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## Rate of Manipulative Learning as a Function of Goal-Setting Techniques

By GERALD C. HELMSTADTER and DOUGLAS S. ELLIS

### INTRODUCTION

Although most studies involving the use of goals as motivators in learning have been concerned with which types of goals produce the greatest improvement, there have been some indications that the method of presenting a given type of goal may determine its effectiveness.

Mace (4), for example, found that a moving standard based on previous performance was more effective in a computational task than simple instructions to "do your best". Both of these techniques were superior to a fixed goal set by *E*. The least effective technique was simple instructions to surpass previous performance.

A similar study concerned with methods of setting goals has been reported by Bayton (1). Working with a simple manipulative task, he found that the methods could be ranked from most effective to least effective as follows: (1) *S* sets own goal and tells *E* what it is; (2) *S* sets own goal but does not tell *E* what it is; (3) *S* is given knowledge of results with no other comment; (4) *S* is told nothing concerning his previous performance. However, statistical analysis revealed that the only significant differences were those between methods 1 and 4 and between methods 2 and 4.

These two studies suggest at least three parameters that may define the influence of motivational techniques which combine knowledge of results with a standard or goal. Mace's finding that a moving standard was more effective than a fixed one indicates that the relationship between the standard and *S*'s performance is important for externally-set goals. Bayton's results suggest that, for self-set goals, the degree of ego-involvement should be considered. Finally, whether the goal is self-set (Bayton's most effective manipulation) or externally-set (Mace's most effective manipulation) may be a critical dimension of goal setting techniques.

The present study explores this last dimension by utilizing the following four motivational conditions:

I. Knowledge of results

II. Self-set: *S* sets own goal on the basis of past performance.<sup>1</sup>

<sup>1</sup>This method of goal setting is equivalent to the manipulation followed in level of aspiration experiments (5).

- III. Externally-set norm: *E* provides a goal based on an average performance curve.
- IV. Externally-set improvement: *E* provides a goal based on *S*'s previous performance and increments on an average performance curve.

Conditions II and IV are, respectively, the most effective techniques used by Bayton and Mace. Their comparison should provide evidence of the importance of who sets the goal. Condition III, a technique commonly used in practical situations, serves as an additional externally-set manipulation for comparison with Condition II. Condition I is included as a control to determine if any of the goal-setting techniques used provide motivation beyond that associated with simple knowledge of results.

#### METHOD

*Subjects and experimental design*—A total of 100 volunteers from undergraduate psychology courses at Iowa State College served as *Ss*. Except for the first five *Ss* who were placed in group I, they were assigned to the four groups corresponding to the four motivational conditions so that the groups were fairly well matched on initial score and sex distribution.

*Task*—The task used was a modified form of the block-turning portion of the Minnesota Rate of Manipulation Test. *S* was required to work continuously through the middle two rows of blocks, and was given standardized instructions and a demonstration of the work methods to be used. Following an untimed practice trial, ten 60 sec. trials were administered with a 60 sec. rest interpolated between trials. The number of blocks turned per 60 sec. trial was taken as the measure of performance.

*Goal-setting procedures*—During rest periods, knowledge of results was given to all *Ss* by showing *S* a consecutive plot of his previous performance scores. *Ss* in the knowledge of results group (Condition I) received no additional treatment. *Ss* in the self-set goal group (Condition II) were asked to state an expected score for their next trial, and this aspiration score was also plotted on the graph. A complete average performance or norm curve against which *S* could compare his performance was shown to members of the externally-set norm goal group (Condition III) after each trial.<sup>2</sup> For members of the externally-set improvement goal group (Condition IV), the

<sup>2</sup>The norm curve was an estimate based on the results of previous investigations (2,3) as well as the scores of the first five *Ss* tested in the present experiment. Evidence of the reasonableness of the various goals used is presented in connection with the results of the experiment (see Fig. 2).

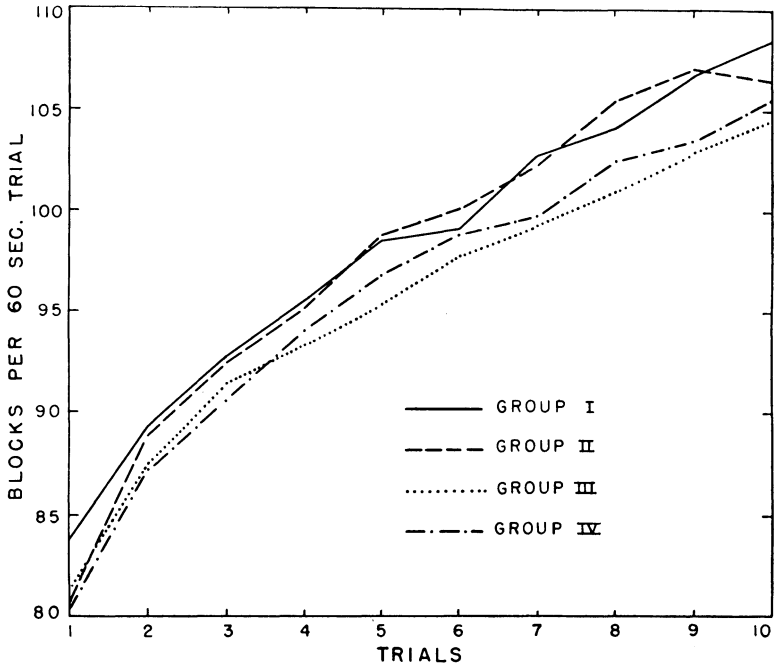


Figure 1.

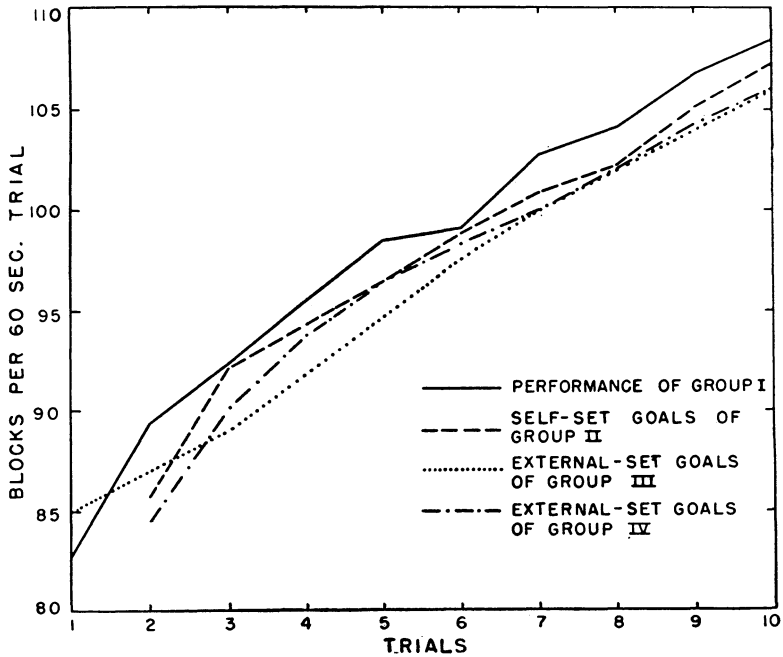


Figure 2.

goal set for *S* on each trial was determined by adding to his previous performance the increment on the norm curve between the same two trials.

RESULTS

The learning curve for the four groups are presented in Fig. 1. The rapid improvement and the similarity of all the curves is readily apparent. In Fig. 2 the average performance of the knowledge of results group is compared with the three goals used. It should be noted that all of the goals were reasonably close to actual performance.

In Table I the average difference scores (score on last trial minus score on first trial)<sup>3</sup> are shown separately for men and women as well as for the sexes combined.

Table I  
Average Improvement Following 10 Minutes of Work.

Group	Measure	Men	Women	Sexes Combined
I (Knowledge of results)	N	13	12	25
	Av. Diff.	27.8	21.4	24.7
	S.D.	8.5	7.8	8.6
II (Self-goal)	N	14	11	25
	Av. Diff.	27.0	24.7	26.0
	S.D.	11.4	7.7	9.8
III (Norm-goal)	N	13	12	25
	Av. Diff.	23.9	23.0	23.5
	S.D.	7.4	5.3	6.4
IV (Improvement-goal)	N	13	12	25
	Av. Diff.	26.9	23.2	25.2
	S.D.	9.0	7.3	8.2
Groups combined	N	53	47	100
	Av. Diff.	26.4	23.1	24.8
	S.D.	9.1	6.9	8.2

Table II presents an analysis of variance of the data, from which it can be seen that the only statistically significant effect obtained was that between the sexes. The Bartlett test for homogeneity of variance indicated that significance was due to a difference in means rather than in variability.

<sup>3</sup>Although the use of difference scores eliminated the necessity of matching groups, an analysis of variance using initial scores as the variable was made to examine differences in initial ability among the groups. No statistically significant differences were found.

**Table II**  
Summary of Analysis of Variance of Improvement Scores.

Source of Variation	df.	SS	MS	F
Goal setting Techniques	3	85.56	28.52	.46
Sex	1	276.62	276.62	4.27*
Sex x G.S.T.	3	459.00	153.00	2.36
Error	92	5962.93	64.81	
Total	99	6784.11		

\*Significant at the 5% level of confidence. The 5% and 1% values of F are, respectively, 3.95 and 6.92.

### DISCUSSION

The interpretation of the results is straight-forward. Although there was a definite improvement with practice, it is apparent that the several methods of setting goals do not have a differential effect on performance improvement. Apparently, the various goal-setting techniques used did not provide motivation beyond that associated with simple knowledge of results.

The most obvious explanation for this result is that, under the conditions of this experiment, the three goal-setting techniques used were not motivators. Another possibility is that the goal-setting techniques were potent motivators, but that their effect was not demonstrated because of certain characteristics of the experimental situation. For example, the use of knowledge of results with college student Ss may provide maximum motivation with the result that the effects of additional goal-setting manipulation are negligible. It also seems possible that the short practice periods and the simple task used might have been unfavorable for the differential operation of various goals. Finally, the externally-set goals might have operated more effectively if they had been set at a greater distance above the actual performance. These considerations suggest the desirability of examining the following variables in conducting further research on goal-setting techniques: (1) initial motivation of Ss, (2) complexity of task, (3) length of work period, and (4) relationship between goals set and actual performance.

The finding that sexes differ in improvement, though statistically significant, is probably of little practical importance since the magnitude of the difference is quite small. Of both practical and theoretical interest, however, is the observation that the sexes are not affected differentially by the various motivating techniques employed.

### SUMMARY

An experiment was conducted to investigate the effects of several goal-setting techniques on the performance of a simple block-turning task. The investigation utilized a total of 100 Ss, distributed among four groups corresponding to the following motivational conditions:

- I. Knowledge of results
- II. Self-set goal
- III. Externally-set norm goal
- IV. Externally-set improvement goal

The obtained results indicated that none of the three goal-setting techniques was superior to simple knowledge of results. Although the sexes differed significantly in performance, they were not differentially effected by the motivational conditions employed. A further investigation of the problem is suggested using Ss of lower initial motivation, longer work periods, tasks of greater complexity, and external goals set a greater distance above actual performance.

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