PARTICIPATIVE GOALS AND ASSIGNED GOALS
ON INSPECTION PERFORMANCE

by

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INTRODUCTION

General.

The majority of any organization's problems are human
performance problems. The major method for tackling these
problems has been the "internal approach",that is, looking
inside the individual in determining his or her needs and
interests. Behavior occurs when people try to satisfy one
or more needs. The relationship among needs, goals, and
behavior can be thought of as shown in Figure 1.

Herzberg (1965) has developed a theory which provides
a useful framework for describing the needs of Industrial
Employees. This theory which has been termed- a "motivation/
maintenance" theory, states that there are two categories of
needs that influence employee motivation and job satisfaction.
As shown in Figure 2, the first category contains
maintenance needs - those aspects of work environment that
are not directly related to the job itself, Maintenance
needs involve orientation, security, status, social factors,
physical sorroundings, and economic benefits that are not
directly related to merit or performance. The theory
suggests that these factors can serve as sources of
dissatisfaction if they are not maintained above certain
minimum levels, but they cannot be used to create high
levels of motivation.
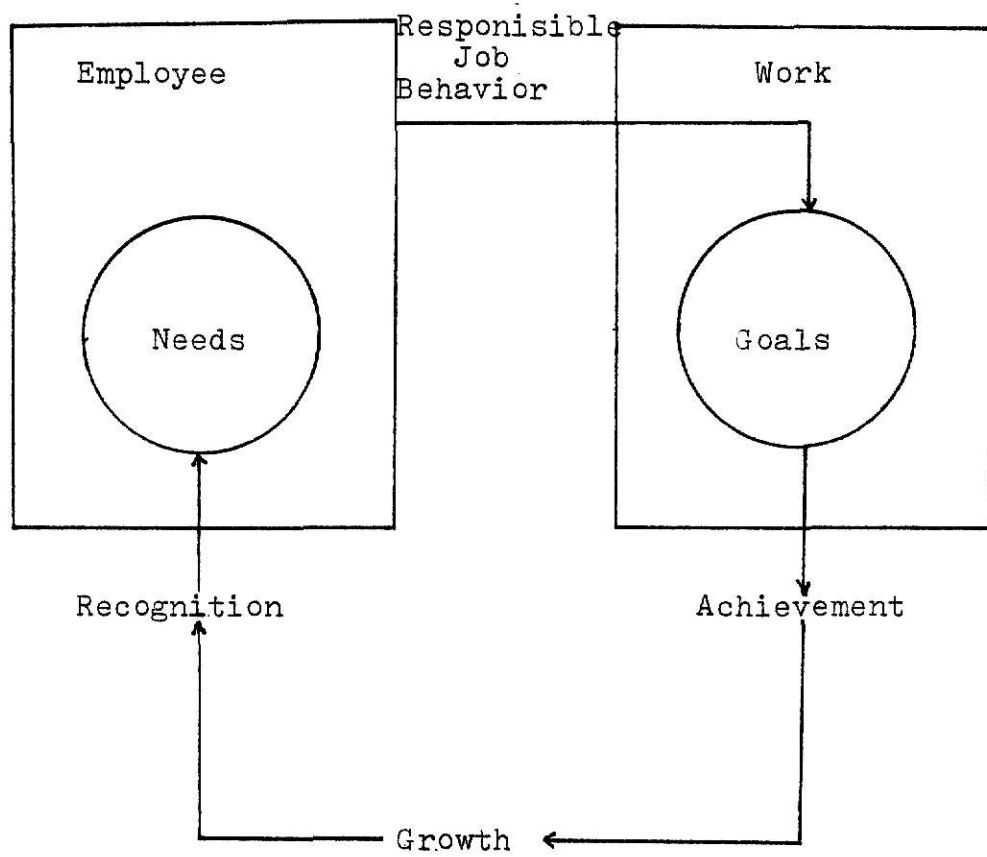
Figure 1. Relationships among employee needs, job
behavior, and goal achievement
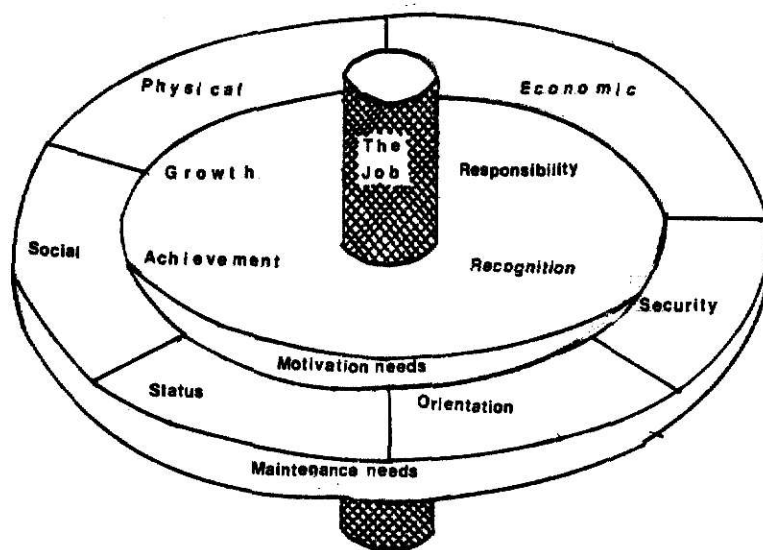
Figure 2. A classification system for employee
needs

The second category includes <u>motivation</u> <u>needs</u> such as achievement, earned recognition, responsibility, and opportunity for personal growth. Herzberg says that these needs which are directly related to the job itself are the most potent source of motivation. In other words, the theory suggests that the most effective way to motivate employees is to give them jobs that challenge their capabilities and to provide rewards that are tied directly to their accomplishments.

The concept of goal setting provides a framework for relating both motivation and maintenance needs to the objectives of the organization. Positive job motivation exists when an individual is working towards goals that he thinks he can obtain and feels will satisfy his needs. One requirement for implementation of this approach is a company goal setting system that establishes meaningful objectives for each level of management. This approach to motivation is based on the assumption that most people will identify with the company's goal, or a portion of the company's goals, as a means of satisfying some of their personal needs.

Review of literature.

Research in the field of goals and goal setting has been carried out for a long time. A major portion of the work has been concerned with the study of the effects of goals and goal setting on other aspects of behavior like

Knowledge of Results, Level of Aspiration and Achievement.

Interest in the study of goals as a prerequisite of human performance on the job began to develop in the late nineteen sixties. Specific reasons cannot be given for the late interest on this topic. But the important aim was to develop a general theory of goal setting and make it applicable to industrial situations.

One of the pioneers in this field was Locke (1968). He conducted several studies in collaboration with Bryan. He also integrated the literature available on the topic of Hard goals and "Do-best" goals in a paper presented in 1968.

In this paper, Locke collected all the existing work done on conscious goals or intentions and task performance. In his own experiments conducted along with Bryan, they used the following method for goal setting:

Goals can be assigned by the experimenter before performance and the subjects acceptance of these scores checked later.

Subjects can be given a limited choice of goals before task performance and asked to choose one of them.

Subjects can be allowed to set any goals they wish on the task and then asked to indicate what their goal was after the performance.

Locke and Bryan's studies involved predominantly simple tasks in which learning complex new skills and making long-term plans and strategies were not necessary

to achieve goals.

Goal difficulty and Level of performance. The studies in this
section are concerned with the relationship between the
level of difficulty of goals the subject is trying for and
the quantitative level of his performance. If goals
regulate performance, then hard goals should produce a
higher level of performance than easy goals. Figure 3. shows
the combined results of the 12 studies on this topic by
Locke and his colleagues. In all cases goals were expressed
in terms of some specific quantitative score that the
subject was trying to achieve on each trial or on the task
as a whole. Goal difficulty is expressed in Figure 3. in
terms of the percentage of trials on which subjects trying
fòr a particular goal actually beat that goal. Performance
level is expressed in terms of the within-study z-score for
performance for the particular goal group in question. Thus
each point represents a particular group(á particular goal)
in a particular study.

The results show that the harder the goal, the higher
is the level of performance. This was also true within each
study as shown in Table 1. Although the subjects with very
hard goals reached their goals far less often than subjects
with very easy goals, the former consistently performed at
a higher level than the latter.

The nature of the experiments from which the above
data were obtained are summarized in Table 1. For their
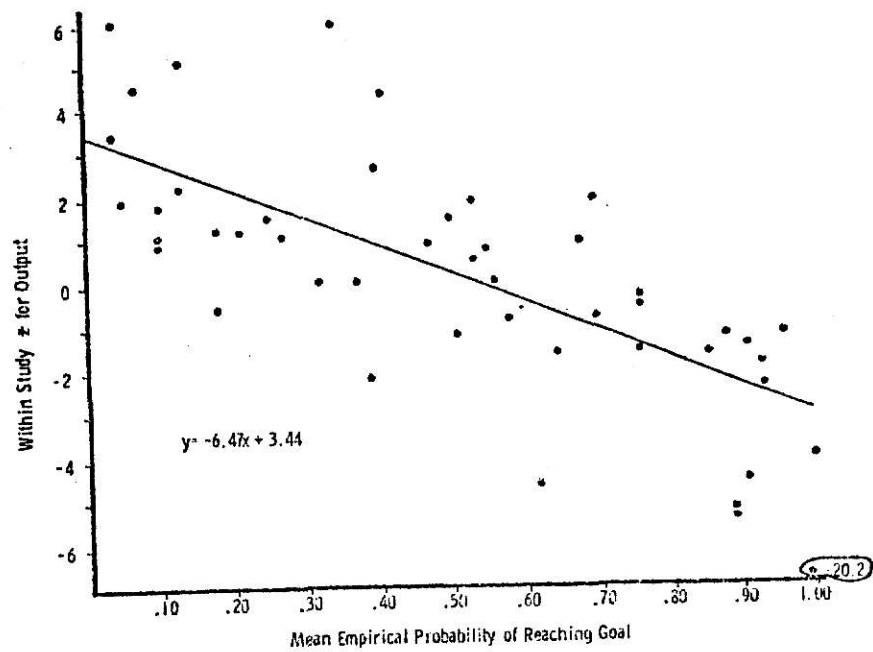
Figure 3. Output as a function of goal difficulty for
12 studies combined

TABLE 1 Summary of 12 Studies of the Relationship of Goal Difficulty to Performance Level

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	NO. OF SUBJECTS	GOAL SOURCE E[a]	GOAL SOURCE S[a]	SUCCESS %	SUCCESS RANK	PERFORMANCE MEASURE	OUTPUT RANK	RHO: SUCCESS RANK VS OUTPUT RANK
LOCKE #1 1966a	Listing objects in a given category	15 1-minute trials	Easy	26	*		93	1	Total objects listed	3	− 1.00
			Medium	22							
			Hard	23							
#2	Listing uses for objects	20 1-minute trials	Easy	27	*		91	1	Total uses given	4	− 0.80
			Self-set	27		*	53	2		2	
			Progressive	29	*		18	3		3	
			Hard	29	*		7	4		1	
#3	Listing uses for objects per goal	6 1-minute trials	Easy	23 Same Ss	*		89	1	Total uses given	3	− 1.00
			Self-set	23 Ss		*	76	2		2	
			Hard	23 Ss	*		04	3		1	
LOCKE AND BRYAN 1966b	Complex computation	6 10-minute trials	Hard	5	*		13	2	Total problems correct	1	− 1.00
			Improve over Prev. Perf.	24	*		70	1		2	

TABLE 1 (Continued)

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	NO. OF SUBJECTS	GOAL SOURCE		SUCCESS		PERFORMANCE MEASURE	OUTPUT RANK	RHO: SUCCESS RANK VS OUTPUT RANK
					E^a	S^a	%	RANK			
LOCKE AND BRYAN 1967	Perceptual speed (Pilot-study)	10 2-minute trials	Hard Improve – Beat previous score	9	*		5	3	Total rows correct in	1	– 1.00
			Best previous score	16	*		21	2	Relation to practice score	2	
			Improve – beat or equal immediate previous score	12	*		39	1		3	
LOCKE AND BRYAN 1967	Addition (Pilot-study)	10 2-minute trials	Very hard	8	*		4	4	Total problems correct in relation to practice score	1	– 0.800
			Hard	26	*	*	50	3		2	
			Easy	13		*	76	1		3	
			Very easy	4		*	62	2		4	

TABLE 1 (Continued)

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	NO. OF SUBJECTS (N)	GOAL SOURCE E	GOAL SOURCE S	SUCCESS % BLOCK II	SUCCESS % BLOCK III	SUCCESS RANK BLOCK II	SUCCESS RANK BLOCK III	PERFORMANCE MEASURE	OUTPUT RANK	SUCCESS RANK VS OUTPUT RANK
LOCKE, BRYAN & KENDALL 1968	1 Listing uses for objects	7 1-minute trials on each block (II & III)	HARD (With incentive)	19	*		76	25	2	10	Total uses given	8 1	-.85
			Hard (without incentives)	17	*		88	27	1	9		11 2	
			Self-set (with incentive)	22		*	58	56	4	5		9 7	
			Self-set (without incentives)	12		*	65	51	3	6		12 10	
			Very hard (with incentives)	21	*		32	18	8	11		6 3	
			Very hard (without incentives)	15	*		37	10	7	12		5 4	

TABLE 1 (Continued)

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	NO. OF SUBJECTS (N)	GOAL SOURCE E^a	GOAL SOURCE S^a	SUCCESS % BLOCK II III	SUCCESS RANK BLOCK II III	PERFORMANCE MEASURE	OUTPUT RANK	SUCCESS RANK VS OUTPUT RANK
LOCKE, BRYAN AND KENDALL 1968	#2 Toy construction	1 50-minute work periods	High Imp	15	*	*	53	2	Total toys made in last 25 mts in relation to first 25 mts	1	-1.00
			Low Imp	15	*	*	93	1		2	
LOCKE 1967	Listing objects in a given category	15 1-minute trials	4 No.obj-ectives 8 to try 10 for on 12 each 13 trial	11 17 15 41 21	* * * * *		99 89 68 41 34	1 2 3 4 5	Total objects listed	5 4 3 2 1	-1.00

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	NO. OF SUBJECTS N	GOAL SOURCE E	GOAL SOURCE S	SUCCESS %	SUCCESS RANK	PERFORMANCE MEASURE	OUTPUT RANK	RHO : SUCCESS RANK VS OUTPUT RANK
LOCKE & Bryan 1968	Academic Performance	1 Semester	A Minimum	10	*		40	4	Grade obtained in history course	1	-1.00

TABLE 1 (Continued)

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	NO. OF SUBJE-CTS (N)	GOAL SOURCE E	GOAL SOURCE S	SUCCESS %	SUCCESS RANK	PERFOR-MANCE MEASURE	OUTPUT RANK	RHO : SUCCESS VS OUTPUT RANK
			B Satis-factory	32		*	70	3		2	
			C Grade	168	*	*	96	2		3	
			D	10		*	100	1		4	−1.00
LOCKE & BRYAN	Addition	5 Trials Length of 12 mt. each	Hard	20	*		10	2	Total prob-lems attem-pted in relation to practice score	1	
			Easy	20	*		86	1		2	−1.00
LOCKE 1967	Reaction time	40 trials	Beat best prev.time	10	*		10	3	Mean reac-tion time	1	
			Beat imme-diate previous time	10	*		41	2		2	
			Beat worts prev.time	10	*		91	1		3	−1.00

a.'E' means goal was assigned by experimenter.
a.'S' means goal was selected by subject.
If an '*' appears both in the E and S columns:This means goal was assigned by the experi-menter but that only this sub-group said they accepted the goal;(that is there were other subjects who did not accept it and thus were not included).

studies Locke and Bryan used a variety of tasks:
brainstorming, complex computation, addition, perceptual
speed, toy construction, reaction time, grade achievement in
college thus indicating the generality of the results across
tasks.

In his paper Locke also reviewed other studies
conducted in goals and performance.

Dey and Kaur (1965) using a letter cancellation task
found hard output goals to produce a higher level of
performance than easy goals. This experiment was carried
out in an assigned condition of goal setting.

Another study, conducted by Mace (1935) on
psychomotor performance revealed that subjects who were
instructed to try to improve their scores 25 percent per
day, improved at a faster rate than those instructed to
improve at a rate of five percent per day.

In an experiment carried out to study the effects of
specific hard goals and specific easy goals, conducted by
Siegel and Fouraker (1960), with an experimental bargaining
task, subjects were asked to try for a specific
quantitatively high profit and others to try for a specific
quantitatively low profit. The former group negotiated
higher profit than the latter.

Locke (1966) reanalyzed some data gathered by Fryer
in a study of code learning, in which some subjects set
goals before each trial and some did not. Locke found that
those subjects who set higher goals in relation to their

previous performance performed better on the task than those who set comparitively low goals.

In a target pursuit rotor task carried out by Eason and White (1961), subjects were instructed to try to stay on on target for zero, fifty, and hundred percent of the time. Results showed that they actually did so. It was also found that subjects tracking a smaller target showed greater muscular control than those tracking a larger target.

Stedry (1960) in a study of problem solving, demonstrated the importance of distinguishing between instructions and the subjec s personal goals. He told different groups of subjects to try to complete different numbers of problems in the time allowed. He also had subjects indicate their own personal level of aspiration either before or after the goals were assigned by the experimenter. He found that hard assigned goals led to a higher number of problems completed than easy goals only if the goals were assigned before the hard-goal subjects set their own personal goals. If they set personal goals first, they tended to reject the assigned hard goals and performed quite poorly on the task.

A study of real life goal setting was carried out by Zander and Newcomb (1967). They studied the United Fund campaign of 149 selected communities over a period of four years. It was found that communities who set monetory goals that were higher than their previous year's performance raised more money in relation to their previous year's

performance.

Realtionship of qualitatively different goals to levels
of performance. In the same paper Locke (1968) summarized
the studies concerned with the relationship of qualitatively
different goals to the level of performance. Most of them
deal with a comparison of "do-best" goals and a specific hard
goal.

Table 2. summarizes the results of eight studies
conducted by Locke and Bryan in which these two types of
goals were compared. In six of the eight studies the
subjects trying for specific hard goals performed at a
significantly higher level than subjects trying to "do-their
-best".

Thus, a "do-best" goal does not tend to produce the
higher levels of performance.

Mace (1935) obtained a similar finding in a study of
complex computation. He gave one group of subjects specific
hard goals (geared to their ability level) to aim for in
each period. To a second group he simply told the subjects
to "do-your-best". The results indicated that the group with
hard standards improved much faster than the "do-best"
group.

The results obtained by Mace were confirmed by Locke
and Bryan in their own studies.

TABLE 2   Summary of Eight Studies Comparing Specific Hard Goals with "Do-best" Goals

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	N	GOAL SOURCE		SUCCESS %	PERFOR-MANCE MEASURE	BEST (ABSO-LUTE) PERF BY	STAT	P
					E	S					
Locke & Bryan 1966	Complex Co-ordina-tion	12 10-min. trials	Hard Do Best	14 14	x x		29 -	Lin slope of perf. curve	Hard goal	F=17.75 (df=1,24)	.001
Locke &Bryan 1966	Complex Co-ordina-tion	6 10-mt. trials	Hard Do Best	5 17	x x	x x	13 -	Total problems correct	Hard goal	t = 1.99	.07
Locke & Bryan 1967	Perceptual Speed (Pilot-study)	10 2-mt. trials	Hard Do Best	9 22	x x	x x	05 -	Total rows correct in rela-tion to practice score	Hard Goal	t 1	ns
	Addition (Pilot-study)	10 2-mt trials	Very hard Do Best	8 21	x	x x	04 -	Total problems correct in rela-tion to practice score	Hard goal	t 1	ns
# 1	Perpectual speed	1 90-mt trials	End goal Do Best	24 17	x	x	08	Total rows correct in rela-	End goal	t = 3.49	.002

TABLE 2 (Continued)

STUDY	TASK	TRIALS & LENGTH	GOAL GROUP	N	GOAL SOURCE E	GOAL SOURCE S	SUCCESS %	PERFORMANCE MEASURE	BEST (ABSOLUTE) PERF BY	STAT	P
								to prac. score			
#2 Addition		1 2-hr trial	End goal	18	x		16	Total problems correct	End goal	$t = 4.5$	.001
			Do Best	18	x	x	-				
Locke 1967	Addition	5 trials mean length= 12 mt ea	Hard	18	x	x	16	Total problems correct in relation to practice score	Hard goal	$F = 4.83$	.001
			Do Best	18	x		-				
Bryan & Locke 1967	Addition	12 trials (Range 15 secs to 32 mts on each 3 days)	Hard	6	x		54	Differences of trends across 3 days	Hard goal	$F = 6.2$ (df 2,20)	.01

E means goal was assigned by experimenter (E).
S means goal was selected by subject.
If an x appears in both the E and S columns, this means goal was assigned by E but that only this sub-group said they accepted the goal (that is there were other subjects assigned the same goal who did not accept it and thus were not included).

Practical tests. Meyer, Kay, and French (1965) examined the effects of goal setting during appraisal interviews on subsequent job performance. They found that of those performance items which were translated into specific goals, 65 percent showed subsequent improvements, while of those performance items that did not get translated into goals, only 27 percent showed subsequent improvements.

Goal setting and performance was again studied by Latham and Kinne (1974). They conducted a study in improvement of job performance through goal setting. The subjects in this study were pulp-wood logging operators. Twenty subjects in this study were matched and randomly assigned to either a one-day training program in goal setting or a control group (no training in goal setting). Measures of production, turnover, absenteeism, and injuries were collected for 12 consecutive weeks. Analysis of variance indicated that goal-setting can lead to an increase in production and a decrease in absenteeism.

Latham and Baldes (1975) examined the "practical significance" of Locke's theory of goal setting. Data was collected on the net weight of 36 logging trucks in six logging operations for 12 consecutive months. Results showed that performance improved immediately upon assignment of a specific hard goal. Company cost accounting procedures indicated that this same increase in performance without goal setting would have required an expenditure of a quarter

of a million dollars on the purchase of additional trucks.

Ivancevich (1976) conducted a field experiment to compare participative (self-set), assigned, and no-training (comparison) goal setting groups. For this experiment 37 sales personnel were trained in participative goal setting, and 41 were trained in assigned goal setting. A third group of 44 personnel served as a comparison unit. Mean age over range of subjects was 34.3 to 36.4 years. Measures of four performance and two satisfaction criteria were collected at four data points, before training,and six, nine, and twelve months after training. Analysis of variance and Duncan's multiple-range test results indicated that for atleast nine months both participative and assigned goal setting subjects were more in improving performance. The improvements however were generally not found 12 months after training.

In another industrial application of goal setting, Latham and Yukl (1975) conducted a field experiment to compare three conditions of goal setting. The subjects were woods workers and were divided into two samples based on level of education ("educated" and "uneducated"). For the uneducated sample, participative condition had higher productivity than the assigned and "do-best" conditions. In addition, goal attainment was significantly higher in the participative condition than in the assigned condition. No significant differences among conditions were found for the educated sample.

Kim and Hammer (1976) studied the effect of goal setting and feedback on performance in a large telephone company. A quasi-experimental design was employed to investigate the effects of evaluative and non-evaluative feedback and goal setting on performance and satisfaction on the job. Subjects, 114 in number, were divided into three experimental groups composed of extrinsic feedback, intrinsic feedback, and extrinsic and intrinsic feedback in addition to goal setting, while a fourth group received only goal setting instructions. Results showed that it is possible for goal setting alone to enhance performance without a formal knowledge of results program, and thus yield external validity for Locke's theory of goal setting.

Participative (self-set) and Assigned goal setting was again studied by Latham and Yukl (1976) with 41 typists. Performance under these two conditions was evaluated over a 10-week period. Significant productivity improvement occured in both goal setting conditions during the second five-weeks of goal setting. However, job satisfaction decreased slightly in both goal-setting conditions.

PROBLEM

Most of the previous studies on goals and performance did not consider the effect of goals on visual inspection tasks. Also not considered was feedback to aid in better performance. Hence the present study will investigate the effect of participative and assigned goals on performance in a visual inspection tasks. One reason for the study of an inspection system is that inspection is a repetitive process requiring the involvement of individuals performing the job. Also inspection costs are a major part of the total cost of many products and thus every effort should be made to reduce them.

In this study, the Participative goal setting will be under two levels of difficulty. They are "High" level of difficulty and "Normal" level of difficulty. These conditions will be compared with the Assigned goal setting condition.

The first hypothesis in this problem was that the inspection task performance under the Participative goal setting condition will be better than inspection task performance obtained under the Assigned goal setting condition.

The second hypothesis in this study was that the inspection task performance will be better if goals are set under the "High" level of goals as compared to the "Normal" level of difficulty of goals.

METHOD

Indepedent Variables

The experimental treatments consisted of two participative goal setting conditions and two assigned goal setting conditions. Participative condition was under two levels of difficulty of goals. These were "High" level goals and "Normal" level goals.

The assigned conditions were yoked to the goal setting conditions on the basis of the goals set by the subjects in the participative conditions.

Participative Goals. Participative goals are goals set by the subject voluntarily. Thus each subject in this participative goal setting condition had their individual goal.

Assigned Goals. Assigned goal setting condition is that condition in which goals are assigned by the experimenter (supervisor) to the subjects (workers). This usually means that the subject (worker) has no say in the performance (output) that is expected of him.

Level of Difficulty. This is defined as the subject's goal level and the probability that he will achieve it. Hence, other things being equal, as the level of difficulty increases, the probability of achieving the goal decreases.

In the present study, there were two levels of difficulty of goals. They were "High" level of difficulty

of goals or "High" goals and "Normal" level of difficulty of
goals or "Normal" goals.

In the "High" goal setting condition, subjects
were asked to set their goal as high possible. In other
words, they were asked to set the highest possible goal
which seemed achievable.

In the "Normal" goal setting condition, subjects
were asked to set a reasonable goal, which they felt they
could reasonably achieve.

Dependent Variables

The principal dependent variable in this study
was the detection performance obtained in a visual
inspection task. Performance was measured as the number of
defectives which the subjects were able to pick out from a
batch containing 240 defectives ("Hits") and is expressed
as a percentage. The number of good targets picked out as
defective were not taken into consideration.

Conveyor belt speed (angular velocity). The speed of
movement of the targets on the conveyor, set by the subject
was expressed as the angular velocity in degrees per second.

Borg scale rating. Borg scale rating is a scale for
rating the degree of perceived exertion during physical
work. This rating also called as RPE (rating of perceived

exertion) correlates well with heart rate. This has been verified for various physical activities (Borg 1962, Borg and Liberholm 1967, Skinner et al 1970). The relation between RPE and heart rate appears to be fairly linear.

Experimental design

The experimental design in this study was a yoked control design, wherein subjects with similar inspection task performance were divided into sets of four subjects. This was made possible by a pre-test similar to the actual study. The performance data obtained from the pre-test was utilized to divide the subjects into sets of four ranging from the best four, the next best four, etc. Thus, there were eight sets of four subjects each.

The members of each set were randomly assigned to the four experimental treatments. Two of these treatments were under the participative goal setting condition and the remaining pair of assigned condition were yoked to the two participative goal setting condition.

Subjects and Recruitment procedures

Thirty two subjects, most of whom were college students at Kansas State University were chosen for the study. The subjects formed an incidental sample and their ages ranged from 17 years to 40 years. They were paid $2.00 for participating in the study.

Apparatus

The apparatus for the study consisted of the Doll Straight Belt Conveyor with a variable speed drive, where the belt moved smoothly over a supporting platform. The belt was shrouded by two wooden structures to provide a window width of 16 inches. The color of the conveyor belt was a textured gray. The straight belt of the conveyor was 11.25 inches wide and 10.75 feet long. The conveyor was located in an inspection laboratory and is shown in Figure 6. Dynamic display is shown in Figure 5.

Subjects for the experiment were seated in a chair located along one end of the conveyor.

Materials

Materials for the inspection task consisted of black discs arranged four rows by ten columns on a white sheet of paper. The paper was eight and half inches wide and eleven and a half inches long. Each of the sheets was a batch of 40 articles. A good article was considered as a disc having no white dots on it's surface. A defective article was a disc having a white dot (a defect) on it. There was a total of 1200 discs to be inspected and they had a defect rate of 20 percent. The discs were 9.4 millimeters in diameter and the white dots were 0.88 millimeters in diameter which was equivalent to 9.8 minute of arc of viewing angle. There were 30 batches in total (see Figure 4),
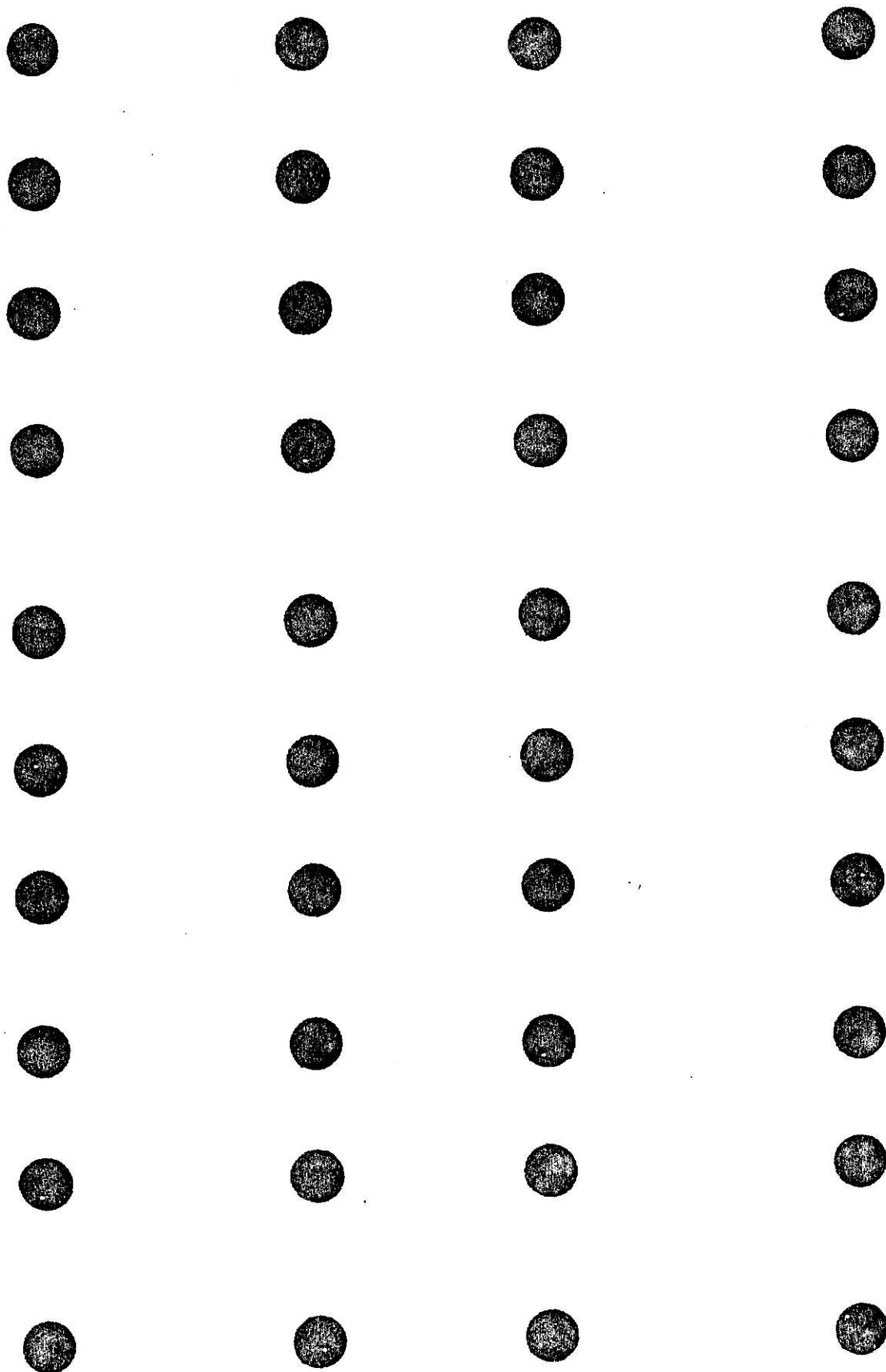
Figure 4. Example pattern

Target interspace
distance 24 inches

Target viewing
window width 16 inches

Belt velocity

wooden
board

belt

Subject to target
distance
12-15 inches
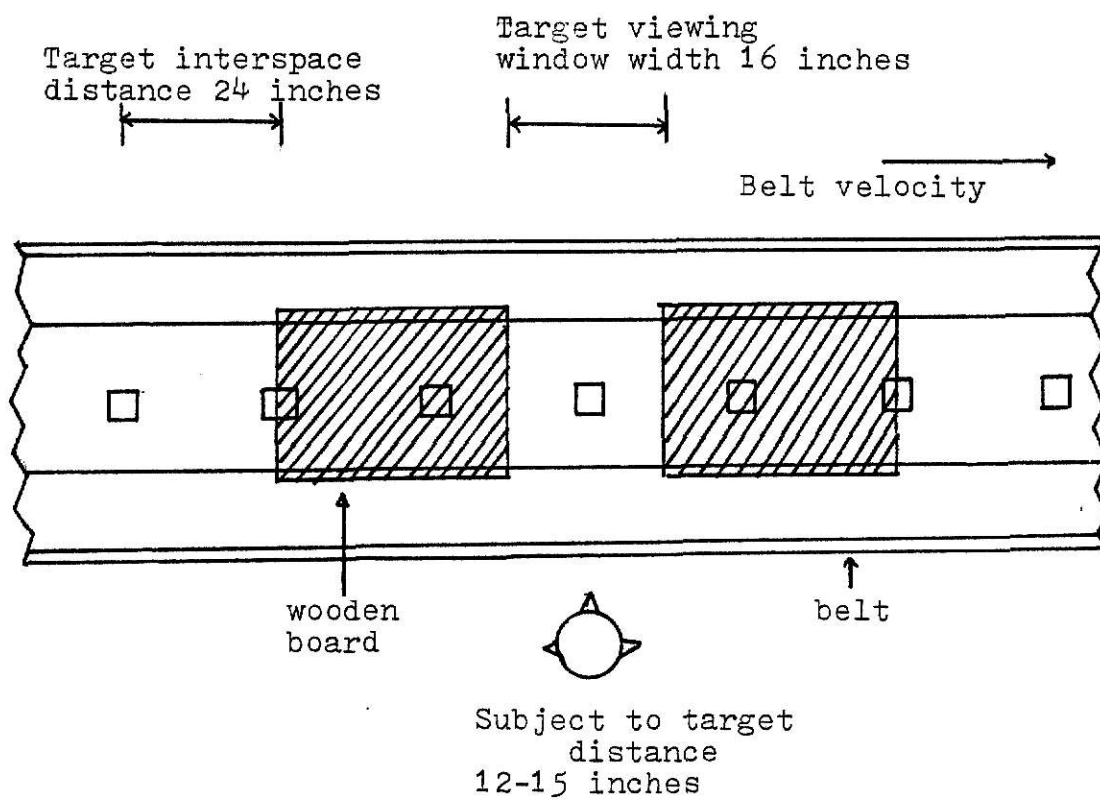
Figure 5. Diagram of dynamic display
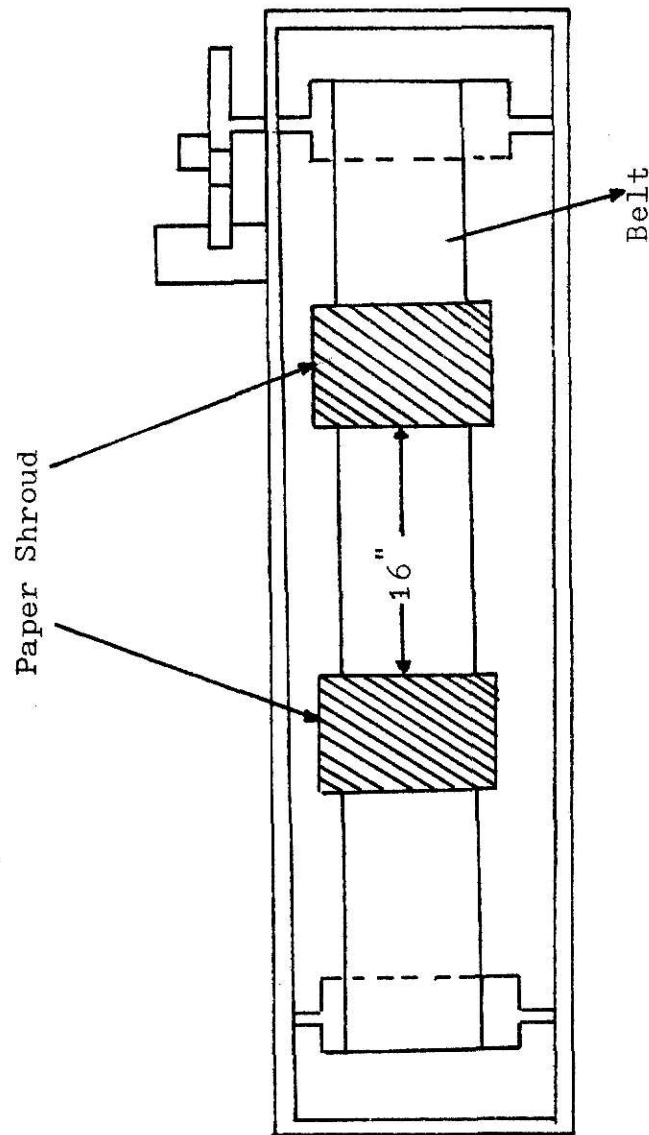
Figure 6. The Doll Straight Belt Conveyor

Task

The task was composed of inspecting a batch of 1200 black discs. The subject was seated in front of the conveyor along one end while the discs passed in front of him from the left to the right. Subjects had a viewing area of 1.25 square foot. The subjects picked out the defectives by making a mark on them as they passed in front of them on the conveyor. There was a gap of two feet between the batches.

The speed of the conveyor was initially set by the subject by means of a knee pedal. This pedal was located below the conveyor belt and was fixed to the leg of the conveyor. The subject had the pedal near the inside of his right thigh and had to move his leg to the left to increase the speed. In case the subject did not want to utilize the knee pedal to increase the speed, there was a minimum speed of eleven degrees per second for all of the subjects. This speed was maintained by placing a wedge on the pedal. Due to the difficulty that subjects experienced in maintaining a constant speed, the time taken for the task was noted to determine the average speed per batch. The task lasted for about five minutes for each subject.

Working Environment

Environmental variables such as temperature, noise, and lighting were constant throughout the experiment. The

INSTRUCTIONS

This experiment is being conducted to study Inspection Performance.

The details of the task are as follows.

You are asked to detect Discs having Manafacturing defects from a batch of 40 Discs.

The discs are black in color.

Defects are those in which a disc has a white spot on it's surface.

Good Disc   **Defective Disc**

The discs are arranged in 4 Rows and 10 Columns.

There are 30 batches to be inspected.

Each batch of 40 articles will come in front of you on the conveyor from your left to your right.

As soon as a batch comes in front of you, mark the defective with the pencil provided.

You may increase the speed of the conveyor by pushing down on the pedal which is located below the conveyor.

However, we would you to work fast.

There will be no break dueing the experiment.

You may, however, withdraw at any time you like.

THERE ARE NO RISKS INVOLVED IN THIS EXPERIMENT.

If you have any further questions, please ask me.

Thank you for participating in this study.

Figure 7. General instructions.

INFORMED CONSENT

I have read and understood the procedures and have no objection to participating in this study.

NAME:_____

AGE:_____

SIGNATURE:_____

DATE:_____

TELEPHONE#:_____

Figure 8. Informed consent.

temperature in the laboratory was around 78 degrees Farenheit. Noise level varied between 70 decibels (dbA) and 82 decibels (dbA) while the conveyor was in operation. There was general lighting on the working surface in the amount of 110 foot candles. Glare from the working surface was negligible.

Procedure

The experimental procedure was carried out in two phases; a pre-test and experimental phase.

Pre-Test phase. Each of the 32 subjects undertook a vision test on a Titmus "Vision Tester". This was done to ascertain that the subjects had 20/20 acuity. Subjects were given general instructions and asked to fill out the Informed consent. General instructions are shown in Figure 7 and Informed consent is shown in Figure 8. The subjects were shown how to use the knee pedal (and it's location) for increasing the speed of the targets. Then the targets (15 in number) were run before the subjects. The time taken for the 15 batches to move from one end to the other was noted using a stop watch. This gave the angular velocity of each batch as it moved from the left of the subject to his right. The subjects were told at the beginning of the experiment that they would have to come for the actual study at a later date. All of the subjects were run within two days of the actual study.

The data obtained from the pre-test was in terms

of the defectives each subjects had picked out and the time
taken for all of the 15 batches to move from one end of the
conveyor to the other end. These values were converted to
percentage and angular velocity respectively and are shown
Table 4.

Experimental Phase. This phase of the study was the
actual experiment. Each of the four subjects in the eight
sets was assigned to one of the four treatments. There were
written instructions as to what subjects were expected to do
in each of these instructions. These instructions contained
feedback on the previous performance followed by the level
of difficulty of goals the subject had (High or Normal). The
instructions for assigned goal setting condition consisted
of feeedback about previous performance followed by the
assigned goal which the subject ("High" assigned or "Normal"
assigned) had. All the subjects in the assigned condition
were run after the subjects in the goal setting condition
completed their experiment. The subjects had to perform the
same task as they performed in the previous test. The
instructions for the different goal setting conditions are
shown on Figure 9, Figure 10, and Figure 11 for the "High"
goals, "Normal" goals, and assigned goals respectively.
Before commencing the actual experiment, subjects were shown
how to use the knee pedal to increase the speed of the
conveyor from the minimum speed of eleven degrees per
second. This was the same speed as was used in the pre-test.
All subjects had the liberty of choosing their own speed of
the conveyor. The experimental phase had 30 batches to be

INSTRUCTIONS

In the previous session which was a practice session, you

were asked to detect for defective discs from a batch of

40 discs.

There were a total of 15 batches.

The results of that session are as follows.

You were able to pick out _____ defective discs out of a

total of 120 defective discs.

Based on the above knowledge of your performance, I would

like for you to set a goal for yourself for the present

task.

PLEASE SET YOUR GOAL AS HIGH AS YOU CAN POSSIBLY ACHIEVE.

There are 240 defective discs in this batch.

The goal will be in terms of the percentage defectives you

can pick out.

Write your goal in the space provided below.

Name:_____   Goal:_____ Percent.

Figure 9. Instructions for "High" goals.

INSTRUCTIONS

In the previous session which was a practice session, you
were asked to detect for defective discs from a batch of
40 discs.

There were total of 15 batches.

The results of that session are as follows.

You were able to pick out _____ defective discs out of a
total of 120 defective discs.

Your performance was ____ percent.

Based on the above information of your performance, I
would like for you to set a goal for yourself for the
present task.

PLEASE SET YOUR GOAL AS WHAT YOU CAN REASONABLY ACHIEVE.

There are 240 defective discs in this batch.

The goal will be in terms of percentage defectives you can
pick out.

Write your goal below.

Name:_____   Goal:____ Percent.

Figure 10. Instructions for "Normal" goals

INSTRUCTIONS

In the previous session which was a practice session, you
were asked to detect for defective discs from a batch of
40 discs.

There were a total of 15 batches.

The result of that session are as follows.

You were able to pick out _____ defective discs out of a
total of 120 defective discs,

Your performance was ____ percent.

There are 240 defective discs in this present batch.

In this present task you have to pick out ____ of the
defective discs.

Figure 11. Instructions for assigned goals

QUESTIONNAIRE

Please answer the following questions concerning the present study:

Based on the Goal you have set or have been assigned, what do you feel about achieving your goal:

a) Definitely sure that I have met the goal.

b) Quite sure I have met the goal.

c) Not sure that I have met the goal.

d) Definitely have not met the goal.

e) No comment.

Do you feel that the speed of the conveyor affected your performance ?.

YES   NO   NOT SURE

If ansewered yes indicate in what way.

Do you feel your performance would have been the same if you working at a stretch for 8 hours ?.

YES   NO   NOT SURE

Please write any further comments or suggestions you have.

Figure 12. Questionnaire

```
 6 ├──
 7 ├── Very Very Easy
 8 ├──
 9 ├── Very Easy
10 ├──
11 ├── Fairly Easy
12 ├──
13 ├── Somewhat Hard
14 ├──
15 ├── Hard
16 ├──
17 ├── Very Hard
18 ├──
19 ├── Very Very Hard
20 ├──
21 ├──
```
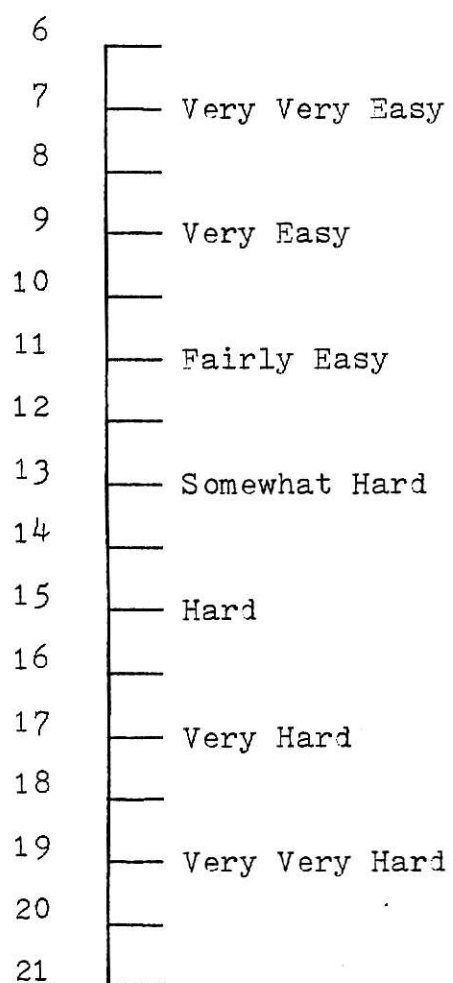
Figure 13. <u>Borg perceived exertion scale</u>

inspected.

On completion of the task, each subject was asked
to fill out a questionnaire concerning the study and was
asked to give his rating of the task based on the Borg scale
of perceived exertion. The questionnaire and Borg scale are
shown on Figure 12 and Figure 13 respectively.

TABLE 3

Result of Pre-Test "Hit" Percentages

Subject	Pre-Test Performance (%)	Angular Velocity of Targets °/sec	"High" Goal Setting	"High" Assigned Goals	"Normal" Goal Setting	"Normal" Assigned Goals
1	100	13.39	*			
2	99.2	15.87				*
3	98.3	13.23		*		
4	98.3	13.07			*	
1	98.3	13.07		*		
2	98.3	14.01			*	
3	98.3	13.70	*			
4	98.3	14.43				*
1	97.5	16.83	*			
2	96.7	14.43			*	
3	96.7	12.92				*

TABLE 3 (Continued)

Subject	Pre-Test Performance (%)	Angular Velocity of Targets	"High" Goal Setting	"High" Assigned Goals	"Normal" Goal Setting	"Normal" Assigned Goals
4	95.8	13.39		*		
1	95.8	15.16			*	
2	95.0	20.84	*			
3	94.2	12.34		*		
4	94.2	17.63				*
1	93.3	14.25	*			
2	91.7	14.01		*		
3	91.7	15.43			*	
4	91.7	11.11				*
1	90.8	17.01	*			
2	90.0	16.34		*		

TABLE 3 (Continued)

Subject	Pre-Test Performance (%)	Angular Velocity of Targets	"High" Goal Setting	"High" Assigned Goals	"Normal" Goal Setting	"Normal" Assigned Goals
3	90.0	13.70			*	*
4	89.2	12.21				
1	89.2	15.43			*	*
2	88.3	13.39	*			
3	85.8	15.01		*		
4	85.8	15.22				
1	79	16.34			*	*
2	77.5	15.58				
3	74.2	15.22	*	*		
4	70.0	15.15				
Means			94.86	95.7	94.75	93.38

RESULTS

The experimental results consisted of detection performance on the task, speed of movement of the targets (angular velocity) selected by the subjects and the Borg scale rating of the task (see Figure 13). Eight matched sets of (Four subjects each) data were collected for the four experimental treatments. The inspection task performance under four experimental treatments is shown in Table 4. The angular velocity (in degrees per second) of the targets for the four treatments is shown in Table 4. Borg scale rating of the task by the 32 subjects under the four experimental treatments is shown in Table 6.

Detection percentage ranged from a minimum of 83.3 percent for the poorest performing subject to a maximum of 100 percent for the subject with the best performance with an overall average of 94.7 percent. Angular velocity of the targets varied from a minimum of 13.89 degrees per second to a maximum of 23.49 degrees per second with a mean overall speed of 17 degrees per second (see Table 5).

The task had an overall mean Borg scale rating of 11.06 (Fairly Easy) and varied from "Very Very Easy" (7) to "Hard" (15).

Analysis of variance was carried out to compare the inspection performance under participative "High" goals and inspection performance under assigned "High" goals, and is shown in Table 10. Analysis of variance

of the inspection performance under participative "Normal" goals and inspection performance under assigned "Normal" goals is shown in Table 11. Finally Table 12 shows the analysis of variance of inspection performance under participative "High" goals and participative "Normal" goals.

The above analyses of variance were carried out on the same data to test the hypotheses that:

Performance on an Inspection task under Participative goal setting condition will be better than performance on an Inspection task under the Assigned goal setting condition.

Performance on an Inspection task under a "High" goal setting condition will be better than performance in an Inspection task under a "Normal" goal setting condition.

The conveyor speed for the four experimental treatments were analysed and this is shown in Table 13. The analysis of the Borg scale ratings of the task under four experimental conditions are shown in Table 14. None of the analyses gave significant results.

Correlations between Participative "High" goals and Assigned "High" goal was positive and equal to 0.48. The correlation between Participative "Normal" goals and Assigned "Normal" goals was positive and equal to 0.64. The above correlations clearly shows that the process of matching the subjects on goals was correct.

The correlation coefficient between the Pre-test detection performance and the actual test performance was 0.344. The coefficient of correlation between conveyor belt velocity and the detection percentage performance on the actual test was 0.101. The correlation of Borg scale rating and the detection percentage performance on the actual test was equal to 0.101. Finally, the correlation coefficient between the Borg scale rating and the conveyor belt velocity was 0.071.

None of the above correlations was significant at the 5% level of significance. This suggests that the various measures were not reliable (the task should have been longer) and indicates that the matching of subjects was ineffective.

TABLE 4

Goal setting condition and detection percentage performance

Goal setting condition	Set of subject I	Set of subject II	Set of subject III	Set of subject IV	Set of subject V	Set of subject VI	Set of subject VII	Set of subject VIII
Participative "High" Goals	95.5	88.7	96	97.5	98.7	97.9	91.3	93.3
Participative "Normal" Goals	95.8	96.3	100	93.3	98.8	97.5	93.0	83.3
Assigned "High" Goals	98.7	96	95.8	94.9	96	92.9	93	98.3
Assigned "Normal" Goals	97.9	96.3	91.7	93	96.3	92.9	95.4	91.2
Means	96.98	94.33	95.88	94.68	97.45	95.30	93.20	91.53

TABLE 5

Goal setting condition and conveyor belt velocity

Goal setting condition	Set of subject I	Set of subject II	Set of subject III	Set of subject IV	Set of subject V	Set of subject VI	Set of subject VII	Set of subject VIII
Participative "High" Goals	17.09	18.3	16.66	16.51	16.50	15.22	16.10	16.58
Participative "Normal" Goals	13.89	16.83	16.26	16.10	18.21	17.09	16.10	17.09
Assigned "High" Goals	16.70	15.22	18.42	16.34	19.15	19.15	23.49	14.24
Assigned "Normal" Goals	19.39	16.83	16.58	16.10	14.24	16.83	19.39	19.15
Means	16.76	16.79	16.98	16.26	17.03	17.07	18.77	16.77

TABLE 6

Goal setting condition and Borg scale rating

Goal setting condition	Set of subject I	Set of subject II	Set of subject III	Set of subject IV	Set of subject V	Set of subject VI	Set of subject VII	Set of subject VIII
Participative "High" Goals	15	9	13	11	10	11	13	7
Participative "Normal" Goals	10	15	11	12	11	11	11	13
Assigned "High" Goals	11	9	11	11	13	11	12	9
Assigned "Normal" Goals	9	13	7	13	13	12	12	10
Means	11.25	11.5	10.5	11.75	11.75	11.25	10.75	9.75

TABLE 7

Mean values for detection percentage performance

	"High" goals	"Normal" goals	Means
Participative goals	94.86	94.75	94.86
Assigned goals	95.70	93.38	94.54
Means	95.28	94.00	

TABLE 8

Mean values for conveyor belt velocity

	"High" goals	"Normal" goals	Means
Participative goals	16.62	16.44	16.53
Assigned goals	17.84	17.31	17.58
Means	17.23	16.87	

TABLE 9

Mean values for Borg scale rating

	"High" goals	"Normal" goals	Means
Participative goals	11.13	11.75	11.44
Assigned goals	10.88	10.50	10.69
Means	11.00	11.12	

TABLE 10

Analysis of variance for detection percentage performance under Participative "High" goals and detection percentage performance under Assigned "High" goals

Source	df	Mean Square	F	Alpha hat
Type of goal setting	1	2.80	.31	0.59
Sets of subjects	7	7.85	.88	0.56
Error	7	8.92		
Total	15			

TABLE 11

Analysis of variance for detection percentage performance under Participative "Normal" goals and detection percentage performance under Assigned "Normal" goals

Source	df	Mean Square	F	Alpha hat
Type of goal setting	1	0.68	0.06	0.81
Sets of subjects	7	21.38	1.74	0.23
Error	7	11.97		
Total	15			

TABLE 12

Analysis of variance for detection percentage performance under Participative "High" goals and detection percentage performance under Participative "Normal" goals

Source	df	Mean Square	F	Alpha hat
Sets of subjects	7	15.23	1.46	0.26
Goal difficulty	1	4.35	0.42	0.53
Sets of subjects and Goal difficulty	7	14	1.34	0.30
Type of goal setting	1	0.36	0.03	0.85
Goal difficulty and Type of goal setting	1	3.12	0.30	0.59
Error	14	10.44		

Total 31

TABLE 13

Analysis of variance for conveyor belt velocity under Participative "High" goals, Participative "Normal" goals, Assigned "High" goals, and Assigned "Normal" goals

Source	df	Mean Square	F	Alpha hat
Sets of subjects	7	2.17	0.44	0.86
Goal difficulty	1	0.98	0.20	0.66
Sets of subjects and Goal difficulty	7	2.08	0.42	0.87
Type of goal setting	1	8.7	1.76	0.20
Type of goal setting and Goal difficulty	1	0.25	0.05	0.83
Error	14	4.95		
Total	31			

TABLE 14

Analysis of variance for Borg scale rating under Participative "High" goals,
Participative "Normal" goals, Assigned "High" goals, and Assigned "Normal" goals

Source	df	Mean Square	F	Alpha hat
Sets of subjects	7	3.03	0.87	0.55
Goal difficulty	1	0.28	0.08	0.78
Sets of subjects and Goal difficulty	7	8.07	2.32	0.08
Type of goal setting	1	1.53	0.44	0.52
Goal difficulty and Type of goal setting	1	5.28	1.52	0.23
Error	14	3.48		
Total	31			

DISCUSSION

General

The null hypothesis that the performance on an Inspection task will be the same under two conditions of goal setting, Participative or Assigned was accepted. Thus, the analysis did not indicate the expected result that performance would be better if goals are set participatively rather than when goals are assigned.

Analysis of the Participative "High" goals and Participative "Normal" goals gave no significant differences in performance under these two conditions. Thus the expected hypothesis that performance under the "High" level of difficulty of goals would be better than performance under the "Normal" level of difficulty of goals was not accepted.

Analysis of variance of the conveyor speed or the angular velocity of the movement of targets before the subjects, for the four experimental conditions revealed that neither Participative goals nor Assigned goals had any influence on the speed selection by the subject. Also, goal difficulty did not influence the speed of the conveyor.

Borg scale ratings of the perceived exertion on the tasks, were not influenced by the goal setting condition. Most of the subjects found the task to be fairly easy in difficulty.

Participative and Assigned Goals.

The analysis indicated that for this experiment,
Participative goals did not give better performance than
Assigned goals. This was regardless of whether the goals
were High or Normal. Also the level of difficulty of goals
had no influence on the performance in the inspection task.

The subjects in the participative condition set
a mean goal of 93 percent and achieved a mean performance of
94.8 percent. The same mean goal when assigned gave a mean
performance of 94.5 percent. This indicates that though the
Participative condition was not better than Assigned, the
process of goal setting itself gave high performance in
both the conditions. It is observed here that goal
setting by i-self can lead to high goals being set and
achieved. A comparison of the pre-test performances and
the performances of the actual test show evidence that goal
setting itself leads to high performances. The same
argument can be extended to Participative "Normal" and
Assigned "Normal" goals.

Though a mean goal of 93.5 percent was set by
subjects in the Participative (High and Normal) condition,
it appears that this goal was consciously accepted by the
subjects in the Assigned condition. This fact is
demonstrated by the high mean performance for the subjects
in the Assigned condition.

In the present study, the length of the task was
about three minutes and it is felt that this had an effect

on the goals being set and assigned. This fact is clearly
demonstrated by the high detection percentages obtained in
both of the conditions. Mace (1935) in a similar study
says that goal setting becomes important only if the task
is long, because subjects in goal setting groups work
better during the latter parts of the work period. Locke
and Bryan (1967) using tasks lasting about one and a half
to two hours found that differences between groups increased
steadily during the course of these long work periods.
Since in the present study the task was very short in
duration, no differences may have occured because it did
not give the goal setting groups a chance to evaluate their
goal.

Instructions.

Another factor which probably affected the results
is the type of instructions. In this study, all of the
instructions were written. The mean goal set for the "High"
goals condition was 93.38 percent whereas the mean goal set
by the subjects in the "Normal" goals conditions was
93.63 percent. This indicates that the "High" and "Normal"
instructions did not have the desired effect on the goals
which were set. On the topic of instructions Locke and
Bryan (1966) have this to say " Instructions do not
inevitably nor automatically affect an individual's goals
or his performance ". The present study shows that the
instructions did not have an effect on the goals being set.

because written instructions may not have emphasized the differences in the goals to be set under two levels. It appears that written instructions did not work well in this study.

Conveyor belt speed.

Though it was thought at first that speed of movement of the targets had a significant effect on the performance. However, there was a minimum conveyor speed of 11 degrees per second. It was expected that, subjects in the participative condition would choose a speed higher than the subjects in the assigned condition. The reason behind this was that once a goal was assigned to a subject in the assigned condition, he would have a lower conveyor speed thus having better viewing time and this would help him meet his goal. However, subsequent analysis of the speed at the four experimental conditions did not reveal any significance. Though most of the subjects made use of the knee pedal to increase the speed above the minimum, it appears that subjects did so regardless of which condition of goal setting they were in.

A notable factor in this study was that independent speed selection worked well in that it resulted in a high output for all of the subjects. It could be said that for short tasks, speed does affect the outcome appreciably.

Type of Tasks.

The task utilized in this study was inspecting batches of black discs for defectives. There were 30 batches to be inspected and time taken depended on the angular velocity which the subjects chose. The performance and subjective results show that the task was easy. Further investigations should be carried out which consist of tasks of varying degrees of difficulty.

Subjects.

Before concluding one has to point out the fact that in the present study most of the subjects were part of an educated sample. Comparison can be drawn to another study conducted by Latham and Yukl (1975) on educated and uneducated woods workers. In this study the three goal setting conditions were participative, assigned, and "do-best" goals. They found that for the educated sample no significant differences among conditions existed. The same result was found in the present study. The reason behind this may be that in an educated sample, achievement may not have any significance since subjects are already performing under a high degree of achievement. For such a sample goal setting may not have any significance at all.

Summing up the discussion, in the present study the following observations might be made:

Participative goals and Assigned goals are significant only when the instructions are effective in emphasizing the significance of each. Oral instructions probably help do this.

For goal setting in itself to give significant results, the tasks should probably be lenthy in duration.

Tasks with various degrees of difficulty may be attempted. to give significant results.

Educated samples in general may not respond very well to goal setting.

For simple and short tasks, feedback, goal setting, and whether task is paced or unpaced has no significance.

Suggestions for future research on Goals and Performance.

Results of this study, though giving inconclusive evidence of the superiority of Participative goals over Assigned goals give sufficient background for further investigations in this area. It is felt here that this study revealed some of the factors which constrain an effective goal setting program and any further studies should take into account some or all of the factors which were discussed earlier.

One should point out here that the results do not necessarily mean that goal setting has no relevance and is of little practical value to organizations. Past studies found in the literature give ample evidence to the contrary. It is our firm belief that motivation of the individuals by their supervisors to challenge their

capabilities is very important to bring about the best in an individual. Goals are just a part of this motivation.

All future studies should be carried out in a real situation rather than in a simulated setting. It was found that simulation did not work well in the present study. Also it is suggested that data collection be carried out over a longer period of time.

Practical implications.

The results of this study should be useful to any organization in their goal setting program. Instead of just assigning targets to be met to the employees, an effective way could be to get togehter with each individual and decide on specific goals to be met based on the employees capabilities.

CONCLUSIONS

Inspection performance under Participative and Assigned goal setting conditions were compared to observe possible differences in performance. It was found that there was no significant differences in performance among the two conditions.

Inspection task performance under two levels of difficulty of goals were compared to measure the differences in performance.No differences in performances were observed under the two levels of difficulty of goals.

Conveyor speed was not found to be affected by the goal setting condition. Also the Borg scale rating of the perceived exertion on the task was not found to be affected by the goal setting condition.

Process of goal setting gave rise to high performance in all of the conditions.

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PARTICIPATIVE GOALS AND ASSIGNED GOALS
ON INSPECTION PERFORMANCE

by

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ABSTRACT

This study investigated the effects of Participative goals and Assigned goals on self paced visual inspection task.

The Participative goal-setting condition was further broken down into two levels of goal difficulty. These levels were Participative "High" goals and Participative "Normal" goals. The Assigned conditions were yoked to the Participative condition based on the goals set in the participative conditions.

Results showed that, for this study no differences existed between the Participative goal-setting condition and the Assigned goal-setting conditions.

Goal difficulty was not found to effect the inspection performance.

Conveyor belt speed was not influenced by the goal -setting conditions.

Borg scale rating of perceived exertion was not affected by the goal-setting condition.