The impact of assigned, conflicting goals on task performance

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THE IMPACT OF ASSIGNED, CONFLICTING GOALS
ON TASK PERFORMANCE

A Thesis
Presented to the
Department of Psychology
and the
Faculty of the Graduate College
University of Nebraska

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
University of Nebraska at Omaha

by
Daniel P. Whitenack
December, 1984
THESIS ACCEPTANCE

Accepted for the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the degree Master of Arts, University of Nebraska at Omaha.

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Abstract

Previous research has strongly supported Locke's theory of goal-setting: given specific, difficult, accepted goals with proper feedback, individual performance will improve relative to others not given a goal. A possible exception to this theory might be the setting of goals that conflict or require widely different strategies for task completion. The present study employed a 2 x 2 factorial design (presence/absence of a quantity and a quality goal) to investigate the impact of conflicting goals on task performance. Results showed that assigned, conflicting goals do not provide an exception to the goal-setting/performance relationship since significant main effects were found for both goals. Thus, the theory of goal-setting as proposed by Locke was supported.
Chapter I

Introduction

"Nothing can be done at once
hastily and prudently"

Syrus
35 B.C.

Many times, how fast one works affects how well the work is performed. Most people are familiar with the saying "haste makes waste" and recognize an implicit relationship between the quantity and the quality of one's performance. Limitations in information processing capabilities have often been cited as the basis of this relationship. If one works at a very fast pace, then he or she simply cannot pay as much attention to the fine details of quality, and performance deteriorates. The fact that information processing limitations have an impact on the relationship between quantity and quality of performance is unquestioned. What can be asked is, "Can motivational techniques counteract or alter the inverse relationship between the quantity and quality of task performance?" This paper explores one such motivational technique and examines its impact on both the quantity and quality of performance.
Definition of Motivation

In studying the nature of human motivation, one is initially confronted with a multitude of definitions. The word motivation was originally derived from the Latin word "movere" meaning to move. Jones (1955) elaborated by defining motivation as "how behavior gets started, is energized, is sustained, is directed, is stopped" (p. vii). The reader is invited to compare this definition to Vroom's interpretation (1964), when he wrote that motivation is "a process governing choices made by persons or lower organisms among alternative forms of voluntary activity" (p. 6). Although these definitions prove useful in a heuristic sense, they provide little theoretical direction due to their generality and breadth. In an attempt to narrow the focus, Campbell and Pritchard (1976) argued that:

Motivation has to do with a set of independent/dependent variable relationships that explain the direction, amplitude and persistence of an individual's behavior, holding constant the effects of aptitude, skill and understanding of the task, and the constraints operating in the environment. (p. 65)

This latter viewpoint interprets motivation as a set of variables that can help us understand not only the direction, but also the strength and duration of behaviors. This definition is not inconsistent with the first two, although it does narrow the term down to a more useful and practical level.

In order to understand the variability of behaviors in terms of direction and amplitude, a multitude of useful motivational theories
were constructed. Many of the early theories of motivation were diffuse in their targets of behavior—that is, a theory would attempt to explain all behavioral motivations with only a few variables, such as conditioning or needs. However, in the words of some researchers:

Such theories have been gradually replaced by more modest and limited approaches to motivation. These approaches do not presume to explain all motivational phenomena; their domains are more restricted. The study of goal setting is one such limited approach. (Locke, Shaw, Saari, & Latham, 1981, p. 125)

The Goal-Setting Technique

Although the goal-setting technique may lack universal applicability, it does seem to benefit from larger empirical support. The approach has received widespread attention since its inception by Locke and his colleagues nearly 20 years ago. This attention was readily apparent when the Locke et al. (1981) goal-setting review article cited over 140 references. Such attention seems warranted since the original research has been replicated (Garland, 1983), and the field applications appear quite significant (Latham & Baldes, 1975). In fact, in Locke et al.'s review (1981), it was noted that 90% of previous studies generally supported Locke's theory of goal-setting.

What is a goal? Webster's New Collegiate Dictionary (1981) defines it as "the end to which effort is directed: aim" (p. 488). Locke, Shaw, Saari, and Latham define a goal as a level of proficiency usually attained within some specified time limit (1981).
The theory of goal-setting assumes that behavior is both purposeful and cognitive in nature—that we attempt behaviors with the thought of attaining certain consequences (Locke & Bryan, 1969). It is primarily with the assumption of purposefulness that Locke takes issue with advocates of behavior modification. Those who advocate behavior modification as a motivational technique give an employee a standard to achieve. If the employee attains the standard, he or she would be given some reinforcer. Locke's theory notes that this motivational technique sometimes fails to improve performance under some circumstances. He postulated that one cognitive condition must be met before these standards or goals improve performance—namely, the goal must be accepted by the subject (Locke, 1968).

In analyzing how a goal can affect one's performance, Locke et al. (1981) hypothesized that goals affect direction, amplitude, and duration of an action—all three aspects of motivation as previously defined. Research has tended to support the idea that goals affect the direction of behavior. Rothkopf and Billington (1979) found that subjects given specific goals read prose passages with goal-relevant material an equal or greater amount than subjects given no specific goal. Reynolds, Standiford, and Anderson (1979) found that subjects spent a significantly greater amount of time reading passages relevant to their goal than other passages of reading. Locke et al. (1981) concluded that "most fundamentally, goals direct attention and action" (p. 131).

The second way in which goals affect task performance is through amplitude (i.e., effort). Several researchers have found that goals
which require greater effort produce higher subjective and/or objective effort levels (Kahneman, 1973; Locke, 1968; Sales, 1970; Terborg, 1976; Terborg & Miller, 1978).

Third, goals affect performance by directing subjects to work for longer periods of time on tasks (persistence). This enduring effort is directed toward the goal-specific task. Two studies support the notion that goals affect the length of time subjects spend on relevant tasks (LaPorte & Nath, 1976; Rothkopf & Billington, 1979).

In the above discussion of a goal-setting/performance relationship, several important goal characteristics have been identified. The first requirement is for goals to be specific. Since goals affect the direction of one's behavior, a specific goal would lead to more concentrated or directed behaviors by the subject. A non-specific (e.g., "do your best") goal gives less direction for behavior and, therefore, by definition is a less effective motivator. Most studies have supported the idea that specific goals enhance performance over "do your best" goals (Kaplan & Rothkopf, 1974; Miller, Katerberg, & Hulin, 1979; Mobley, Horner, & Hollingsworth, 1978; Mobley, Hand, Baker, & Meglino, 1979; Rothkopf & Kaplan, 1972).

A second important characteristic of goals is their difficulty level. As noted above, goals which require greater effort on the part of the subject tend to elicit such effort. Said differently, the harder the goal the higher the level of effort or performance. Many researchers have addressed the question of whether specific, challenging goals lead to higher performance levels than specific and moderately difficult or specific, non-difficult goals. The laboratory

Not only must goals be specific and challenging, but they must also be accepted by the person given the goal. Locke argues that one can institute many goals without success unless the subject accepts the goal as his/her own. Acceptance, therefore, is the third necessary component for effective goal-setting interventions (Locke et al., 1981).

Finally, feedback or knowledge of results (hereafter referred to as KR) to the subject is the last requirement for effective goal-setting. Goal theorists initially hypothesized that the effect of feedback on performance was mediated only through goals (Locke, 1967, 1968; Locke, Cartledge, & Koeppel, 1968; Locke & Bryan, 1969). Such a position was a challenge to earlier views that feedback independently motivated workers/subjects to attain higher performance levels (Arps, 1920; Johanson, 1922; Maier, 1965; Smode, 1958; Viteles, 1953). Subsequent attempts to separate the effects of goals from feedback demonstrated that neither one without the other had any significant impact upon performance. Apparently, both feedback and goals were necessary to affect performance. It was, therefore, concluded that feedback should be included as the fourth necessary component in any goal-setting intervention (Becker, 1978; Erez, 1977; Latham & Baldes,
Latham, Mitchell, & Dossett, 1978; Locke, 1980; Locke et al., 1981). These results were consistent with other studies which had concluded that feedback was necessary for learning ("At Emery Air," 1973; Bass & Vaughn, 1966; Bilodeau & Bilodeau, 1961; Bilodeau, Bilodeau, & Schumsky, 1959; Wingfield, 1979).

Having established the four prerequisites for effective goal-setting interventions (specificity, difficulty, acceptance, and feedback), researchers began to focus upon the resultant performance. Earlier, it was hypothesized that performance was increased on a particular dimension because the goals functioned to specify behavioral efforts in that direction. However, performance can be measured in more than one way, or even on more than one dimension (Smith, 1976). For example, a manager may be responsible for receiving raw materials, manufacturing several products, and keeping a low turnover rate. Simply looking at one dimension of the manager's performance gives an incomplete view of his actual output. In addition, directing the manager's efforts toward one particular dimension may, in fact, deteriorate his performance on another dimension. Indeed, researchers have known for some time that if they set a specific performance goal on one dimension, the subject's performance on another dimension was negatively affected (e.g., Rothkopf & Billington, 1979).

The Tradeoff Between Quantity and Quality of Performance

One typical tradeoff can be found in the relationship between quantity and quality of performance. For example, as one strives to produce more goods, the quality of those goods may diminish. The idea of an inverse relation between performance quantity and quality is not
a new one. Garrett (1922) investigated the impact one's speed had on performance accuracy. However, the tasks employed to demonstrate this relationship were sensory-motor in nature (e.g., tracing, handwriting), and required little judgment or high level cognitive processing. Garrett concluded that there is a consistent, inverse relationship between the quantity and quality of a person's performance. In his autobiography, Henry Ford (1973) described the proper speed of an assembly-line:

The speed of the moving work had to be carefully worked out; in the fly-wheel magneto, we first had a speed of sixty inches per minute. That was too fast. Then we tried eighteen inches per minute. That was too slow. Finally, we settled on forty-four inches per minute. The idea is that a man must not be hurried in his work—he must have every second necessary, but not a single unnecessary second. (p. 82)

Ford recognized that maximum productivity was achieved by balancing the quantity and quality of a worker's performance. He eventually settled on an acceptable error rate and properly set the speed of the assembly-line. Recent research has demonstrated further support for the quantity/quality relationship. Sales (1970) gave subjects a high quantity of work to do and found that they made more errors as a result of lowering their standard of quality. Rosswork (1977) noted that when subjects were given sentence writing quotas, they simply jotted down shorter sentences. In analyzing their own research findings, Bavelas and Lee (1978) found that subjects gave lower
quality answers in tasks accompanied by specific, challenging (i.e., quantitative) goals. This finding seemed to further support the quantitative/qualitative relationship of performance and was consistent with work of other researchers (Aronson & Gerard, 1966; Fitts & Posner, 1967; Miller, 1960; Reed, 1973). Bavelas and Lee (1978, p. 236) concluded by arguing that:

Variations in goal level implicitly dictate variations in qualitative as well as quantitative aspects of performance . . . . These two response parameters, quantity and quality, are traded off by the subject in accordance with task definition. Tradeoff is taken here to mean an inverse relationship between quantity and quality of response.

Although the existence of a quantity/quality performance relationship is seldom doubted, its characteristics can be questioned. Given the established literature, these questions can be posed: How flexible is the quantitative/qualitative tradeoff in human performance? Can the establishment of goals significantly affect the relationship? What is the effect of quantity and quality goals upon performance? Indeed, although the above researchers supported the inverse quantity/quality relationship, few have tested its boundaries or limits. In addition, there appears to be no research in which goals are set at the same time for performance quantity and quality. Researchers have set multiple goals for subjects, but not on these two dimensions simultaneously and not with the four necessary components of goals. For example, Constantine (1976) set multiple goals for students in a family therapy training program with positive results.
However, these goals lacked specificity and were assigned at different stages of the program. Locke (1967; 1982) set multiple goals with the necessary components, but did not simultaneously implement them. Subjects participated in several short-interval brainstorming sessions, but only received one goal per session. Thus, subjects did not receive multiple goals regarding the same task at the same time.

Conflicting Goals

Given their inverse relationship, if one set both a quantity and quality goal for a subject, the goals would be conflicting. If past research results are correct, as the subjects strive for one goal, their effort toward the other goal should decrease. Since these two goals require opposite behavioral strategies, their simultaneous implementation should have some effect on performance.

One setting in which conflicting goals have been studied is maintenance organizations such as prisons and mental hospitals (Katz & Kahn, 1966). In 1978, Steller concluded that the prison structure with its inherent emphasis on discipline conflicted with the rehabilitative process. Steller argued that the conflicting goals of rehabilitation and discipline resulted in ineffective treatment for the prisoners. Dimsdale, Klerman, and Shershow (1979) found that the goals of patients in mental hospitals conflicted with the goals of the medical staff. According to the author, this discord resulted in ineffective treatment. Understanding the relationship of conflicting goals to performance, Pogrebin (1978) asserted:

A large body of literature in the fields of correction and mental health documents the fact that certain social
arrangements (organizational structure) are facilitative of
treatment goals while others are facilitative of custody
goals. While both goals are important in dealing with
offenders, an effort to maximize one of the goals often
reduces the effectiveness of efforts to achieve the other.
(p. 149)
Unfortunately, Pogrebin (1978) had difficulty in measuring treatment
effectiveness, thereby making it difficult to show performance
decrements. In addition, Klingemann (1982) factor analyzed an
attitudinal survey of prison guards and found two distinct "belief
systems: security and treatment" (p. 159). However, he did not
specify the impact these conflicting beliefs had upon performance
levels. Stoelwinder and Charns (1981) noted that many organizations
have multiple, unprioritized, and conflicting goals. They proposed a
task field model for organizational analysis and design to account for
the conflicting goals. However, this model does not account for
intrapersonal conflicting goals, nor does it specify the impact
conflicting goals have on performance.

Overall, research conducted in maintenance organizations seems
unable to determine the impact conflicting goals have upon performance.
First, the studies include poor measures of performance. Pogrebin
(1978) noted that "it is almost impossible to evaluate the
effectiveness of an officer's treatment ability because of the lack of
obvious criteria on which to base an evaluation" (p. 154). Second,
these studies are non-experimental in design. They demonstrate the
existence of conflicting goals but cannot experimentally link these
goals to performance. Third, the goals do not conform to the four prerequisites of effective goal-setting discussed earlier. "Rehabilitation" is not a specific behavioral directive for a guard to undertake. In addition, since the guard's rehabilitative performance cannot be measured, systematic feedback to them is severely hampered.

The maintenance organization literature may not always call it such, but the incongruent attitudes and beliefs produce a "role conflict." Brief and Aldag (1976) defined role conflict as "the degree of incongruity of expectations associated with a role" (p. 469). Role conflict is a topic relevant to goal conflict. If one's strategy for attainment of goal 1 is antagonistic toward the strategy required of goal 2, then one's expectations toward each goal become incongruous. Several studies have demonstrated the impact role conflict has on performance. Johnson and Green (1973) demonstrated that employees who experience job conflict often end up rejecting the organization. Schuler (1975) found that role ambiguity reduced performance more than role conflict. In addition, both role conflict and role ambiguity resulted in lower reported levels of job satisfaction. Posner and Randolph (1980) reported that role conflict produced lower levels of self-rated performance. Futrell and Parasuraman (1981) confirmed the inverse relationship between role conflict and task satisfaction. More recent studies suggest moderator variables between role conflict and performance. Stumpf and Rabinowitz (1981) found that the employee's career stage moderated the relationship. Similarly, Drory (1981) found organizational level to be a moderator. One study (Berkowitz, 1980) found no relationship
between role "perception" and performance, but these results should be closely examined. First, role "strain" was measured and not role conflict per se. Role strain was defined as "the difficulty individuals encounter in meeting their role expectations" (p. 241). Notice that the definition does not focus on conflicting expectations. Instead, the term applies to difficulty meeting expectations in general—conflicting or congruent. Second, the participants (salespeople) were measured on one dependent variable: dollar value of sales. Although salespeople have some control over their sales volume, much of their performance is beyond their control. Indeed, Berkowitz (1980) reported no attempt to control for different shifts, hours worked, geographic location, etc. Overall, most research has tended to support the negative relationship between role conflict and job performance.

The research reviewed above gives a rich background for studying the impact of conflicting goals upon performance. Unfortunately, the methodology of these studies can be criticized in several areas. First, the studies typically employ inadequate measures of performance. Most of the above role conflict studies use a subjective rating scale based upon overall job performance (e.g., Posner & Randolph, 1980; Schuler, 1975; Stumpf & Rabinowitz, 1981). In effect, Johnson and Green (1973) used only one dichotomous variable to measure performance—role rejection. Any attempt to study conflicting goals and performance should seek to improve the performance measurement techniques. Multiple, objective performance indicators offer an alternative to these methods.
Second, much of the role conflict literature lacks experimental control. These studies measure role conflict via questionnaire (Rizzo, House, & Lirtzman, 1970) and correlate it with a performance measure. It seems desirable to create goal conflict directly, and measure it objectively in an effort to reduce contamination and assure accuracy.

**Questioning the Impact of Conflicting Goals on Performance**

The question remains then: What is the effect of conflicting (quantity and quality) goals upon performance? A 2 x 2 factorial design will be used to address this question. The first factor is a quantitative goal and is either absent or present. The second factor is a qualitative goal, and is similarly varied.

Locke does not explicitly deal with the issue of conflicting goals. As was mentioned previously, when goals contain the four prerequisites (acceptance, difficulty, specificity, and feedback), they should result in significantly higher performance levels. Whether these goals are quantitative, qualitative, or both, the effect should be the same. Therefore, although quantitative goals require a different behavioral strategy than the qualitative goals, Locke would argue that both should produce significant effects. Since Locke does not specify conflicting goals as an exception to his goal-setting/performance relationship, he would see each goal as producing a main effect. This projection is predicated on the assumption that both goals are accepted by the subjects. In addition, it will be interesting to see if setting both quantitative and qualitative goals
affects one's acceptance or commitment toward either goal. However, if both goals are accepted, this model would predict two main effects.

Hypotheses from the role conflict literature would project a different outcome. According to this model, the two goals are conflicting because both goals require different behavioral strategies toward speed. To achieve the quantity goal, the subject may focus on speed and, therefore, focus less on accuracy. To achieve the quality goal, the subject may focus on accuracy so much as to neglect speed. The previously cited role conflict research suggests that if workers are faced with conflicting expectations, their performance often declines. Thus, according to this model, the simultaneous implementation of both quantity and quality goals, with its accompanying strategy conflict, should result in decreased performance compared to the implementation of a single goal. Because these strategies conflict with each other, an overall interaction should result. The impact a quantity goal has on performance is dependent upon the presence or absence of the quality goal, and vice versa. Thus, subjects given only a quantity goal should perform faster than subjects given both goals. In the same way, subjects given only a quality goal should perform more accurately than subjects given both goals. Subjects given neither goal should perform slower than their counterparts who receive only a quantity goal, and less accurately than the subjects given only a quality goal. In addition, these no-goal subjects should perform slower and less accurately than the subjects who receive both quantity and quality goals since workers in role-conflict situations usually outperform workers in role-ambiguous
situations (Schuler, 1975). Those that receive both goals may accept and attempt each with equal enthusiasm or instead put forth more effort toward one of the two goals. The goal toward which subjects exert more effort may be a function of individual differences. Thus, performance variance on both quantity and quality dimensions should be greater for this group according to this model.

Given the two models, two contrasting hypotheses can be formulated for testing.

Goal-Setting Hypothesis: A main effect for both goals assigned by the experimenter.

Role-Conflict Hypothesis: An overall interaction such that:

a. Subjects given only a quantity goal should attempt more problems than subjects in the other three groups.

b. Subjects given only a quality goal should be more accurate than subjects in the other three groups.
Chapter II

Method

Subjects

Eighty male and female undergraduate students enrolled in introductory psychology courses served as subjects in this experiment and received extra credit in university coursework for their participation.

Procedure

Subjects were randomly assigned to conditions, taken to a room in groups, and seated away from each other. Subjects representing all four treatment conditions were in the same group. A brief introduction ensued, describing the focus of the experiment as looking at math abilities of college undergraduates. For pre-testing, each subject was then given 50 math addition problems and two minutes to complete them. Each problem consisted of three single-digit numbers which were to be summed (see Appendix 1). This pre-test was used as an indicator of ability. At the conclusion of the pre-test, subjects were given a two-minute break. During this break, subjects remained in their seats and received instructions relevant to their respective treatment condition (see Appendix 2). Because subjects from each condition were in the same group, instructions were provided in writing. Following
this, subjects were given a short questionnaire (see Appendix 3) to fill out prior to starting the test. The purpose of this questionnaire was to determine if subjects accepted the goal, anticipated feedback, and perceived their goal as difficult.

**Group 1—No Quantity Goal, No Quality Goal.** This "do your best" group was told they were going to receive another set of problems and five minutes in which to do them. The task consisted of the same type of addition problems, but simply had more problems (200). The number of problems for the test (200) was determined after pilot testing revealed this to be a difficult standard. Indeed, during pilot testing, no subject attempted more than 175 problems. Subjects were told to do their best work with respect to speed and accuracy, and that they would be able to find out how they did on the task at its conclusion. The experimenter then directed their attention to a stack of bogus tests already scored, and described how he would call out the correct answers at the end of the test, to allow subjects to grade their own tests. This self-grading immediately followed the task, so that participants anticipated timely feedback.

The rest of the groups received the same practice test, pre-test questionnaire and test. The only difference among the four groups was the goal given in the instruction phase.

**Group 2—Quantity Goal, No Quality Goal.** Following the practice exercise, these subjects were told to attempt an answer for all 200 problems presented to them in the test. Therefore, their goal for the upcoming task was to answer all 200 problems. In an attempt to convey goal difficulty to the subject, the experimenter mentioned that the
goal given to them is attainable but had proven to be difficult from past experience.

**Group 3—Quality Goal, No Quantity Goal.** The goal of these subjects was to not give an erroneous answer to any problem attempted. Therefore, their goal was to commit zero errors in the problems attempted. Again, the experimenter mentioned that the goal given to them had proven to be difficult from past experience.

**Group 4—Quantity Goal, Quality Goal.** The subjects in this group were told that they had two goals: First, their goal was to attempt an answer for each problem on the task; and second, to not give a single incorrect answer to any problem they attempted. The experimenter mentioned that the goal given them had proven to be difficult from past experience.

On their pre-test questionnaire, all subjects were asked to write their goal as a manipulation check. The other items on the pre-test questionnaire measured the subject's perception of goal characteristics: goal-difficulty, goal-acceptance, and anticipated feedback. Items for the goal-acceptance scale included:

1. I intend to reach the goal given to me by the experimenter.
2. I will work hard to achieve the goal given to me.
3. I want to reach the goal given me by the experimenter.

Goal difficulty was measured by two items:

1. I think most people can achieve the goal given to me by the experimenter.
2. The goal given to me is difficult.
Finally, the anticipated feedback scale consisted of two items:

1. I will be able to find out how I do on the next task.
2. The experimenter will tell me my results.

Following completion of the pre-test questionnaire, subjects were told that if they finished the upcoming task in less than five minutes, they should simply sit quietly. The experimenter's stopwatch was then set for five minutes, and subjects were told to begin. At the top of each page of each subject's test booklet was the goal assigned to them. At the conclusion of the five minutes, all subjects were stopped, then the correct answers were called out for each of the 200 problems. Finally, subjects were debriefed and thanked for their participation.
Chapter III

Results

Manipulation Check

After being given their goal statement, subjects were asked to fill out a two-page questionnaire on their goal. The first item on the questionnaire read, "My goal for this task is ________." The item served as a check to see if the goal was properly read and understood by the subjects. A content analysis was then performed on the item.

Based upon the completed sentence for the item, the experimenter and a second rater independently predicted to which of the four goal conditions the subject was assigned. The inter-rater agreement was 84%. Disparities between predictions were resolved by a third, independent rater. Thus, there was one predicted condition for each subject based upon the content of Item 1. The accuracy of these predictions was then assessed as a measure of the quality of the manipulation. The overall accuracy of prediction was 84%.

Table 1 breaks down these prediction errors by cell. The table shows the goal condition actually assigned and, within that condition, how the item was coded. The prediction accuracy varied from 75% in the quality goal condition to 90% in the quantity goal condition.
Table 1  
Content Analysis of Stated Goal

<table>
<thead>
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<tr>
<td>Coded: Do Your Best</td>
<td>17</td>
<td>85%</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Quality Goal</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Quantity and Quality Goal</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual: Quantity Goal</th>
<th>Frequency</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coded: Do Your Best</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>18</td>
<td>90%</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Quantity and Quality Goal</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual: Quality Goal</th>
<th>Frequency</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coded: Do Your Best</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Quality Goal</td>
<td>15</td>
<td>75%</td>
</tr>
<tr>
<td>Quantity and Quality Goal</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Actual: Quantity and Quality Goal</th>
<th>Frequency</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coded: Do Your Best</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Quality Goal</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Quantity and Quality Goal</td>
<td>17</td>
<td>85%</td>
</tr>
</tbody>
</table>
The errors of prediction, most prevalent in the quality goal condition, represent an interesting case. Three of the subjects assigned the quality goal were predicted to be in the quantity and quality treatment group. This was because the three indicated a goal of "completing" the task, as well as responding accurately. Two others were assigned a quality goal, but were coded as being in the "do your best" condition. These two mentioned a goal to complete a portion of the problems, but made no mention of being correct. The other three cells exhibited fairly high accuracy ratings and showed no signs of systematic error in coding.

Thus, it appears that the subjects as a whole read and understood the goal assigned to them by the experimenter. In some instances, the wording used by subjects made it difficult to predict which goal was assigned to them. Consequently, the prediction accuracy was not 100%. Overall, the manipulation seemed successful.

Questionnaire Scales

Acceptance

Table 2 shows the mean goal-acceptance ratings by subjects per condition. The higher the score, the higher the level of goal acceptance, with a possible range of 3 to 15. Little variance is evident in this breakdown, and analysis of variance revealed no significant main or interaction effects. Regardless of the goal condition, subjects appeared to have accepted it with relatively equal vigor. In fact, acceptance of the goals was strong enough to produce
Table 2

Means of Pre-test Items

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Range</th>
<th>Quantity Goal Present</th>
<th>Quantity Goal Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal Acceptance</td>
<td>3-15</td>
<td>14.40</td>
<td>13.95</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>14.50</td>
</tr>
<tr>
<td>Goal Difficulty</td>
<td>2-10</td>
<td>5.05</td>
<td>5.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.90</td>
</tr>
<tr>
<td>Anticipated Feedback</td>
<td>2-10</td>
<td>8.05</td>
<td>8.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8.55</td>
</tr>
<tr>
<td>Q4: Intend to be correct</td>
<td>1-5</td>
<td>4.80</td>
<td>4.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4.85</td>
</tr>
</tbody>
</table>
a ceiling effect, as almost all the subjects rated the items at the highest level. The internal consistency for the three items of the acceptance scale was moderate (α = .71), but within the range of a satisfactory scale. Basically, the three items seemed to measure the same thing--goal acceptance.

**Difficulty**

The mean goal difficulty ratings by subjects per cell are also shown in Table 2. Again, the higher the score, the more difficult the goal was perceived to be. Given that the difficulty scale had a maximum possible value of 10, the ratings do not seem particularly high. In addition, analysis of variance showed a highly significant main effect for the quantity goal, $F_{(1, 76)} = 6.63$, $p < .01$. Hence, the presence of a quantity goal was perceived as making the task more difficult than the absence of a quantity goal. On the other hand, the presence of a quality goal was not perceived as making the task more difficult than the absence of a quality goal, $F_{(1, 76)} = 1.82$, n.s., and there was no interaction, $F_{(1, 76)} < 1$. Looking at the mean ratings across conditions, neither goal was perceived as being particularly difficult.

The internal consistency of the items comprising the difficulty scale was low, $α = .48$. The two items in the scale were: (1) I think most people can achieve the goal given to me by the experimenter; and (2) the goal given to me is difficult. The former item was reverse scored. It seems plausible that while the goal may not have appeared difficult to the subject, the subjects felt that it would be difficult
for other subjects. However, internal consistency this low leads one to question the usefulness of the scale as a measure of goal difficulty.

**Feedback**

The purpose of this check was to ensure that subjects anticipated feedback regarding their performance in relation to their goal. Subjects were informed in the instruction phase of the experiment that they would grade their own tests "to determine if they achieved their goal or not." The feedback scale measured their anticipation of this feedback. Table 2 shows the mean ratings per cell. The higher the rating, the more the subject expected to receive feedback. Subjects in all conditions felt they would find out their results as the cell means are all relatively high, and analysis of variance showed no main or interaction effects.

The internal consistency for the items of the anticipated feedback scale was acceptably high, $\alpha = .86$. Although the scale was composed of only two items, both items appeared to be measuring the same thing—the anticipation of feedback in relation to the assigned goal.

Although subjects anticipated feedback at the conclusion of the test, preparations were made to reduce variant feedback to the subject during the test. For example, if each test problem were numbered, subjects in the quantity goal condition would know where they stood in relation to their goal throughout the test. At the same time, subjects in the quality goal condition would receive no immediate feedback per problem unless they double-checked each answer. Since some subjects may choose to double-check more than others, feedback
would vary considerably both within and between conditions. Thus, the
decision was made in pilot testing to eliminate the numbering of
problems to reduce feedback variability. Nonetheless, all subjects
anticipated feedback at the end of the testing session on a relatively
equal basis.

The four prerequisites to effective goal-setting appear to have
been met, assuming that the goals were specific, subjects accepted a
goal, and anticipated feedback from the experimenter. A case can also
be made that the goals were, in fact, difficult. As was noted
earlier, in an absolute sense, neither goal was rated as being
particularly hard. It is interesting to note, however, that these
perceptions were not borne out by the objective performance indicators,
since only one subject achieved his assigned goal (quantity goal
absent, quality goal present). In addition, neither goal was attained
during pilot testing. Thus, even though the goals may have seemed
quite achievable to the subjects, in actuality they proved quite difficult.

**Item 4**

Item 4 of the pre-test questionnaire consisted of a Likert rating
on the following statement: "I intend to be correct for each answer
I give." Of course, subjects will try to give correct answers
regardless of their treatment condition, but it was hypothesized that
those given a quality goal would place more emphasis on correctness.
Analysis of variance for this item showed a marginally significant
effect for the quality goal condition, $F(1, 76) = 3.22, p < .077$, but
no significant effect for the quantity goal, $F(1, 76) < 1$, and no
interaction effect, \( F(1, 76) < 1 \). These results indicate that subjects given a quality goal demonstrated a slightly stronger intent to be correct per answer given.

Performance Variables

Quantity Goal

Two performance variables were used to assess the effect of the quantity goal: number of problems attempted by the subjects and number of correct answers given. Locke's theory suggests that a significant main effect will be found for each of the two performance indicators. Role conflict theory, on the other hand, suggests that an interaction will be found because the quantity goal effects depend upon the presence or absence of the quality (conflicting) goal.

Analysis of variance revealed a quantity goal main effect for the first dependent variable (number of problems attempted), \( F(1, 76) = 6.13, p < .02 \), and no other effects. Thus, subjects given the quantity goal attempted more problems on the average than subjects not given the quantity goal. Table 3 shows the means and standard deviations for the number of problems attempted by subjects per cell, as well as the summary table for the analysis of variance results.

Given the fact that the pre-test served as an indicator of ability (covariate), analysis of covariance can also be performed on these data if the assumptions of this analysis are met. Elashoff (1969) specifies the assumptions required before analysis of covariance is appropriate. Assumption 1: The covariate is independent of treatment.
Table 3

ANOVA: Problems Attempted

Mean Number of Problems Attempted

<table>
<thead>
<tr>
<th>Quality Goal</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>M=136.15 S=26.45</td>
<td>M=133.25 S=29.97</td>
</tr>
<tr>
<td>Present</td>
<td>M=146.55 S=31.69</td>
<td>M=156.05 S=31.50</td>
</tr>
</tbody>
</table>

Analysis of Variance Summary Table

Dependent Variable = Total Number of Problems Attempted

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td>2</td>
<td>2864.5</td>
<td>3.18</td>
<td>0.047</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td>5511.2</td>
<td>6.13</td>
<td>0.015</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>1</td>
<td>217.8</td>
<td>0.24</td>
<td>0.624</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>768.8</td>
<td>0.85</td>
<td>0.358</td>
</tr>
<tr>
<td>Explained</td>
<td>3</td>
<td>2165.9</td>
<td>2.41</td>
<td>0.073</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>898.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>946.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The distribution of covariate values is not affected by the treatments either through direct causation or through correlation with another affected character (and the X variable does not affect the treatment). To achieve this statistical independence, the X variable should be measured prior to the administration of treatments, and treatments should be assigned to groups at random. (p. 388).

This assumption has been met for all of the dependent variables since the covariate (pre-test) was measured before the goal was assigned to the subjects, and treatments were assigned randomly.

Assumption 2: Linearity of regression. "The standard covariance analysis assumes that the covariate has a linear relationship with the criterion variable" (p. 390). Thus, the relationship between the pre-test covariate (in this instance—number of problems attempted on the pre-test) and the criterion variable (number of problems attempted on test) must be linear. Elashoff (1969) continues by noting that "the simplest check for linearity is a carefully prepared set of X-Y scatterplots for each treatment group. Gross departures from linearity will be easily discovered" (p. 391). Scatterplots were diagrammed for the covariate and the criterion variables, and a linear relationship was found.

Assumption 3: Homogeneity of regression. Elashoff (1969) points out that "the standard covariance analysis procedure rests on the assumption that the regression of Y on X is linear, and that the slope is the same for all treatment groups (there is no treatment slope interaction)" (p. 391). The F-test for homogeneity of regression of
this covariate on this criterion proved nonsignificant, $F(3, 72) < 1$. Hence, there are no significant differences between the covariate betas between the four groups.

Thus, the assumptions for analysis of covariance have been met, and the analysis can be used to further study the relationship between the number of problems attempted on the test and the quantity goal--given the covariate (number of problems attempted on the pre-test). The correlation between the number attempted on the pre-test and the number attempted on the test was relatively high, $r = 0.45, p < .001$.

Given the significant relationship, it was appropriate to do analysis of covariance. Table 4 shows the mean number of problems attempted per cell adjusted for the covariate. The analysis of covariance summary table is also presented. These results confirm the analysis of variance results since a significant effect was found for the quantity goal, $F(1, 76) = 4.37, p < .04$. In addition, a highly significant effect was found for the covariate, $F(1, 76) = 19.90, p < .001$. Hence, after adjusting for the ability covariate (number of problems attempted on the pre-test), there remained a significant relationship between the quantity goal and the number of problems attempted on the test by subjects.

Analysis of variance for the second dependent variable (number of correct answers) also showed a significant main effect for the quantity goal, $F(1, 76) = 5.85, p < .02$, no significant effect for the quality goal, and no significant interaction. Thus, the number of correct answers given by subjects in the quantity goal condition was significantly greater than the number of correct answers given by
Table 4

ANCOVA: Problems Attempted

**Adjusted Means**

<table>
<thead>
<tr>
<th></th>
<th>Quantity Goal</th>
<th>Present</th>
<th>Absent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quality Goal</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absent</td>
<td>135.82</td>
<td>136.55</td>
<td></td>
</tr>
<tr>
<td>Present</td>
<td>145.32</td>
<td>152.98</td>
<td></td>
</tr>
</tbody>
</table>

**Analysis of Covariance Summary Table**

Dependent Variable = Total Number of Problems Attempted

Covariate = Number of Problems Attempted in the Pre-test

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate</td>
<td>1</td>
<td>14868.45</td>
<td>19.90</td>
<td>0.000</td>
</tr>
<tr>
<td>Main Effects</td>
<td>2</td>
<td>1815.06</td>
<td>2.42</td>
<td>0.095</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td>3262.41</td>
<td>4.37</td>
<td>0.040</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>1</td>
<td>356.22</td>
<td>0.48</td>
<td>0.492</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>238.25</td>
<td>0.32</td>
<td>0.574</td>
</tr>
<tr>
<td>Explained</td>
<td>3</td>
<td>4684.20</td>
<td>6.27</td>
<td>0.000</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>747.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>946.56</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
subjects who were not assigned such a goal. Table 5 shows the means and standard deviations for the number of correct responses by treatment condition, as well as the analysis of variance results.

Before analysis of covariance can be performed on this dependent variable (number of correct answers on the test) with number of correct answers on the pre-test as a covariate, assumptions two and three must be re-examined. Inspection of scatterplots showed that the linearity of regression has been met. The test for homogeneity of regression revealed no significant difference among betas between conditions, $F(3, 72) < 1$. Thus, the assumptions for analysis of covariance have been met for this dependent variable.

The correlation between the covariate and the number of correct answers on the test was high, $r = 0.50$, $p < .001$. It was appropriate, then, to analyze this dependent variable according to the analysis of covariance model. Table 6 shows the adjusted means per cell as well as the analysis of covariance summary table. The analysis of variance results are confirmed for this dependent variable as well. A significant main effect was found for the quantity goal, $F(1, 76) = 4.15$, $p < .045$. The covariate was highly related to the dependent variable, $F(1, 76) = 26.86$, $p < .001$. Thus, after controlling for the number of correct answers in the pre-test, the quantity goal had a significant effect on the number of correct answers given.

These results support Locke's theory of goal-setting. As noted previously, hypotheses stemming from this theory suggested that a main effect would be found for each dependent variable. Analysis of variance results for the quantity goal dependent variables show two
Table 5

ANOVA: Correct Answers

Mean Number of Correct Answers

<table>
<thead>
<tr>
<th>Quality Goal</th>
<th>Quantity Goal</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>M=133.20</td>
<td>S=26.11</td>
<td>M=130.95</td>
</tr>
<tr>
<td>Present</td>
<td>M=142.70</td>
<td>S=31.63</td>
<td>M=153.80</td>
</tr>
</tbody>
</table>

Analysis of Variance Summary Table

Dependent Variable = Number of Correct Answers

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td>2</td>
<td>2812.1</td>
<td>3.15</td>
<td>0.049</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td>5232.6</td>
<td>5.86</td>
<td>0.018</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>1</td>
<td>391.6</td>
<td>0.44</td>
<td>0.510</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>891.1</td>
<td>0.99</td>
<td>0.321</td>
</tr>
<tr>
<td>Explained</td>
<td>3</td>
<td>2171.8</td>
<td>2.43</td>
<td>0.072</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>893.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>941.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6

ANCOVA: Correct Answers

Adjusted Means

<table>
<thead>
<tr>
<th>Quality Goal</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present</td>
<td>141.88</td>
<td>151.10</td>
</tr>
<tr>
<td>Absent</td>
<td>132.84</td>
<td>135.78</td>
</tr>
</tbody>
</table>

Analysis of Covariance Summary Table
Dependent Variable = Number of Correct Answers
Covariate = Number of Correct Answers in Pre-test

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate</td>
<td>1</td>
<td>18609.6</td>
<td>26.86</td>
<td>0.000</td>
</tr>
<tr>
<td>Main Effects</td>
<td>2</td>
<td>1822.7</td>
<td>2.63</td>
<td>0.079</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td>2881.3</td>
<td>4.15</td>
<td>0.045</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>1</td>
<td>740.3</td>
<td>1.06</td>
<td>0.305</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>194.9</td>
<td>0.28</td>
<td>0.597</td>
</tr>
<tr>
<td>Explained</td>
<td>3</td>
<td>5612.5</td>
<td>8.10</td>
<td>0.000</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>692.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>941.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
significant main effects. On the other hand, the results thus far do not support the role conflict hypotheses, since neither of the dependent variables showed significant interaction effects.

**Quality Goal**

Two performance measures were used as dependent variables for the quality goal manipulation: number of errors committed and error rate. Hypotheses stemming from Locke's theory predict a quality goal main effect on each dependent variable. Role-conflict derived hypotheses predict an overall interaction for each dependent variable.

Regarding the first dependent variable (number of errors committed), analysis of variance revealed a significant main effect for the quality goal, $F(1, 76) = 6.02, p < .02$, but no significant main effect for the quantity goal, and no significant interaction. Subjects given a quality goal made fewer errors, on the average, than subjects not given the goal. Table 7 shows the means and standard deviations for the number of errors by subjects per condition and the analysis of variance summary table.

To determine the appropriateness of the analysis of covariance model, the two major assumptions were checked. The test of linearity of regression was met but the test for homogeneity of regression was not. The $F$-test for homogeneity of regression was highly significant, $F(3, 72) = 7.23, p < .001$. A highly significant interaction was found between the covariate (number of errors on pre-test) and the quantity goal, $t = 3.43, p < .001$. This heterogeneity of regression violates a fundamental assumption of covariance analysis. Elashoff (1969) argues that "if there is a treatment-slope interaction ..."
Table 7

ANOVA: Errors Committed

Mean Number of Errors Committed

<table>
<thead>
<tr>
<th>Quantity Goal</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>M=2.95, S=2.14</td>
<td>M=2.30, S=1.38</td>
</tr>
<tr>
<td>Present</td>
<td>M=3.85, S=2.74</td>
<td>M=2.25, S=1.68</td>
</tr>
</tbody>
</table>

Analysis of Variance Summary Table
Dependent Variable = Number of Errors

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td>2</td>
<td>14.46</td>
<td>3.44</td>
<td>0.037</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td>3.61</td>
<td>0.86</td>
<td>0.357</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>1</td>
<td>25.31</td>
<td>6.02</td>
<td>0.016</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>4.51</td>
<td>1.07</td>
<td>0.303</td>
</tr>
<tr>
<td>Explained</td>
<td>3</td>
<td>11.15</td>
<td>2.65</td>
<td>0.055</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>4.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>4.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
then the treatment which is best on the average may not be best at all
levels. If [this] model holds, it is questionable whether a
covariance type of analysis is relevant" (p. 391). Analysis of
covariance appears to be inappropriate for this dependent variable.
However, a closer inspection of the interaction does seem appropriate.
When the quantity goal was absent, the relationship between the
covariate (number of errors on the pre-test) and the criterion
variable (number of errors on the test) was quite low, $r = .03,$
$p = .426$. When the quantity goal was present, the relationship was
high, $r = .65, p < .001$. One can only offer an interpretation of
these results. When subjects were pressed for time (as they appeared
to be during pre-testing), they operate consistently with regard to
committing errors. On the other hand, subjects respond differently
when pressed for time (pre-test) compared to when they are not pressed
(e.g., no quantity goal). Instructions for the pre-test did not say
that subjects should attempt all 50 problems--they were simply told to
do their best. The majority, however, did appear anxious to answer
all 50.

Overall, then, the analysis of covariance is inappropriate for
this dependent variable since it does not pass the homogeneity of
regression test. However, the analysis of variance results showed a
significant main effect for the quality goal.

Analysis of variance for the second dependent variable (error
rate of subjects) also showed a significant main effect for the
quality goal, $F(1, 76) = 6.49, p < .01$, no significant main effect for
the quantity goal, and no significant interaction. Error rate was
defined as the number of errors divided by the number of problems attempted. Thus, subjects given a quality goal made fewer errors per number attempted than subjects not given the quality goal. Table 8 shows the means and standard deviations for the error rate of subjects for each of the four conditions (multiplied times 1,000), as well as the summary table for the analysis of variance results.

The test for homogeneity of regression for covariance analysis was significant, $F(3, 72) = 5.23$, $p < .005$. Hence, covariance analysis is inappropriate for this dependent variable as well. A significant interaction between the quantity goal and the covariate (error rate in pre-test) was a factor in this heterogeneity. When the quantity goal was absent, the correlation between the pre-test error rate and the test error rate was low, $r = .14$, $p = .192$. When the quantity goal was present, the relationship between the covariate and the criterion was high, $r = .65$, $p < .001$. It appears that when subjects are pressed for time, as in the pre-test and the quantity goal condition, their error rates are similar. But the error rates differ when subjects are pressed for time compared to when they are not. These results are not surprising in light of the similar results found for the number of errors dependent variable, since error rate is defined as (number of errors/number of problems attempted).

Concluding, analysis of covariance is not appropriate for this dependent variable due to heterogeneity of regression. Analysis of variance results showed a significant main effect for the quality goal.
Table 8

ANOVA: Error Rate

Mean Error Rate*

<table>
<thead>
<tr>
<th>Quality Goal</th>
<th>Absent</th>
<th>Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>M=22.06 S=15.96</td>
<td>M=17.82 S=11.46</td>
</tr>
<tr>
<td>Present</td>
<td>M=27.16 S=17.38</td>
<td>M=15.07 S=11.51</td>
</tr>
</tbody>
</table>

*Error rate x 1,000

Analysis of Variance Summary Table
Dependent Variable = Error rate x 1,000

<table>
<thead>
<tr>
<th>Source</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Effects</td>
<td>2</td>
<td>680.614</td>
<td>3.32</td>
<td>0.042</td>
</tr>
<tr>
<td>Quantity Goal</td>
<td>1</td>
<td>27.614</td>
<td>0.13</td>
<td>0.715</td>
</tr>
<tr>
<td>Quality Goal</td>
<td>1</td>
<td>1333.615</td>
<td>6.49</td>
<td>0.013</td>
</tr>
<tr>
<td>Interaction</td>
<td>1</td>
<td>308.500</td>
<td>1.50</td>
<td>0.224</td>
</tr>
<tr>
<td>Explained</td>
<td>3</td>
<td>556.576</td>
<td>2.71</td>
<td>0.051</td>
</tr>
<tr>
<td>Residual</td>
<td>76</td>
<td>205.203</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>218.546</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The analysis of both dependent variables of the quality goal support the hypotheses derived from Locke's theory since two significant main effects were found. As with the analysis for the quantity goal condition, these results do not support the predictions derived from the role-conflict literature, since significant interactions were not found.

**Relationship Among Dependent Variables**

Since role conflict depends on goal conflict, it is important to look at the relationship among dependent variables to determine if quantity and quality actually conflicted in this experiment. Since the quantity goal should be antagonistic to the quality goal, those who attempt many problems or get many problems correct should also have many errors and a high error rate. Consequently, the correlations between the quantity goal dependent variables and the quality goal dependent variables should be both positive and high. Table 9 shows the correlation matrix after partialing out treatment effects. While the correlation between number correct and number of errors was zero, there was a significant negative correlation between number correct and error rate, $r = -0.30 \ (p = 0.004)$. Similarly, there was essentially a zero correlation between number attempted and number of errors, but a significant negative correlation between number attempted and error rate, $r = -0.23 \ (p = 0.021)$. Hence, it appears that subjects who attempted many problems (or who got many correct answers) had a very low error rate. In this experiment, then, the ability to work quickly is correlated with the ability to work accurately, and the two goals may not have been in conflict.
Table 9
Correlation Matrix of Dependent Variables\textsuperscript{a}

<table>
<thead>
<tr>
<th></th>
<th>Number Correct</th>
<th>Number Attempted</th>
<th>Number Errors</th>
<th>Error Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Correct</td>
<td>1.0</td>
<td>0.9977</td>
<td>-0.0059</td>
<td>-0.2959</td>
</tr>
<tr>
<td></td>
<td>(p &lt; .001)</td>
<td>(p = .480)</td>
<td>(p = .004)</td>
<td></td>
</tr>
<tr>
<td>Number Attempted</td>
<td>1.0</td>
<td>0.0626</td>
<td>-0.2315</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(p = .293)</td>
<td>(p = .021)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number Incorrect</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9332</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(p &lt; .001)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{a}Treatment effects partialled out.
Chapter IV

Discussion

There are several essential characteristics of effective goal-setting. These characteristics include: (1) goal-acceptance; (2) goal-difficulty; (3) goal-specificity; and (4) goal-feedback. Given these characteristics, Locke proposes that performance will be enhanced in a manner specified by the goal. To the extent that these characteristics were present in this experiment, then the conditions necessary for testing Locke's theory appear to have been met. Although goals were not perceived to be difficult by the subjects, only one subject attained their assigned goal. Thus, it could be argued that the goals were, in fact, difficult and the conditions necessary for testing Locke's theory were met. The conditions necessary to test the role-conflict model require that two or more strategies toward a task be in conflict with one another. If one's strategy is to work very quickly, then this has generally led to the detriment of work quality. The work of Garrett (1922) and others quoted previously has led to the notion that there was an inverse relation between the quantity and quality of one's performance. To the extent that the behaviors required of a quality goal were antagonistic toward the behaviors required of a quantity goal, then conditions required to test the role-conflict model have been met.
The work of Garrett and the others previously cited makes a strong case for the argument that these conditions were met since quantity and quality have historically traded off in an inverse manner.

Analysis of variance results showed a significant main effect for both measures of the quantity goal (number of problems attempted and number of correct answers). Subjects given a quantity goal attempted more problems and gave more correct answers than subjects not given a quantity goal. Likewise, a significant main effect was found for both measures of the quality goal (number of errors committed and error rate). Subjects given a quality goal committed fewer errors and had a lower error rate on the average than subjects not given a quality goal.

Hypotheses derived from Locke's goal-setting theory predicted that two such main effects would be found for each goal. Role-conflict hypotheses of an interaction were not supported in this experiment. Therefore, conflicting goals as defined by this experiment did not provide an exception to the goal-setting/performance relationship. Results of this experiment strongly support Locke's theory of goal-setting. Subjects in the conflicting goals condition attempted more problems but committed few errors compared to their counterparts in the other goal conditions. Even though subjects worked quickly, their pace was not to the detriment of accuracy. Consequently, the inverse relation between quantity and quality of performance may have exceptions—at least in the presence of properly set goals. Since goal-setting sets the "direction, amplitude, and persistence" of an action, it may enable a person to simultaneously
focus on performance dimensions that seem to require opposite behavioral strategies. Such remains to be seen.

As with all research, caution must be exercised in interpreting the results of this experiment. For example, it is possible that the "conflicting goals" were not particularly conflicting. The task chosen for this experiment was a math addition task—a task different from previous studies that explored the relationship between quantity and quality of performance. The ability required to answer math problems quickly may be consistent with (or even correlated with) the ability required to answer many math problems accurately. Thus, when requested to answer many problems without errors, the subject may simply pay attention to two performance dimensions instead of just one. The two performance dimensions, however, may not require significantly different behavioral strategies. Historically, quantity and quality have traded off in an inverse manner, so these results may be unique to the experimental task.

One way to test this alternative hypothesis is to examine correlations among the performance dependent variables (see Table 9). Recall that if the goals are in conflict, dependent variables of the quantity goal (number attempted and number correct) should positively correlate with the dependent variables of the quality goal (number of errors and error rate). Negative correlations would support the competing hypothesis. Table 9 shows that error rate was negatively correlated with number of problems attempted and number correct. However, number of errors was uncorrelated with both number of problems attempted and number correct. These results support the
competing hypothesis that the assigned goals were not, in fact, conflicting.

The results present an interesting case. Given the literature review, it appeared that quantity and quality goals would necessarily conflict. In sensory-motor tasks, the relationship between quantity and quality was inversely proportional on a consistent basis. However, in the math task used in this experiment, quantity and quality did not trade-off. Thus, it appears that the quantity/quality relationship is somewhat dependent upon the nature of the task. In tasks such as handwriting, tracing, sentence-writing, model-construction, recognition, and piano-playing quantity and quality apparently do trade-off. Whereas the existence of an inverse relationship between quantity and quality was rarely (if ever) doubted before, it now appears that its characteristics are worth investigating.

A second concern deals with the issue of whether the conditions necessary for role conflict were met. Swanda and McCuddy (1974, p. 2) define role conflict as "a type of stress [which] implies a simultaneous occurrence of two or more role requirements which are contradictory . . . If he satisfies one set of expectations, he violates the other." In this experiment, role conflict was dependent upon the presence of goal conflict. Since the quantity and quality goals did not conflict in the math task of this experiment, role conflict did not occur.

A third concern is the issue of goal difficulty. As noted earlier, goals direct the amplitude of behavior, and goals which are
more difficult tend to produce higher levels of output. Previous
goal-setting studies have typically employed objective measures in
determining goal difficulty. In other words, a goal was considered
difficult if the probability that a subject could attain it was low.
In this experiment, goal difficulty was determined during pilot
testing in the same manner. An interesting result, however, was that
subjects perceived the goals as only moderately difficult. Thus, the
objective measures of goal difficulty did not correspond to the
subjective measures. Since most subjects completed the relatively
easy pre-test, they probably assumed that the test itself required the
same pace of work and, hence, was not too difficult. Although
attempts were made to emphasize goal difficulty to them (i.e., the
statement below their goal), subjects apparently were not impressed.

In addition, there are other issues related to goal difficulty.
For example, the low internal consistency of the difficulty scale
leads one to question whether goal difficulty was accurately measured.
More importantly, however, is the question of the relative importance
of the two measures of goal difficulty. Do goals have to be perceived
as difficult to improve performance? Possibly not since goal main
effects were found in this experiment. Clearly, though, the subjects
direct their effort in accordance with what they perceive to be
required by the goal—including its level of difficulty. If a task is
perceived as difficult, more effort will be exerted. Locke (1982)
notes a strong relationship between objectively determined goal
difficulty and performance, even when the goals are impossible. To
determine the relationship between subjective difficulty and
performance in this experiment, correlations were calculated between the difficulty scale and the four performance dependent variables. The correlation between the difficulty scale and the quantity and dependent variables was low, $r = -0.09 (p = 0.197)$ for the number of problems attempted and $r = -0.10 (p = 0.187)$ for the number of correct answers. The same was true for the quality goal; the correlation between the difficulty scale and the number of errors was low, $r = 0.06 (p = 0.310)$, and so was the correlation between the difficulty scale and error rate, $r = 0.09 (p = 0.221)$. Thus, there appears to be little relationship between subjectively determined goal difficulty and performance in this experiment. Locke specifies goal difficulty as a prerequisite to effective goal setting. It appears that objectively determined goal difficulty satisfies this criterion (at least in this experiment), even when the subjective measures do not.

Finally, if the results of this experiment should be replicated, then there are several important implications. First, goal-setting could prove to be a major motivational technique that can affect the strong, inverse relationship between quantity and quality of performance. Since 1922 when Garrett formally studied the relationship, no motivational method has been introduced which could enable subjects to work at a faster rate with increased accuracy. If these results are consistently supported, then eventually the use of goal-setting in applied settings might also be affected. Perceiving that workers can increase performance output on two dimensions (quantitatively and qualitatively), employers could begin to ask more of their employees. Of course, such assumptions should be thoroughly tested before they can be thought of as valid.
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Appendix 1

ID # __________________________

Group _________________________

Pretest

Description: 50 math addition problems
You will be given 2 minutes.

Example: \( 1 + 8 + 1 = 10 \)

When the experimenter says "begin," turn the page and do as many as you can.
<table>
<thead>
<tr>
<th>Equation</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 + 0 + 2$</td>
<td>______</td>
</tr>
<tr>
<td>$9 + 6 + 2$</td>
<td>______</td>
</tr>
<tr>
<td>$5 + 0 + 5$</td>
<td>______</td>
</tr>
<tr>
<td>$2 + 3 + 5$</td>
<td>______</td>
</tr>
<tr>
<td>$2 + 9 + 8$</td>
<td>______</td>
</tr>
<tr>
<td>$4 + 1 + 2$</td>
<td>______</td>
</tr>
<tr>
<td>$9 + 2 + 6$</td>
<td>______</td>
</tr>
<tr>
<td>$5 + 4 + 7$</td>
<td>______</td>
</tr>
<tr>
<td>$4 + 1 + 5$</td>
<td>______</td>
</tr>
<tr>
<td>$8 + 8 + 6$</td>
<td>______</td>
</tr>
<tr>
<td>$2 + 7 + 2$</td>
<td>______</td>
</tr>
<tr>
<td>$8 + 3 + 3$</td>
<td>______</td>
</tr>
<tr>
<td>$0 + 5 + 5$</td>
<td>______</td>
</tr>
<tr>
<td>$7 + 1 + 6$</td>
<td>______</td>
</tr>
<tr>
<td>$6 + 2 + 9$</td>
<td>______</td>
</tr>
<tr>
<td>$6 + 2 + 1$</td>
<td>______</td>
</tr>
<tr>
<td>$3 + 4 + 2$</td>
<td>______</td>
</tr>
<tr>
<td>$2 + 5 + 7$</td>
<td>______</td>
</tr>
<tr>
<td>$9 + 1 + 9$</td>
<td>______</td>
</tr>
<tr>
<td>$7 + 4 + 8$</td>
<td>______</td>
</tr>
<tr>
<td>$3 + 0 + 7$</td>
<td>______</td>
</tr>
<tr>
<td>$8 + 4 + 4$</td>
<td>______</td>
</tr>
<tr>
<td>$7 + 9 + 3$</td>
<td>______</td>
</tr>
<tr>
<td>$7 + 0 + 9$</td>
<td>______</td>
</tr>
<tr>
<td>$8 + 4 + 0$</td>
<td>______</td>
</tr>
</tbody>
</table>

$7 + 5 + 3 = ______$
$3 + 7 + 1 = ______$
$4 + 3 + 6 = ______$
$0 + 4 + 8 = ______$
$0 + 4 + 1 = ______$
$1 + 5 + 0 = ______$
$7 + 8 + 2 = ______$
$4 + 7 + 2 = ______$
$0 + 6 + 1 = ______$
$4 + 8 + 5 = ______$
$0 + 1 + 8 = ______$
$6 + 3 + 6 = ______$
$6 + 3 + 9 = ______$
$5 + 0 + 9 = ______$
$4 + 7 + 6 = ______$
$1 + 8 + 9 = ______$
$2 + 1 + 4 = ______$
$0 + 2 + 5 = ______$
$1 + 8 + 9 = ______$
$7 + 3 + 4 = ______$
$3 + 4 + 4 = ______$
$2 + 6 + 8 = ______$
$2 + 9 + 7 = ______$
$6 + 1 + 6 = ______$
$6 + 6 + 9 = ______

STOP
Appendix 2

The upcoming task has the same type of problems that you solved in the previous task, except it has more of them and you will be given five (5) minutes to work. The only other difference is that you will be given a goal for the upcoming task.

YOUR GOAL FOR THE NEXT TASK IS:

ATTEMPT AN ANSWER FOR EACH OF THE 200 MATH ADDITION PROBLEMS.

From past experience this goal has proven to be difficult, although it is attainable.
The upcoming task has the same type of problems that you solved in the previous task, except it has more of them and you will be given five (5) minutes to work. The only other difference is that you will be given a goal for the upcoming task.

YOUR GOAL FOR THE NEXT TASK IS:

GIVE ONLY CORRECT ANSWERS FOR THE PROBLEMS YOU ATTEMPT.

From past experience this goal has proven to be difficult, although it is attainable.
The upcoming task has the same type of problems that you solved in the previous task, except it has more of them and you will be given five (5) minutes to work. The only other difference is that you will be given a goal for the upcoming task.

YOUR GOAL FOR THE NEXT TASK IS:
DO YOUR BEST WITH REGARD TO SPEED AND ACCURACY.

From past experience this goal has proven to be difficult, although it is attainable.
The upcoming task has the same type of problems that you solved in the previous task, except it has more of them and you will be given five (5) minutes to work. The only other difference is that you will be given a goal for the upcoming task.

YOUR GOAL FOR THE NEXT TASK IS:

ATTEMPT ALL 200 PROBLEMS AND COMMIT ZERO ERRORS.

From past experience this goal has proven to be difficult, although it is attainable.
Appendix 3

ID # ________________________________
Group _______________________________

Below is a questionnaire for you to fill out. This questionnaire asks about the goal you were given by the experimenter. Please think about your goal for the upcoming task when answering these items. If you have a question, please do not hesitate to ask the experimenter.

1. My goal for this task is __________________________________________

2. I intend to reach the goal given to me by the experimenter.
   Not At All _____:_____:_ _ _ _ _:____:_______ Completely

3. I will work hard to achieve the goal given to me.
   Not At All _____:_____:_ _ _ _ _:____:_______ Completely

4. I want to reach the goal given me by the experimenter.
   Not At All _____:_____:_ _ _ _ _:____:_______ Completely

5. I intend to be correct for each of the answers I give.
   Not At All _____:_____:_ _ _ _ _:____:_______ Completely

6. I think most people can achieve the goal given to me by the experimenter.
   Not At All _____:_____:_ _ _ _ _:____:_______ Completely

7. The goal given to me is difficult.
   Not At All _____:_____:_ _ _ _ _:____:_______ Completely

8. I will able to find out how I do on the next task.
   Agree _____:_____:_ _ _ _ _:____:_______ Disagree

9. The experimenter will tell me my results.
   Agree _____:_____:_ _ _ _ _:____:_______ Disagree

STOP
Appendix 4

GOAL:

\[
\begin{align*}
3 + 1 & + 3 = \_\_\_\_\_ & 4 + 7 & + 4 = \_\_\_\_\_ \\
8 + 4 & + 5 = \_\_\_\_\_ & 6 + 5 & + 5 = \_\_\_\_\_ \\
8 + 2 & + 6 = \_\_\_\_\_ & 5 + 1 & + 7 = \_\_\_\_\_ \\
6 + 9 & + 6 = \_\_\_\_\_ & 5 + 9 & + 3 = \_\_\_\_\_ \\
8 + 7 & + 2 = \_\_\_\_\_ & 5 + 7 & + 4 = \_\_\_\_\_ \\
5 + 7 & + 1 = \_\_\_\_\_ & 4 + 6 & + 4 = \_\_\_\_\_ \\
4 + 6 & + 7 = \_\_\_\_\_ & 7 + 6 & + 1 = \_\_\_\_\_ \\
4 + 5 & + 5 = \_\_\_\_\_ & 5 + 4 & + 4 = \_\_\_\_\_ \\
8 + 8 & + 0 = \_\_\_\_\_ & 1 + 6 & + 2 = \_\_\_\_\_ \\
1 + 2 & + 3 = \_\_\_\_\_ & 6 + 5 & + 3 = \_\_\_\_\_ \\
6 + 6 & + 3 = \_\_\_\_\_ & 7 + 0 & + 7 = \_\_\_\_\_ \\
7 + 4 & + 5 = \_\_\_\_\_ & 8 + 5 & + 5 = \_\_\_\_\_ \\
0 + 5 & + 1 = \_\_\_\_\_ & 7 + 4 & + 1 = \_\_\_\_\_ \\
3 + 3 & + 9 = \_\_\_\_\_ & 3 + 5 & + 2 = \_\_\_\_\_ \\
2 + 3 & + 0 = \_\_\_\_\_ & 5 + 3 & + 3 = \_\_\_\_\_ \\
6 + 0 & + 2 = \_\_\_\_\_ & 9 + 5 & + 3 = \_\_\_\_\_ \\
9 + 3 & + 4 = \_\_\_\_\_ & 8 + 8 & + 7 = \_\_\_\_\_ \\
3 + 6 & + 1 = \_\_\_\_\_ & 7 + 3 & + 7 = \_\_\_\_\_ \\
1 + 9 & + 8 = \_\_\_\_\_ & 1 + 6 & + 0 = \_\_\_\_\_ \\
4 + 2 & + 9 = \_\_\_\_\_ & 1 + 8 & + 9 = \_\_\_\_\_ \\
5 + 1 & + 2 = \_\_\_\_\_ & 3 + 7 & + 6 = \_\_\_\_\_ \\
5 + 1 & + 9 = \_\_\_\_\_ & 4 + 8 & + 4 = \_\_\_\_\_ \\
8 + 6 & + 7 = \_\_\_\_\_ & 9 + 9 & + 3 = \_\_\_\_\_ \\
\end{align*}
\]
GOAL:

\[
\begin{align*}
9 + 6 + 3 &= \underline{\hspace{1cm}} & 8 + 3 + 6 &= \underline{\hspace{1cm}} \\
0 + 8 + 5 &= \underline{\hspace{1cm}} & 8 + 2 + 5 &= \underline{\hspace{1cm}} \\
2 + 2 + 1 &= \underline{\hspace{1cm}} & 7 + 6 + 8 &= \underline{\hspace{1cm}} \\
6 + 5 + 8 &= \underline{\hspace{1cm}} & 8 + 6 + 4 &= \underline{\hspace{1cm}} \\
9 + 5 + 2 &= \underline{\hspace{1cm}} & 2 + 5 + 9 &= \underline{\hspace{1cm}} \\
3 + 9 + 2 &= \underline{\hspace{1cm}} & 2 + 3 + 5 &= \underline{\hspace{1cm}} \\
5 + 8 + 7 &= \underline{\hspace{1cm}} & 7 + 0 + 2 &= \underline{\hspace{1cm}} \\
2 + 2 + 5 &= \underline{\hspace{1cm}} & 5 + 1 + 6 &= \underline{\hspace{1cm}} \\
1 + 0 + 9 &= \underline{\hspace{1cm}} & 4 + 3 + 9 &= \underline{\hspace{1cm}} \\
5 + 0 + 6 &= \underline{\hspace{1cm}} & 5 + 8 + 2 &= \underline{\hspace{1cm}} \\
2 + 8 + 4 &= \underline{\hspace{1cm}} & 0 + 3 + 7 &= \underline{\hspace{1cm}} \\
1 + 9 + 3 &= \underline{\hspace{1cm}} & 3 + 6 + 2 &= \underline{\hspace{1cm}} \\
7 + 5 + 9 &= \underline{\hspace{1cm}} & 4 + 6 + 1 &= \underline{\hspace{1cm}} \\
3 + 7 + 9 &= \underline{\hspace{1cm}} & 9 + 3 + 3 &= \underline{\hspace{1cm}} \\
7 + 5 + 5 &= \underline{\hspace{1cm}} & 9 + 3 + 7 &= \underline{\hspace{1cm}} \\
7 + 3 + 2 &= \underline{\hspace{1cm}} & 7 + 7 + 0 &= \underline{\hspace{1cm}} \\
9 + 8 + 5 &= \underline{\hspace{1cm}} & 5 + 5 + 2 &= \underline{\hspace{1cm}} \\
0 + 5 + 3 &= \underline{\hspace{1cm}} & 0 + 6 + 2 &= \underline{\hspace{1cm}} \\
4 + 7 + 8 &= \underline{\hspace{1cm}} & 3 + 5 + 1 &= \underline{\hspace{1cm}} \\
6 + 2 + 7 &= \underline{\hspace{1cm}} & 4 + 1 + 6 &= \underline{\hspace{1cm}} \\
7 + 7 + 2 &= \underline{\hspace{1cm}} & 3 + 0 + 2 &= \underline{\hspace{1cm}} \\
7 + 7 + 0 &= \underline{\hspace{1cm}} & 9 + 6 + 1 &= \underline{\hspace{1cm}} \\
8 + 7 + 2 &= \underline{\hspace{1cm}} & 5 + 2 + 1 &= \underline{\hspace{1cm}} \\
2 + 8 + 0 &= \underline{\hspace{1cm}} & 0 + 6 + 2 &= \underline{\hspace{1cm}}
\end{align*}
\]
GOAL:

\[
\begin{array}{ll}
4 + 2 + 5 &= 11 \\
6 + 7 + 1 &= 14 \\
7 + 8 + 2 &= 17 \\
4 + 7 + 4 &= 15 \\
8 + 4 + 3 &= 15 \\
1 + 6 + 1 &= 8 \\
4 + 9 + 0 &= 13 \\
4 + 9 + 7 &= 20 \\
3 + 9 + 9 &= 21 \\
6 + 3 + 8 &= 17 \\
3 + 2 + 2 &= 7 \\
1 + 2 + 1 &= 4 \\
1 + 7 + 8 &= 16 \\
6 + 7 + 1 &= 14 \\
0 + 4 + 4 &= 8 \\
2 + 6 + 4 &= 12 \\
7 + 6 + 5 &= 18 \\
3 + 3 + 5 &= 11 \\
2 + 8 + 2 &= 12 \\
2 + 5 + 7 &= 14 \\
3 + 8 + 6 &= 17 \\
7 + 6 + 3 &= 16 \\
1 + 4 + 6 &= 11 \\
9 + 3 + 2 &= 14 \\
9 + 3 + 1 &= 13 \\
3 + 5 + 9 &= 17 \\
3 + 0 + 5 &= 8 \\
2 + 5 + 7 &= 14 \\
7 + 6 + 7 &= 20 \\
2 + 0 + 4 &= 6 \\
3 + 2 + 6 &= 11 \\
6 + 7 + 6 &= 19 \\
6 + 1 + 4 &= 11 \\
0 + 3 + 9 &= 12 \\
6 + 9 + 8 &= 23 \\
9 + 9 + 2 &= 20 \\
4 + 3 + 7 &= 14 \\
6 + 1 + 2 &= 9 \\
9 + 0 + 3 &= 12 \\
9 + 7 + 6 &= 22 \\
1 + 5 + 3 &= 9 \\
9 + 0 + 5 &= 14 \\
5 + 3 + 9 &= 17 \\
9 + 9 + 9 &= 27 \\
5 + 7 + 2 &= 14 \\
9 + 9 + 6 &= 24 \\
3 + 8 + 0 &= 11 \\
2 + 6 + 9 &= 17 \\
\end{array}
\]
**GOAL:**

<table>
<thead>
<tr>
<th>Equation</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>$8 + 1 + 2$</td>
<td>$1 + 9 + 9$</td>
</tr>
<tr>
<td>$2 + 1 + 0$</td>
<td>$2 + 8 + 2$</td>
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<tr>
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<td>$0 + 8 + 7$</td>
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<td>$3 + 2 + 0$</td>
</tr>
<tr>
<td>$3 + 2 + 0$</td>
<td>$4 + 0 + 5$</td>
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<tr>
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<tr>
<td>$6 + 0 + 9$</td>
<td>$0 + 5 + 8$</td>
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<tr>
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<tr>
<td>$8 + 9 + 9$</td>
<td>$3 + 4 + 0$</td>
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<tr>
<td>$7 + 5 + 4$</td>
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<tr>
<td>$9 + 3 + 7$</td>
<td>$2 + 2 + 5$</td>
</tr>
<tr>
<td>$3 + 6 + 4$</td>
<td>$3 + 9 + 0$</td>
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<td>$5 + 1 + 5$</td>
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<tr>
<td>$8 + 2 + 6$</td>
<td>$3 + 1 + 8$</td>
</tr>
</tbody>
</table>
GOAL:

\[
\begin{align*}
2 + 7 + 4 &= \_\_\_\_\_\_ \\
9 + 6 + 6 &= \_\_\_\_\_\_ \\
9 + 0 + 9 &= \_\_\_\_\_\_ \\
8 + 3 + 5 &= \_\_\_\_\_\_ \\
0 + 9 + 9 &= \_\_\_\_\_\_ \\
4 + 6 + 9 &= \_\_\_\_\_\_ \\
9 + 2 + 1 &= \_\_\_\_\_\_ \\
2 + 3 + 6 &= \_\_\_\_\_\_ \\
2 + 6 + 0 &= \_\_\_\_\_\_ \\
5 + 3 + 9 &= \_\_\_\_\_\_ \\
\end{align*}
\]

STOP