the runway trials were longer in both groups than they were during pretraining. This is the opposite of what one would expect, especially when Ss had been given an extended period of pretraining prior to the runway training.

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