ABSTRACT
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Previous studies, however, always afforded to No KR groups some KR.
In the present study a 2x2 factorial design (KR-No KR; low-high goal)
was used. Stringent controls were instituted to eliminate all KR, in
the No KR conditions. The results indicated that KR did have an
effect on performance contrary to previous studies. (Author)

An Effect of Knowledge of Results on Performance with

Goal Setting Controlled

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no effect on performance if goal setting is controlled. Previous studies,

however, always afforded the No KR groups some KR. In the present study a

2x2 factorial design (KR-No KR; low-high goal) was used. Stringent controls

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Literature dealing with knowledge of results (KR) and performance
distinguish between motivational KR and directional KR. Motivational
KR has few or no cue or directional properties. It does not inform S
of the nature and locus of his errors or suggest how they might be cor-
rected. An example would be total number correct summed over several
trials. Although this type of KR could be interpreted by S as a signal
or cue to change his method of performing the task, it would not tell
him what changes to make or how to go about correcting his errors.

Locke, Cartledge and Koeppel (1968), after a thorough review of
the literature conclude that the effect of motivational, as opposed to
directional, knowledge of results (KR) on performance is mediated by
differential goal setting in the KR and No KR groups. Most of the
research they reviewed was dismissed by the authors because goal set-
ting was confounded with KR. That is, either different goals were given
to the KR and No KR Ss, or no explicit goals were assigned to the Ss so
Ss in the KR conditions could have set higher goals for themselves than

the Ss in the No KR conditions. It therefore may have been the goal rather
than the KR that affected performance.

Locke et al (1968) however, do discuss two studies which they feel did
not confound goal setting and KR. In both studies (Locke, 1967; Locke and
Bryan, 1969) a 2x2 factorial design was used with No KR and KR representing
one independent variable and two explicit goals representing the other inde-
pendent variable. In both studies the data showed no effect of KR, an effect
of goal and no interaction. This appears to be convincing evidence for
Locke's contention that KR has no effect on performance when goal setting is
controlled.

A closer look at these two studies, however, indicates two possible re-
servations. First, and most important, is the fact that the No KR groups
did receive KR about their performance. In Locke (1962) the goal was assign-
ed by placing a colored index card in a box containing the problem cards the
Ss would solve. Even Locke et al (1968) acknowledged that the No KR Ss
"could have obtained some idea of their progress" by seeing how close they
came to the colored card. In the second study (Locke and Bryan, 1969) both
the KR and No KR groups were given continuous information by means of lights
about their progress in relation to the assigned goal. The KR groups, how-
ever, as contrasted to the No KR groups, were also told the cumulative number
of problems attempted, the number correct and whether they had met their goal.
The authors report that the Ss ignored the "KR" and concentrated on the light
information which had directional and most likely motivational properties as
well. The question still remains whether KR will affect performance with
goal setting controlled if the No KR groups are completely deprived of any
KR whatsoever. The present study is an attempt to furnish information on

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this point.

The second reservation one may have concerning Locke's conclusion is that it may depend on the type of goal used. In almost all the literature reviewed by Locke et al (1968) the goal was a "better than" goal, for example, to exceed performance on a practice trial by some specified amount. Rationally it seems that a subject could adopt a strategy in which he always tries to improve his performance by some degree depending on the difficulty of the goal. KR does not seem to be necessary in such a situation. With a hard goal (e.g., exceed your practice rate by 25%) the S may put a lot of effort into the task, regardless of whether there is KR or No KR. With an easy goal (e.g., just exceed your practice rate) he would put some effort into the task but not as much as in the hard goal. In each case KR is not really needed to regulate performance.

The present study employed a goal which rationally appears to require KR in order to meet it. The S was required to maintain a constant level of performance (rate of sorting). If the S exceeded this level or did not reach it, he did not meet his goal. The KR given at the end of each trial only indicated whether the S "made the goal" or failed but did not indicate the direction of failure (i.e., too fast or too slow).

<div align="center">Method</div>

Subjects

Thirty-two introductory psychology students served as subjects to fulfill a course requirement. The Ss were told only that the task dealt with perceptual motor skills.

Procedure

The Ss were randomly assigned to one of four conditions. A 2x2   orial

design was employed with KR or No KR representing one factor and low or high goal representing the other factor.

The task was a sorting task in which quality of performance was controlled by making it impossible for the S to make an error. The S was seated in front of a board 28"x21" divided into 9 squares. Each square contained 3 wooden pegs in a unique configuration. The Ss task was to sort 4x6 inch cards into appropriate squares. Each card had punched holes which corresponded to one of the unique peg configurations. In this way a card could not be placed in an incorrect square because it would not fit over the pegs. Thus, quality of performance was controlled. Ss could only vary quantity of performance.

The columns and rows of the board were each marked with a range of numbers (e.g., 501-600, 601-700, and 701-800). Each card contained two numbers; one corresponding to the row and the other to the column. Ss were told they could either sort the cards based on the numbers or by remembering the location of the peg configurations. The cards were randomly stacked in a partially covered box constructed such that only 20 cards were visible at any time. As the S picked the front card, a weight behind the remaining cards pushed them forward again showing 20 cards. In this way the S could not determine the number of cards he had sorted by looking at the number remaining in the box. There were an equal number of cards associated with each of 9 peg configurations.

The S was seated and given four practice trials (lengths 1, 2, 3 and 4 minutes). No KR or goal instructions were given at this time. At the beginning of each trial the E placed a random number of cards on each of the 9 squares. The cards were specially marked on the reverse side so that they could be distinguished from those that the S himself sorted during that trial. This was done on both the practice and experimental trials to prevent the S

from determining the number of cards he sorted by observing the number of cards on the board.

The average practice sorting rate was determined in cards per minute. The subject was then informed of his goal: The Ss were told; "We are interested in consistency of performance from trial to trial in terms of your rate of sorting in cards per minute. Your goal is to maintain a sorting rate between 75 and 99 percent of your practice rate (LOW GOAL). (HIGH GOAL was between 101 and 110 percent). If you exceed 99% (110%) or are below 75% (101%), then you have not met your goal. You must stay between 75 and 99% (101-110%)."

The S was not told his practice rate. Note that the goal range for the low goal is 25 while for the high goal it is only 10. Further, the high goal is above the practice rate and the low goal is below. After it was determined that the Ss understood, the goal was repeated and a sign was placed at the top of the board indicating their goal. After each experimental trial the E verbally reminded S of his specific goal.

The KR groups were told that after each trial the cards would be counted out of sight of S and converted to a rate. If his rate was within the specified goal range a light would be turned on by the E. If the Ss rate was either too fast or too slow, no light would come on. For the Ss in the No KR groups the light was not visible and no mention of KR was made.

Each S was given eight experimental trials, two each of length 1, 2, 3 and 4 minutes. The order of the first four trials was determined by a balanced latin square the sequence was reversed for the last four trials. These four 8-trial sequences were reversed and used for the remaining four Ss in each cell. Different trial lengths were used to make it more diffi-

cult for the $\underline{S}$ to gage his performance.

Results

The total number of trials in which the $\underline{Ss}$ rate was within the goal range (hits) was determined. The obtained means were: KR-low = 3.38; KR-high = 3.75; No KR-low = .62; No KR-high = .62. An analysis of variance indicated only a significant main effect of KR (F = 22.71; df = 1.28; p<.001) with neither a significant main effect of goal (F<1.0) or any interaction (F<1.0).

It was reasoned that total "hits" was a gross measure of performance and a finer measure might pick up an effect of goal. The standard deviation of the eight experimental sorting rates for each $\underline{S}$ was determined. The means were: KR-low = 1.857; KR-high = 1.596; No KR-low = 1.045; No KR-high = 1.063. An analysis of variance showed essentially the same results as found with total hits. The KR main effect was significant (F = 5.97, df = 1.28; p<.025) but neither the goal main effect (F<1.0) nor the interaction was significant (F<1.0). It is of interest to note that the presence of KR actually increased the variability of performance and yet resulted in more hits than the No KR conditions.

It appears that $\underline{Ss}$ were either not reacting to the goal or the difference in goal range between the high and low goal was not great enough to affect performance. If subjects were responding to the goals set by the E then their mean experimental sorting rate divided by the practice rate should be higher in the high goal groups then in the low groups. The means (mean experimental rate/practice rate) were: KR-low = 1.07; KR-high = 1.21; No KR-low = 1.13; No KR-high = 1.33.

An analysis of variance yielded a significant effect of both KR ($F = 5.13$; $df = 1.28$; $p < .05$) and goal ($F = 16.83$; $df = 1.28$; $p < .001$) but not their interaction ($F < 1.0$).

Discussion

The results show quite clearly that KR does have an effect on performance even when goal setting is controlled. The Ss were able to "make their goal" (hits) more often with KR than without KR. The mean experimental rate as a function of practice rate was closer to their goal with KR than without KR, although in both cases the means exceeded the upper limits of the respective goals. This was probably due to the fact that the Ss were still experiencing a practice effect even after the 10 minutes of practice. This made it exceedingly difficult to slow their rate down in the experimental trials. This may also account for the lack of any difference between low and high goals in terms of total hits. The larger goal range of the low goal was offset by the need to slow down the pace below the practice rate, thus making it a more difficult goal. The opposite was true with the high goal.

The data dealing with the standard deviation of performance appears strange. KR actually increased the variance rather than decreasing it. It is the author's opinion that this increase in variance represents the S's attempt at correcting his performance in the KR conditions. When an S fails to make the goal he does not know whether to increase or decrease his rate. If he chooses the wrong direction he would reverse on the subsequent trial thereby increasing the variance of performance.

These results seem at odds with Locke's conclusion that motivational

.KR has no effect on performance when goal setting is controlled. At least two possible conclusions can be made. First, that the type of goal used here in which consistency of performance is involved is sensitive to the presence of KR. If this is true than Locke's conclusion must be so qualified. Alternatively, the additional controls instituted to insure that the No KR group received No KR may have produced results which more accurately reflect the effect of motivational KR on performance than that found in previous studies.

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