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## Effects of Alternative Activities on Productivity under Different Percentages of Incentive Pay

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**EFFECTS OF ALTERNATIVE ACTIVITIES ON PRODUCTIVITY UNDER  
DIFFERENT PERCENTAGES OF INCENTIVE PAY**

by

**Grainne A. Matthews**

**A Dissertation  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Doctor of Philosophy  
Department of Psychology**

**Western Michigan University  
Kalamazoo, Michigan  
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## EFFECTS OF ALTERNATIVE ACTIVITIES ON PRODUCTIVITY UNDER DIFFERENT PERCENTAGES OF INCENTIVE PAY

Grainne A. Matthews, Ph.D.

Western Michigan University, 1997

This study examined whether low percentages of incentive pay would be as effective as high percentages in maintaining work performance in the presence of competitive alternative activities. Incentives may increase performance primarily by decreasing time spent performing alternative activities. Although the link between performance and pay is tighter when the percentage of incentive pay is higher, laboratory studies have not found the expected difference. It is possible that previous simulations of work settings have not offered realistic competing contingencies. This study used a computer simulation of a quality inspection task and provided computer games as alternative activities to participants who reported playing such games frequently. Three percentages of incentive pay were examined: 0% or base pay only, 10%, and 100%. Opportunities to play computer games were provided either two or four times during the 70-minute work period. A between group, 3 x 2 factorial design was used. Subjects were 106 college students who were randomly assigned to one of six conditions. A factorial analysis of variance was conducted on two primary dependent variables: Number of screens completed correctly and time working, as well as a number of secondary, composite measures. A correlational analysis was also conducted to determine the relationship between time working and correct screens.

Neither the pay system nor the number of game opportunities significantly affected the number of screens completed correctly. Large within group variation prevented the detection of between group differences. Participants who received

incentive pay did work significantly longer than participants who received base pay only, but there was no statistically significant difference between the two incentive groups. Those who received only two opportunities to play computer games worked more than those who received four. The results indicated that, although time working was a function of performance contingent pay and the number of opportunities to take a break, a higher percentage of incentive pay did not increase the amount of time working. There was, however, a strong positive correlation between time working and correct screens, indicating that the longer participants spent working, the more correct screens they were likely to complete.

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## INTRODUCTION

The purpose of this study was to determine whether low percentages of incentive pay are as effective as high percentages in maintaining work performance in the presence of competitive alternative activities, such as those found in work settings. Incentives may increase performance primarily by decreasing time spent in alternative activities. Thus, high percentages of incentives, which provide a much stronger link between performance and pay, might be expected to compete more effectively with alternative activities (Blinder, 1990; Dickinson & Gillette, 1993; Dierks & McNally, 1987; Frisch & Dickinson, 1990; Lawler, 1990). However, previous research has consistently found that performance is maintained as effectively by low as by high percentages of incentive pay (Dickinson & Gillette, 1993; Frisch & Dickinson, 1990; Leary, Roberts, Trefsgar, Kaufman, Cassel, Jones, McKnight, & Duncan, 1990; Riedel, Nebeker, & Cooper, 1988). Factors present in the laboratory simulations but absent in work settings may have decreased the probability that participants would engage in the available alternative activities. These factors may account for the prior research findings. If an alternative activity of sufficient interest were provided, in which participants may engage without apparent detection by the researcher, such alternative activity may be more likely to occur. Such circumstances may more aptly simulate work settings where employees have access to a wide variety of alternative activities and may often engage in such activities without the knowledge of their supervisor, thus avoiding any potential negative consequences.



## Incentive Pay Percentage

The percentage of total pay provided as incentive pay has been studied to determine the optimum ratio of base to incentive pay. As incentive pay is dependent upon performance and base pay is not, the connection between performance and pay becomes stronger as the percentage of incentive pay increases. Compensation experts have suggested that productivity increases are therefore likely to accompany increases in incentive percentages (Fein, 1970; Henderson, 1985). However, neither the laboratory studies nor the one field study that have empirically examined the effects of differing percentages of incentives have found any performance variations resulting from such differences.

### Laboratory Studies

#### Riedel, Nebeker, and Cooper (1988)

Riedel et al. (1988), in a study designed to investigate the mechanism by which monetary incentives influence goal choice, goal commitment, and task performance, assessed the effects of incentive payment when participants could earn 0%, 25%, 75%, 100% or 125% of their base pay in incentives. Participants earned a guaranteed base pay and could earn incentives when they performed above a specified performance standard. Participants consisted of 130 high school and college students who were recruited for part-time employment, and worked 4 hours a day for 5 days transferring data from handwritten questionnaires to computer forms. The researchers assigned approximately 20 participants to each pay condition. Participants in the incentive groups performed significantly better than those who did not receive incentives, but there were no significant differences in productivity among the five incentive groups.

Leary, Roberts, Trefsgar, Kaufman, Cassel, Jones, McKnight, and Duncan (1990)

Leary et al. (1990), in an unpublished laboratory simulation, reported that participants who received 25%, 50%, 75% or 100% of their base pay as incentive pay performed comparably. The researchers assigned 50 college students to 10 groups across which the percentage of incentives earned was varied for eight to twenty 15-minute sessions. The experimental task consisted of assembling parts made of pop beads. However, as in the Riedel et al. (1988) study, although participants performed better under incentive than under hourly pay conditions, performance was comparable under the various incentive percentages.

Frisch and Dickinson (1990)

Frisch and Dickinson (1990) undertook to determine the optimum percentage of incentive to base pay effective in improving performance of a repetitive assembly task. They randomly assigned 75 college students to one of five incentive-to-base pay conditions: 0% (no incentives), 10%, 30%, 60%, or 100%. Subjects participated in fifteen 45-minute sessions during which they assembled parts made from bolts, nuts, and washers. Participants received a base pay amount for assembling a minimum of 50 quality parts per session and a per piece incentive for parts over 50. Results indicated that incentive pay greatly increased productivity over base pay only but there were no significant differences in the productivity of the different incentive percentage groups. Those participants in the base pay only group earned the most money while participants in incentive pay groups earned decreasing amounts as the percentage of total pay that was incentive based increased. Therefore, productivity was neither a function of incentive pay percentage nor absolute amount of money earned.

Dickinson and Gillette (1993)

Dickinson and Gillette (1993) conducted two experiments to compare the differential effects on productivity of base pay plus incentives and piece rate pay where 100% of the participant's pay was incentive based. In each experiment, six participants worked under both pay systems in a within-subject reversal design with counter-balanced exposure to treatments. Subjects participated in six to nine 3-hour sessions (Experiment 1) or nine to fourteen 4-hour sessions (Experiment 2). Simulated bank checks with differing cash values were presented on a computer screen and participants entered the cash values using the computer keyboard. The two pay systems did not produce any significant difference in the number of correctly entered checks although participants did earn more money in the 30% incentive than in the 100% incentive condition.

Field StudyLaMere, Dickinson, Henry, Henry, and Poling (1996)

LaMere et al. (1996) found the performance of 20 truck drivers to be comparable when individual incentives comprised 3%, 6%, and 9% of their total wages. The drivers received their regular base pay and earned additional money in incentives when their performance exceeded the group average obtained during baseline. After a 20 week baseline phase, during which drivers received hourly wages, the researchers implemented the incentive system for one half of the drivers. Fourteen weeks later the incentive system was implemented for the other 10 drivers. Thus, the initial incentive condition was introduced in multiple baseline fashion. Performance increased from 29% to 74% and from 67% to 91% for the two groups of drivers. This phase lasted for 28 (Group 1) or 15 weeks (Group 2). Subsequently the researchers

presented the drivers with the 6% incentives condition for 39 weeks and the 10% incentive condition for 26 weeks. The increases in the incentive percentages were not correlated with further performance improvements. The increased incentive percentages were implemented at the same time for all drivers, representing an ABC comparison. Although this study was conducted in an actual work setting, the range of incentive percentages and of absolute dollar amounts examined was small. Thus, although these results suggest that the laboratory findings may generalize to an applied setting, they are certainly not definitive.

### Competing Contingencies

The work environment provides many sources of reinforcement: formal and informal, extrinsic and intrinsic, from peers as well as from managers, for both work and nonwork behaviors. The relative reinforcement rate for an employee's work and nonwork activities determines the extent to which such activities occur. Under hourly pay systems, the financial consequences to the employee of engaging in alternative activities are negligible. As long as an employee maintains some minimum level of performance, they will continue to receive a wage. Dickinson and Gillette (1993) are among those who support the idea that, although incentive pay may increase productivity by motivating employees to become more proficient at the work task, its main effect may be to increase the time spent working by decreasing the time spent on activities maintained by other sources of reinforcement (see also Redmon & Lockwood, 1986). Given that money is of value to the employee, as the percentage of total pay that is incentive based increases, the relative amount of time spent in work activities would also be expected to increase as the amount of time in alternative activities decreased.

Each of the laboratory studies cited above attempted to simulate such competing activities as may occur in the workplace. In the Riedel et al. (1988) study, a break area

where participants could socialize and consume refreshments was provided. Frisch and Dickinson (1990) informed participants that they could take breaks whenever they wanted. They made magazines and refreshments available and participants could interact with experimenters who were always present in another room in the laboratory. Dickinson and Gillette (1993) instructed participants in both of their experiments that they could take breaks whenever they wanted for as long as they wanted. During these breaks, participants could engage in any activity they wanted, including studying or reading materials that they brought with them into the break area. Coffee, soft drinks, magazines, a telephone, and other students, including researchers, with whom to interact were available to the participants in the laboratory break area.

None of these studies, however, systematically observed, measured, or correlated with productivity the time spent in alternative activities by participants. It is unclear, therefore, the extent to which productivity was affected by time spent working. The extent to which participants in the incentive pay conditions actually engaged in alternative activities is also unknown.

There are several possible reasons why participants may have interrupted their work only briefly, if at all. Some of these are discussed in the remaining portion of this section.

### Incentive Pay and Concurrent Schedules

Incentive pay systems that connect pay to performance may be thought of as behavioral choice situations analogous to those studied in the operant laboratory using concurrent schedules of reinforcement. Concurrent schedules present the individual with two or more schedules simultaneously. Several characteristic patterns of behavior allocations to concurrent schedules have been observed. Two viable patterns of behavior choice are matching and maximization. The matching law is an empirical

generalization based primarily on data from pigeons and rats performing on concurrent VI VI (variable interval) schedules (Herrnstein, 1970). The matching law holds that organisms allocate behaviors to alternative activities in proportion to reinforcements returned by those activities such that reinforcement is maximized. Under certain concurrent schedules, however, maximization of reinforcement leads to violations of the matching law by pigeons and rats (Herrnstein & Heyman, 1979; Staddon & Motheral, 1978).

Redmon and Lockwood (1986) also argue that a concurrent schedule analysis can be applied to work situations where an employee can usually make a response appropriate to two schedules of reinforcement. The employee may work or may engage in an alternative task. Their analysis, however, is “loosely based on the quantitative matching law” and their goal is a “qualitative translation” that will have practical implications in organizations. The essence of their discussion is that performance will be a function of the frequency and nature of the reinforcement available from working and that available from activities other than working. Changing the frequency or nature of the reinforcement available from either source will affect the allocation of behavior to the other schedule. Redmon and Lockwood cite examples of profit sharing, incentive payment plans, an attendance lottery, and an organizational development program as examples of organizations reducing the cross-schedule competition in successful efforts to decrease time spent engaged in alternative activities and consequently increase time spent working.

Pierce and Epling (1983) predict that an understanding of human choice based on the matching relationship will increase prediction and control of socially important behavior. The matching law may measure and predict the relative value of alternative sources of reinforcement, in terms of status, equity, social power, etc. (Sunahara & Pierce, 1982). An understanding of the relative rate of reinforcement may increase

control of behavior. For example, a decrease in the frequency of reinforcement should result in an increase in the response rate on the alternative schedule, although the reinforcement from that source does not change. Manipulations of effort, punishment, or reinforcer magnitude should also alter relative response rates in predictable ways. Thus, consideration of alternative sources of control that operate to increase or decrease important work behaviors is essential to designing effective organizational interventions.

Although humans have also exhibited matching on concurrent VI VI schedules (Pierce & Epling, 1983), Mawhinney (1982) reports that, in the context of the VI FR (fixed ratio) situation in which Staddon and Motheral (1978) found neither matching nor maximization in pigeons, humans develop formal analyses of reinforcement contingencies and develop verbal rules for maximization of reinforcement that override any possible propensity to match. Thus, as a result of rule governed behavior, the matching rule also has limited applicability to the choice behavior of people. Mawhinney's analysis derives from Skinner's distinction between rule governed and contingency controlled behavior (Skinner, 1969). People are likely to employ maximization strategies and successfully maximize reinforcement in situations where nonhuman animals such as birds and rats may not.

Mawhinney (1982) compared performance under several concurrent VI FR and a series of single FR schedules. Regardless of the value of the single FR schedules, the participant maintained the high rate of response characteristic of FR schedules. Under the concurrent schedules, however, he maximized overall reinforcement by switching between competing schedules. This resulted in a decrease in the response rate on the FR component over rates on the equivalent simple FR schedule. Thus, human performance under a simple reinforcement schedule may differ from that under a concurrent schedule. The verbal rules generated by the participant indicated that he

responded at a maximum rate when offered no alternative source of reinforcement, regardless of the value of the simple FR schedule. Under the concurrent schedule he reported that he reduced his response rate on the FR to switch to the VI component.

### Hobson's Choice

Although laboratory studies of incentive pay percentages have attempted to simulate the availability of alternative reinforcement sources in the workplace, the constraints placed upon those alternatives by the presence of the researcher, the nature of the alternative activities available, the length of the session, and possibly by other unknown factors, may render this apparent real choice to be no choice at all. Mawhinney and Mawhinney (1982) have called such an absence of alternative sources of reinforcement "Hobson's Choice" after the eighteenth century innkeeper who offered customers their choice of horses, as long as they chose the one assigned them. These authors argue that existing laboratory studies of incentive percentages do not truly simulate real work settings with regard to establishing competing contingencies; they present participants with "Hobson's Choice." If this is true, then we ought not to be surprised if low percentages of incentive pay are as successful in producing high rates of performance as high percentages in laboratory settings. Given no realistic alternative source of reinforcement, participants will maximize their reinforcement by increasing their work rate even under conditions of low incentive pay percentages.

Support for this idea comes from participant interviews by Dickinson and Gillette (1993) designed to explore the verbal rules generated by participants to maximize their reinforcement. Although all six participants were able to describe the differences between the incentive conditions, they stated that they tried to complete as many checks as possible to maximize their earnings. These behavior-governing rules are reminiscent of those obtained by Mawhinney (1982).



Insofar as a laboratory finding requires Hobson's Choice as a precondition, it is unlikely to be replicated in field settings. If previous studies of the comparative effectiveness of various incentive percentages truly offered no realistic alternative source of reinforcement, then their conclusions may not be generalized to real work situations containing multiple sources of reinforcement.

### Alternative Activities

One of the reasons that the alternative activities offered in the laboratory studies cited above may not have functioned effectively as competitive sources of reinforcement to the incentive pay may have been the very nature of the activities themselves. They may not have been sufficiently reinforcing to the participants. The nature of the experimental situation may also have mitigated their reinforcing capacity. For example, one of the alternative activities was talking with other participants, students, and the researchers. This appears to simulate socializing with colleagues, which is a common alternative activity in the work place. However, in the real work setting, employees work together over time and therefore have established relationships and topics of discussion. Such a history is not so easily established in an experiment where participants work together for just a few hours over a short time. It is likely that socializing under these circumstances is a less powerful reinforcer for interrupting work than its counterpart in the work place. It is therefore less likely to compete with monetary reinforcement for working.

### Length of Sessions

Even with relatively strong sources of reinforcement for alternative activities, short experimental sessions, such as those used by Frisch and Dickinson (1990) (45 minutes) and Leary et al. (1991) (15 minutes) may not generate rates of alternative

activities comparable to those seen in an actual workplace. Escaping a work task that is aversive in some way reinforces engaging in alternative activities. The work may be inherently unpleasant or effortful or may become monotonous and effortful over time. Alternative activities that are less unpleasant and effortful or relieve monotony are therefore established as reinforcement for interrupting the work task. However, participants probably have little difficulty delaying alternative activities until a 15- or 45-minute session is over to maximize their incentive pay, irrespective of the nature of the work activity. The brief nature of the session prevents the effective establishment of alternative activities as reinforcers powerful enough to overcome the reinforcement for continuing to work. Thus, short experimental sessions may preclude performance differences that may be generated by different incentive percentages given longer sessions or real work situations.

However, Dickinson and Gillette (1993) used 3- and 4-hour sessions and those of Riedel et al. (1988) were 4 hours long. Additionally, LaMere et al. (1996) conducted a field study where the normal 8-hour workday was in effect. Yet they too found no productivity difference between the various incentive pay percentages. So it is unclear whether the length of the experimental session plays any part in determining the amount of time that participants allocate to the work task or the probability that they will take advantage of the opportunity to engage in alternative activities.

#### Presence of the Researcher

In each of the laboratory studies, researchers were present in the laboratory, either in the break room or in the work area. They would have seen participants engaging in alternative activities. Participants would have been aware that the time they spent in alternative activities was immediately known to researchers, which may have

reduced the probability that they would interrupt their work despite instructions granting permission to do so.

Participants have probably experienced a history of negative consequences for engaging in alternative activities during work hours. Such a history may make it unlikely that they would take breaks that would be observed by people who are empowered to provide such negative consequences. The degree to which participants in these studies felt free to take such breaks is, therefore, unclear. In Riedel et al. (1988) the participants were hired as temporary employees and thus the demand characteristics of this employment setting in particular may have restricted break taking. Participants in the other experiments knew that they were experimental subjects rather than employees, but it is reasonable to believe that the situation contained enough characteristics common to work settings to create similar social demands. In actual work settings, employees are frequently able to engage in alternative activities undetected by supervisors. These laboratory simulations were perhaps not valid simulations of real work situations in this regard.

#### Link Between Productivity and Time Working

Although Dickinson and Gillette (1993) theorize that productivity is affected more by time spent working than by task proficiency, none of the studies systematically recorded the number and length of work breaks taken by participants. Therefore, no empirical information exists to document a difference in the proportion of time spent working and time spent engaging in alternative activities between highly productive participants and those with lower rates of productivity. The mechanism by which individual incentive pay influences productivity has yet to be demonstrated.

## Feedback

In all prior studies of the effects of the percentage of incentive pay, participants have received performance feedback. This feedback may have sustained performance under the differing percentages of incentive pay and may have accounted for the failure to find productivity differences. In the Riedel et al. (1988) study, participants were given explicit performance feedback each morning for the previous day's work. In the Frisch and Dickinson (1990) and the Leary et al. (1990) studies, the researchers counted completed widgets in front of each participant at the end of each session and paid participants based on the number of correct widgets. In the Dickinson and Gillette (1993) study, the researcher plotted the number of checks entered correctly by each participant on a graph that remained visible to the participants during all sessions, and recorded the amount of money earned based on performance, at the end of each session. Participants could also click on a button at any time during the session to see how many checks they had completed. In the LaMere et al. (1996) study, the truck drivers recorded the number and type of jobs that they completed and the number of miles driven on a daily measurement form. This information was the basis for the performance measure on which the incentive pay was based, so drivers were always aware of their own performance. Thus the effect of feedback may have confounded the possible effects of incentive pay in all previous research. Attempts to eliminate this potential confound were made in this study. First, no explicit feedback was provided. Second, the nature of the task was such that it would be almost impossible for participants to track their own performance, making self-generated feedback unlikely. Finally, each subject participated in only one experimental session, preventing incentive pay received from functioning as feedback and affecting performance in later sessions.

## Rationale

Human performance under individual reinforcement schedules can differ from that obtained under concurrent schedules. Participants may respond at a higher rate on a simple schedule than they would on the equivalent component of a concurrent schedule. Incentive payment systems are analogous to reinforcement schedules, and actual work settings provide concurrent schedules where reinforcement may be obtained both for work and for nonwork activities. Although the link between performance and pay or response and reinforcement is tighter when the percentage of total pay that is incentive based is higher, laboratory studies have not found the expected performance difference under different incentive percentage conditions. Explanations for this include the possibility that laboratory simulations of work settings do not offer realistic competing contingencies to the incentive pay contingency. It is possible that the activities offered were not intrinsically reinforcing for the participants and that the presence of the researcher served as a deterrent to engaging in those activities. In addition, sessions in laboratory studies have been short enough that it is possible that escape from the work task was not established as a reinforcer effective enough to overcome the incentive pay contingency, regardless of the amount of the incentive pay. A second explanation is the presence of feedback in all previous studies. Feedback may have confounded the effects of incentive pay by maintaining high performance levels regardless of the percentage of total pay that was incentive based.

To examine these possible explanations for the failure of different incentive percentages to produce different performance, this study used a computer simulation of a quality inspection task and provided a variety of computer games as alternative activities. Computer games may be inherently more reinforcing than the activities that were available in previous studies. Furthermore, computer games have become a

■

realistic alternative to working in many work settings and appear to represent a threat to employees' productivity and perhaps even to their job security. In a 1993 survey by Information Week, a computer trade magazine, 90% of 200 information system managers said that they have access to computer games in the workplace (Eng & Schwartz, 1993). Half of the respondents believe that the games hurt productivity in their companies. Forty-two percent reported that the games were played at the office several times a week, and 16% reported that the games were played several times a day. A national poll conducted by Coleman and Associates, Inc. in January 1995 found that 23% of people who played computer games played their most recent game at the office (Betts, 1995). A number of organizations, including the Virginia state government, the United States Departments of Labor and of Defense, The Boeing Company, Ford Motor Company, Sears Roebuck and Company, Garber Travel Services, Inc., and The Travelers Companies, have instituted procedures to curtail employee use of computer games. These organizations have expressed concern about the effects of the game playing on productivity and on public relations. Efforts to prevent employees from playing computer games at work include policies ranging from monthly purges of games on company personal computers to disciplinary action, including termination (Betts, 1995; Eng & Schwartz, 1993; Klett, 1994; Wilson, 1992). These reports support the suggestion that playing computer games is sufficiently reinforcing to compete with work under many circumstances.

In the present study, the computer offered participants the opportunity to play computer games at certain times during the experimental session. Neither the researcher nor other participants were able to detect during the session whether participants were working or playing the games, and participants knew that their game playing was undetectable. This may have reduced the threat of negative consequences that made participants reluctant to take breaks in previous studies. The work task was

one that pilot study participants described as unpleasant, effortful, and monotonous. This may have established escape from work as a competitive reinforcer for engaging in alternative activities. Finally, individuals who reported that they enjoyed playing computer games and played them regularly were chosen to participate in the study.

In addition to increasing the probability that participants were offered a realistic choice by increasing the reinforcing value of the alternative activity, this study attempted to determine whether time allocated to work and to alternative activities mediated productivity under incentive systems. The computer program controlled the frequency and duration of game access to facilitate the measurement of time working, the distinction between participants in terms of time working, and the correlation of time working and productivity. Controlling the schedule under which alternative activities were available also allowed examination of whether the number of opportunities to take a break from work influenced the number of such breaks taken and whether there was an interaction with the incentive pay condition.

Finally, this study removed the potential feedback confound present in previous research. Both researcher- and self-generated feedback was eliminated and subjects participated in only one experimental session. This prevented any performance information inherent in incentive pay from functioning as feedback for performance in subsequent sessions.

## METHOD

### Participants

Students of Western Michigan University were recruited to participate using campus flyers (See Appendix A) and announcements in undergraduate and graduate psychology classes (See Appendix B). They were paid for their participation as described in the “Independent Variables” section. Criteria for participation (See Appendix C) included availability at the scheduled session times and the ability to manipulate a computer mouse and to see figures on the computer screen. In addition, students were screened for interest in playing computer games and for financial need. Only students who reported that they regularly played computer games were included. Students who reported that they planned to spend any money earned in the study on discretionary items were excluded. Finally, students of Psychology 344 or 444, Organizational Psychology, whose class readings included studies of the differential effects of incentive pay percentages, were also excluded from the study. Students read and signed an Informed Consent (See Appendix D) before participating in the experiment. Students had to be at least 18 years old to give consent to participate so students younger than 18 were also excluded.

Eighty students were determined to be ineligible according to these criteria. One hundred and eighteen students attended their scheduled session and were randomly assigned to one of the six experimental groups. Three participants quit during the work period and the data for nine others were lost due to computer malfunctions. The students who quit during the course of the study were in the 0% incentive 2 game opportunity, the 10% 4 game opportunity, and the 100% 4 game opportunity



conditions. Final data were available for 106 participants with between 16 and 20 in each of six experimental groups. The average participant was 20 years old with a range of 18 to 50. The majority of participants were women (73%). Table 1 shows the number of female participants, group size, average age, and age range, for each of the six groups.

Table 1  
Participant Characteristics

	Incentive Pay Percentage					
	0%		10%		100%	
	Game Opportunity					
	4	2	4	2	4	2
N	16	17	16	18	19	21
No. Female	11	14	11	14	14	13
Average Age	19	18	20	21	21	22
Age Range	18-24	18-20	18-23	18-33	18-38	18-50

### Setting

Experimental sessions were conducted in a university computer laboratory that contained 15 personal computers spaced approximately 3 feet apart on four rows of tables. Two to 15 participants worked in the laboratory during any one session. The researcher and research assistants left the laboratory as soon as the experimental session began but remained available in an adjacent room during the session.

### Apparatus

The personal computers ran the Microsoft Windows 3.1<sup>©</sup> operating system on a Local Area Network. A computer simulation of a quality inspection task created using Visual Basic<sup>©</sup>, called Beaks<sup>©</sup>, and three computer games, Solitaire<sup>©</sup>, Yatetris, and Bago, were also loaded on the network. The computer software, Beaks<sup>©</sup>, recorded the participants' responses to the work task, the amount of time spent playing the computer games, and the amount of time not interacting with the computer. Beaks<sup>©</sup> also controlled access to the three computer games as described below. The experimental manipulandum was the computer mouse for selecting and deselecting figures that appeared on the computer screen and for moving through the screens. Both the mouse and keyboard were used to play the computer games.

### Work Task

Participants were required to examine screens of figures and indicate which figures were "defective." Each screen consisted of a grid of 126 boxes, a band of information below the grid, and three buttons: "Done," "Next Screen," and "Start." Within each of the 126 boxes was a figure called a "beak" (See Appendix E). The program randomly determined the position of defective beaks in the grid and their distribution across screens (within the parameters specified below) as the screens were generated.

Two percent of the beaks in every 20 screens were defective with a maximum of 10 defective beaks per screen. The defect rate was based on recommendations from signal detection research (Wiener, 1987), on previous research using this task (Urbach, 1995), and on pilot work using Beaks<sup>©</sup>. With batches of 20 screens having equal numbers of defective beaks, participants examined approximately equivalent amounts

of defects irrespective of how many screens they viewed. This allowed for comparisons between the performance of participants who completed varying numbers of screens. A possible alternative would have been to have 2% of all screens contain defective beaks. However, this would result in 98% of the screens being defect-free and participants would be able to earn 98% of the available incentive pay without identifying any defective beaks. The present procedure distributed the defective beaks across more of the screens, while holding the defect rate relatively constant across participants. One thousand screens were available. The total number of screens necessary to prevent participants from exceeding the number available was determined from pilot research, in which the maximum number of screens viewed was 236.

### Beaks

Each beak consisted of two slanted, symmetrical lines that formed an angle with the vertex at the left, like the letter “V” rotated 90° to the right. A defective beak had an angle that was slightly larger than that of a non-defective beak. To indicate the presence of a defective beak, participants selected the box containing the beak by clicking on it. A selected beak could be deselected in the same manner. When participants thought that they had selected all defective beaks on that screen, they clicked on the Done button to activate the Next Screen button. To advance to the next screen, participants clicked on the Next Screen button. The next screen appeared immediately.

### Information Band

The band of information below the grid indicated the amount of money the participant would receive for each correctly completed screen, the number of computer game opportunities available, and the amount of time remaining in the work session.

## Alternative Activities

### Computer Games

Three computer games were available as alternatives to the work task. The computer program, Beaks<sup>®</sup>, presented participants with the opportunity to play the games at specific times during the session. A dialog box appeared on the computer screen and required participants to indicate whether they chose to continue to work or to accept the opportunity to play the games. If they chose to continue to work, the program returned to the work task. If they chose to play a game, they selected one of the three games and could play for up to 5 minutes. Participants could return to the work task at any time during the game period. At the end of the 5-minute game period, the program presented the work task again.

### Identification of Computer Games

Four hundred and sixty-eight students enrolled in Psychology 100 General Psychology responded to a brief survey designed to identify computer games likely to appeal to the participant population (See Appendix F). Students who reported playing computer games listed their favorites. The results are reported in Appendix G. The three most popular games that met the criteria for inclusion were chosen for the study. The inclusion criteria were that the games did not require extensive practice to enjoy, a complete game could be played in the 5-minute game period, and different types of computer games would be represented. Finally, the games had to be compatible with the Microsoft Windows 3.1<sup>®</sup> operating system and Microsoft Visual Basic<sup>®</sup> programming language. The three games were Solitaire (a card game and the most popular among the surveyed students), Yatetris (a version of Tetris, the third most popular), and Bago (a word game).

### Other Alternative Activities

Participants were instructed that they were expected to remain at the computer for the entire 70-minute work session. They were encouraged to use the rest room immediately before the beginning of the work session. No other alternative activities were available.

### Dependent Variables

There were two primary dependent variables, the number of correctly completed screens and the time spent working. A correctly completed screen was a screen on which all defective beaks were selected and no nondefective beaks were selected. At the end of the experimental session the computer program subtracted the number of screens on which an error occurred from the number of screens correctly completed by each participant. Also at the end of the experimental session, the program subtracted the sum of the time spent playing computer games plus the total length of breaks in computer activity during work periods, from the work period of 70 minutes, to determine the time spent working. Breaks in computer activity during work periods were calculated in the following manner: A timer started immediately following each mouse click. If another mouse click occurred within 60 seconds, the timer reset and no break in computer activity was recorded. If, however, another mouse click did not occur within 60 seconds, a break in computer activity was recorded. The length of the break included the initial 60 seconds and any additional time until the next mouse click. The program totaled the length of all such breaks in computer activity at the end of the experimental session and also reported the number of such breaks.

Data on the variables that contributed to the two primary dependent variables were also recorded and analyzed. Number of correct screens was a function of these

dependent variables: (a) hits, (b) misses, (c) false alarms, (d) total errors, (e) percentage of defective beaks selected, (f) percentage of screens completed correctly, (g) number of incorrect screens, and (h) total number of screens completed. The dependent variables that contributed to time spent working were: (a) time playing games, (b) percentage of game opportunities accepted, (c) time in breaks in computer activity, and (d) number of breaks in computer activity.

### Independent Variables

#### Incentive Pay Percentage

There were three levels of the incentive pay percentage - 100%, 10%, and 0%. Under the 100% incentive condition, participants received 10¢ for each screen correctly completed. There was no base pay. Participants who performed at the average rate of one screen per minute (derived from the pilot study) had the opportunity to earn \$7.00. Under the 10% incentive condition, participants received a base pay of \$6.30 for the session and 1¢ per correct screen. Participants who performed at the average rate also had the opportunity to earn \$7.00 in this condition. Under the 0% incentive condition, participants received \$7 for the 70-minute work session regardless of the number of correct screens completed.

#### Opportunities for Alternative Activities

There were two levels of opportunities for alternative activities. Under the first level, the alternative activity of playing computer games was available four times during the 70-minute session, i.e., participants worked for five 10-minute periods and had four 5-minute game opportunities. The session began and ended with a 10-minute work period. Under the second level, the computer games were available only twice,

i.e., participants worked for two 25-minute periods before each 5-minute game opportunity occurred. These sessions also ended with a 10-minute work period.

### Experimental Design

This study used a 3 x 2 between group factorial design. Each of the experimental groups contained at least 15 randomly assigned participants. Two factor analyses of variance were used to determine whether the effects of the independent variables were statistically significant. Tests were conducted on 14 dependent variables. Given the number of dependent variables, a Bonferroni  $\underline{F}$  was used as the critical  $\underline{F}$  value to account for inflation of the family-wise error rate (Huitema, 1980). With an alpha level of .05, the critical value of the Bonferroni  $\underline{F}$  statistic at 5, 101 degrees of freedom is 3.77. With an alpha level of .01,  $\underline{F}_{critical} = 4.67$ . When appropriate, post hoc multiple comparison tests were conducted using Fisher's Least Significant Differences (LSD) procedure (Howell, 1997).

### Experimental Procedure

Subjects participated in one 3-hour session. During a 30-minute introductory phase, the researcher explained the work task and the relevant incentive payment system to participants using a written script (See Appendix H). Participants also read a description of the incentive system and then completed a quiz to ensure that they understood how they would earn their pay (See Appendix I). They then used a computer training program to familiarize them with the work task and the computer games. The training program consisted of a sequence of computer screens containing text and graphics that described and illustrated the work task and the computer games. The training program also included practice screens on which participants selected and deselected defective and non-defective beaks and moved through several screens by

clicking on the Done and Next Screen buttons. The program provided feedback after each beak selection. Participants also practiced choosing a game and played the three games for 5 minutes each.

After a brief break, participants returned for the 70-minute experimental phase. This phase began with a work period. The participants selected the Start button to begin the work task. At the end of each work period, a dialog box appeared offering the opportunity to play the computer games for up to 5 minutes. At the end of the 5-minute game period, the program disabled the game and presented the work task again. At the end of the 70-minute session, the work task was disabled and a "Time's Up" message appeared on the screen. The researcher returned to the computer laboratory to obtain the number of screens correctly completed from the computer program and to pay participants according to the relevant incentive pay condition.



## RESULTS

### Number of Screens Completed Correctly

Two-way analyses of variance were conducted on the number of screens completed correctly and the following dependent variables that were related to this measure: (a) hits, (b) misses, (c) false alarms, (d) total errors, (e) percentage of defective beaks selected, (f) percentage of screens completed correctly, (g) number of incorrect screens, and (h) total number of screens completed. The means and standard deviations for each measure by group are provided in tabular form in Appendix J, Tables J1 through J9. Table 2 summarizes the results of the analyses. Only main effects are reported because there were no statistically significant interaction effects. The source table for each ANOVA is provided in Appendix K. No multiple comparison tests were conducted for the three incentive conditions because there were no statistically significant mean differences.

The mean number of screens completed correctly by all the participants in the 0%, 10%, and 100% incentive conditions was 51, 65, and 59, respectively (SDs = 35, 25, and 31). The participants in the 10% incentive condition averaged slightly more correct screens than those in the 100% incentive condition and both incentive groups averaged slightly more correct screens than the non-incentive group. However, the differences between the three conditions were not statistically significant. The mean number of screens completed correctly by all the participants in the two game opportunity condition was 61 and in the four game condition, 56 (SDs = 30 and 31). The participants in the two game condition averaged slightly more correct screens than those in the four game condition. These differences also were not significant.

**Table 2**  
**Obtained Value of the F Statistic for Performance Related Dependent Variables**

Dependent Variable	Independent Variable	
	Incentive Percentage	Game Opportunities
Correct Screens	1.90	0.88
Hits	2.00	1.91
Misses	0.64	0.16
False Alarms	1.13	0.69
Total Errors	0.54	0.05
% Defects Selected	1.20	0.01
% Screens Correct	0.97	0.18
Incorrect Screens	0.33	0.02
Total Screens	0.69	0.54

Note. Bonferroni  $\underline{F}$  critical (5, 101, .05) = 3.77. Bonferroni  $\underline{F}$  critical (5, 101, .01) = 4.67.

Data were also analyzed on the following composite performance measures: number of hits, misses, false alarms, total errors, percentage of defective beaks selected, percentage of screens completely correctly, number of screens completed incorrectly, and total screens completed. There were no statistically significant effects of either independent variable on any of these dependent variables.

### Time Spent Working and Related Dependent Variables

Two way analyses of variance were conducted on the time spent working and the following factors that contributed to the time spent working: (a) time playing games, (b) percentage of game opportunities accepted, (c) total length of breaks in computer activity, and (d) number of breaks in computer activity. The means and standard deviations for each measure by group are provided in tabular form in Appendix L, Tables L1 through L5. Table 3 summarizes the results of these analyses. Only main effects are reported because there were no statistically significant interaction effects. The source table for each ANOVA is provided in Appendix M.

Table 3

Obtained Value of the F Statistic for Time Related Dependent Variables

Dependent Variable	Independent Variable	
	Incentive Percentage	Game Opportunities
Time Working	18.35 ****	19.03****
Time Playing Games	15.59 ****	25.73****
% Game Opp. Accepted	12.52 ****	0.014
Length of Breaks	3.53	0.019
Number of Breaks	2.49	0.08

Note. Bonferroni  $F_{critical}(5, 101, .05) = 3.77$ . Bonferroni  $F_{critical}(5, 101, .01) = 4.67$ .

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . \*\*\*\* $p < .0001$ .

Multiple comparison tests were conducted for the three incentive pay percentages when the ANOVA mean differences were statistically significant. Such tests were not necessary for the game opportunities because there were only two comparisons. The multiple comparison LSDs for each dependent variable are presented in Table 4.

Table 4  
Post hoc Multiple Comparison Fisher's Least Squared Difference Tests

Dependent Variable	Incentive Condition Paired Comparison		
	<i>t</i>		
	0% and 10%	0% and 100%	10% and 100%
Time Working	4.49****	5.32****	0.65
Time Playing Games	3.84**	5.06****	1.07
% Games Accepted	3.66**	5.25****	1.33

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ . \*\*\*\* $p < .0001$ .

As the percentage of total pay that was incentive based increased, the mean amount of time spent working also increased: Participants in the 0%, 10%, and 100% incentive pay conditions worked an average of 52 min 24 s, 60 min 43 s, and 61 min 49 s, respectively (*SDs* = 7 min 53 s, 7 min 17 s, and 7 min 9 s). The analysis of variance indicated that the effects of incentive pay percentage were statistically significant at the .0001 level. The LSD test indicated that the differences between the 0% incentive condition and the 10% and 100% incentive conditions were both significant at the .0001 level. There was no statistically significant difference between

the 10% and 100% conditions. Participants in the two game opportunity condition worked for a mean of 61 min 33 s while those with four game opportunities worked for a mean of 55 min 24 s (SDs = 7 min 31 s and 8 min 19 s). This difference was also statistically significant at the .0001 level. There were no statistically significant interaction effects.

#### Factors That Determine Time Spent Working

Time spent working was a function of the amount of time spent playing computer games and the total length of breaks in computer activity. Related measures included the percentage of the opportunities to play games accepted by participants and the number of breaks in computer activity.

#### Amount of Time Playing Games

Participants in the 0%, 10%, and 100% incentive conditions played for a mean 13 min 5 s, 7 min 22 s, and 5 min 46 s, respectively (SDs = 5 min 46 s, 6 min 21 s, and 6 min 22 s), differences that were statistically significant at the .0001 level. The participants with two game opportunities spent a mean time of 5 min 49 s playing computer games while those with four opportunities played for a mean of 11 min 25 s (SDs = 2 min 16 s and 7 min 53 s). This mean difference was also statistically significant at the .0001 level. There were no interaction effects. The LSD test indicated that the differences between the 0% and each of the 10% and 100% incentive conditions were statistically significant while the difference between the 10% and 100% groups was not.

### Percentage of Game Opportunities Accepted

Participants in the 0%, 10%, and 100% incentive pay conditions accepted 91%, 60%, and 48% respectively of computer game opportunities (SDs = 26, 41, and 41). These differences were statistically significant at the .0001 level. Participants in the two game opportunity condition accepted a mean of 68% of game opportunities; those in the four game opportunity accepted 65% (SDs = 44 and 37). This difference was not statistically significant. There were no statistically significant interaction effects. The LSD test indicated that the differences between the 0% incentive and both the 10% and 100% incentive conditions were statistically significant while the difference between the mean percentage of game opportunities accepted by the participants in the 10% and 100% groups was not.

### Length of Breaks in Computer Activity

The mean break length for participants in the 0%, 10%, and 100% incentive pay conditions was 4 min 32 s, 1 min 54 s, and 2 min 24 s respectively (SDs = 6 min 41 s, 2 min 38 s, and 2 min 36 s). The mean break length of the two game opportunity groups was 2 min 49 s; of the four game opportunity groups, 3 min 11 s (SDs = 5 min 15 s and 3 min 23 s). There were no statistically significant effects of either independent variable.

### Number of Breaks in Computer Activity

Participants in the 0%, 10%, and 100% incentive pay conditions had means of 7, 5, and 6 breaks, respectively (SDs = 6, 5, and 5). Participants in both the two and four game opportunity conditions had a mean of 6 breaks in computer activity (SDs = 6

and 5, respectively). There were no statistically significant effects of either independent variable.

### Summary of Factors That Determine Time Spent Working

As stated above, time spent working was determined by time playing games and breaks in computer activity, which, in turn, were related to the percentage of opportunities accepted and the number of breaks. The differences between the 0% incentive groups and both the 10% and 100% incentive groups were statistically significant for time working and playing games and for the percentage of opportunities accepted. However, there were no statistically significant differences between the 10% and 100% incentive groups on any of these time related variables.

Based on this analysis of the factors that determine the time spent working, it appears as though time working is primarily determined by time playing games and percentage of opportunities accepted, rather than either the length or number of breaks in computer activity.

### Correlation of Time Working and Performance

Correlational analyses of the amount of time spent working and the number of screens completed correctly revealed that there was a statistically significant, moderately strong correlation of .514, indicating that time working accounted for 25.8% of the variability in the number of correct screens ( $F_{\text{obt}} = 280.47$ ;  $df = 1, 104$ ;  $p < .0001$ ). The correlations between time working and percentage of screens completed correctly ( $r = .267$ ;  $df = 1, 104$ ;  $p < .01$ ), total number of screens completed ( $r = .375$ ;  $df = 1, 104$ ;  $p < .0001$ ), and the number of hits ( $r = .545$ ;  $df = 1, 104$ ;  $p < .0001$ ) were also statistically significant. The null hypothesis that the population correlation was zero, or that time working and performance measures were linearly independent, was tested by

comparing the obtained value of the  $F$  statistic with the critical value of  $F$  for 1 and  $N - 2$  degrees of freedom (Howell, 1997).

Correlations of the amount of time spent working and the percentage of defective beaks selected ( $r = .093$ ;  $df = 1, 104$ ;  $p > .05$ ), the number of errors ( $r = -.054$ ;  $df = 1, 104$ ;  $p > .05$ ), and the number of screens completed incorrectly ( $r = .026$ ;  $df = 1, 104$ ;  $p > .05$ ) were not statistically significant.

Correlations between the amount of time spent working and the percentage of game opportunities accepted ( $r = -.663$ ;  $df = 1, 104$ ;  $p < .0001$ ), time spent playing computer games ( $r = -.854$ ;  $df = 1, 104$ ;  $p < .0001$ ), number of breaks in computer activity ( $r = -.399$ ;  $df = 1, 104$ ;  $p < .0001$ ), and the length of breaks ( $r = -.586$ ;  $df = 1, 104$ ;  $p < .0001$ ) were statistically significant and negative. The amount of variability in time spent working accounted for by time playing games was 72.7% while that accounted for by length of breaks was 33.7%.

### Individual Variability

Figure 1 displays scatter plots of the individual data for each group, with the ordinate representing the number of hits and the abscissa, the number of total errors (misses and false alarms). Desired performance, a high number of hits and a low number of both types of error, would be indicated by data points falling in the upper left quadrant of the scatter plot. Both types of error represent failures of a quality inspection system. These scatter plots reveal considerable individual variability with outliers in each of the six groups. For example, in the 0% incentive condition, one participant in the four game condition made 430 hits and only 10 errors while another made 100 hits but 690 errors. Also in this incentive condition, one participant in the two game condition made only 40 hits and 10 errors. In the 10% incentive condition, one four-game opportunity participant made 225 hits and 15 errors, while another made



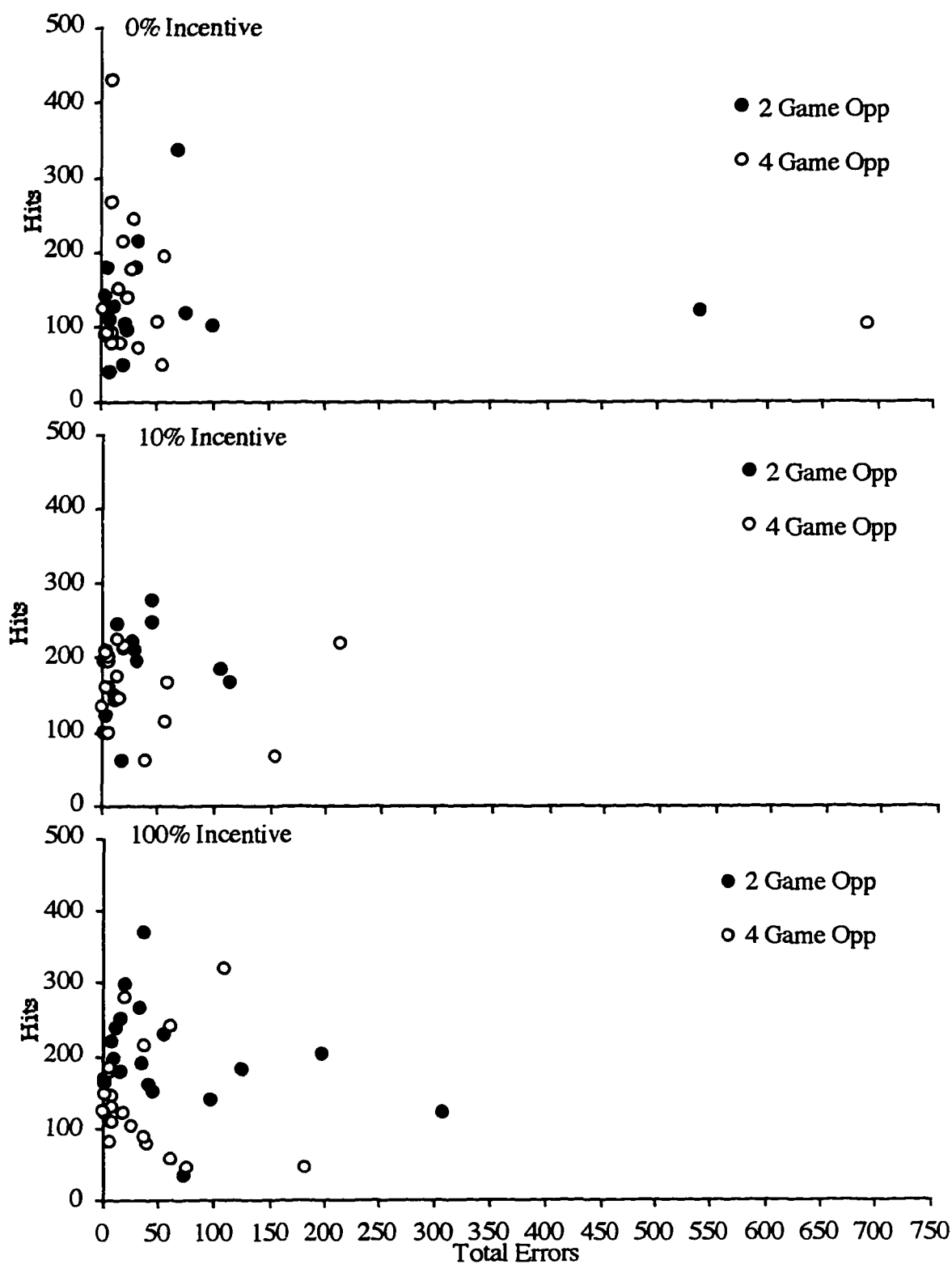


Figure 1. Scatter Plots of Hits by Total Errors for Three Incentive Pay Conditions.

220 hits and almost that many errors (215). In the 100% incentive condition, one two-game participant made 375 hits with only 40 errors but another made both 200 hits and 200 errors. No pattern of performance is evident in any of the groups and the performance of one group cannot be distinguished from that of another, although outliers do appear to occur more frequently and to be more extreme in the 0% incentive groups.

### Cost Effectiveness

Although the incentive pay system was designed such that participants in each of the three pay conditions had the opportunity to earn \$7 for the 70 minute work session, there were differences in the absolute amount of money earned between the six experimental groups. The means and standard deviations for the absolute amount of money earned are provided in tabular form in Appendix N, Table N1. Participants in the 0% incentive condition all received \$7; those in the 10% and 100% incentive conditions earned \$6.95 and \$5.91, respectively (SDs = 25¢ and \$3.07). Participants in the two and four game conditions earned \$6.23 and \$6.92, respectively (SDs = \$3.08 and \$3.75)

The means for the cost per correct screen are provided in Appendix N, Table N2. The cost per correct screen was highest in the 0% incentive condition at 31¢, and lowest in the 100% incentive condition at 10¢ (SDs = 60 and 36, respectively). In the 10% incentive conditions correct screens cost an average of 13¢ each (SD = 9). Cost per correct screen in the two and four game conditions was 12¢ and 17¢, respectively (SDs = 16 and 48).

## DISCUSSION

### Incentive Pay

This study examined the effect of high, low, and zero incentive pay percentages on productivity to determine whether the failure to find expected performance differences in previous laboratory simulation studies may have been due to the absence of competitive alternative activities or the presence of feedback. The task was a repetitive and effortful one and computer games were provided as alternative activities under two different schedules of availability. No performance feedback was available.

The primary measure of performance, number of screens completed correctly, combined both quantity and quality measures because screens on which any error occurred were subtracted from the total number of screens completed to determine overall performance. Correctly completed screens were those on which all defective beaks were selected (hits), no defective beaks were missed (misses), and no nondefective beaks were selected (false alarms). The pay conditions did not differentially affect the number of correctly completed screens, nor did they affect either the measure of quantity, total number of screens completed, or the measures of quality - hits, misses, and false alarms. The relative effects of high versus low percentages of incentive pay cannot be adequately assessed unless it can be shown that incentive pay affects performance. In the current study, that did not happen. Therefore, determination of the relative effects of the 10% and 100% incentive conditions was precluded.

A second purpose of this study was to examine whether performance differences under incentive pay conditions could be attributed to the time spent

working. Although the effects of incentive pay on performance were not significant, there were significant differences in time spent working as a function of incentive pay. Participants in the 0% incentive condition spent significantly less time working than those in either the 10% or 100% incentive conditions, while those in the 10% and 100% conditions spent a comparable time working. Although prior studies have not examined the time spent working, these data resemble the performance data from those studies - large, significant differences between base and incentive pay, but no incremental difference as a function of the percentage or amount of incentive. Thus, the data from this study extend those findings to the time spent working.

Although the differences in time working did not result in significant performance differences, the correlational analyses revealed a statistically significant relationship between the time spent working and the number of screens completed correctly. Approximately 25% of the variation in performance was accounted for by the time spent working. The remaining 75%, however, must be attributed to other variables, such as the possibility of differentially effective strategies for detecting and selecting defective figures. Although all participants demonstrated the ability to detect and select defective figures during the training session, examination of the number and type of errors indicated that participants developed a variety of approaches to the task.

Quality inspection tasks can be conceptualized as signal detection tasks and extensive between-subject variability has been reported in that literature. However, this variability has largely consisted of a dichotomy between those who do well at the task and those who do not. For example, Badalamente and Ayoub (1969), Holland (1958), and Mackworth (1948) all report that their participants could be divided into two somewhat distinct groups - high detection and low detection, a finding recently confirmed by Nolan (1996). Prior research has not explored the source of such differences although Nolan discusses the potential contribution of both skill and

motivation. He suggests that researchers evaluate the ability of potential participants to perform the task under experimental conditions, and then either exclude or train to criterion those whose performance is unacceptable.

### Opportunities to Play Computer Games

It was hypothesized that participants who received 0% incentive pay might both accept a larger percentage of opportunities to play computer games and play them longer than those who earned either 10% or 100% incentives. Moreover, the percentage of accepted opportunities and the length of time spent playing games might also have been a function of the incentive percentage. If that were the case, performance, as measured by the number of screens completed correctly, and time spent working, would have differed under 0% incentive pay, but would have been comparable under the 10% and 100% incentive conditions, across the two and four game opportunity conditions. The results did not support these hypotheses. The number of game opportunities did not affect the number of screens completed correctly. Although number of game opportunities did affect time spent working and playing the games, no interaction between the pay condition and the number of game opportunities was evident. That is, participants offered four opportunities played the games longer and spent less time working than those offered two opportunities irrespective of the pay condition.

### Computer Games as Competitive Alternative Activities

The pay systems did differentially affect the time spent working and the time spent playing the computer games: Participants who received incentives spent significantly more time working and less time playing games than those who received guaranteed pay. In this study, the time spent working was the inverse of the time spent

playing the games and the length of break in computer activity. The correlational analyses revealed that time spent playing the games accounted for 73% of the variability in time spent working while 34% of the variability was accounted for by the breaks in activity. Thus, time spent working was primarily a function of game playing which was affected by both the pay condition and the number of opportunities to play the games.

The games did appear to be competitive activities as participants whose pay was independent of their performance accepted over 90% of the opportunities to play and played for over 13 minutes, and those paid incentives accepted 65% of opportunities and played for 9 minutes. Moreover, when offered more opportunities to play games, participants did so regardless of the pay system. Thus, the attempt to more closely approximate the multiple sources of reinforcement present in real work settings appears to have been successful. This is of import because, although each of the laboratory studies of incentive pay percentages cited (Dickinson & Gillette, 1993; Frisch & Dickinson, 1990; Leary et al., 1990; Riedel et al., 1988) tried to simulate such competing activities, the nature of the activities may have rendered this "choice" to be no choice at all, what Mawhinney and Mawhinney (1982) call "Hobson's Choice." If available activities are not reinforcing to the participants, it is reasonable that low percentages of incentive pay would be as successful as high percentages in producing high rates of performance. In the absence of alternative sources of reinforcement, participants may have maximized their reinforcement by increasing their work rate even under conditions of low incentive pay percentages. Given that much research in organizational behavior management is, of necessity, conducted in simulated work settings, the demonstration that the opportunity to play computer games can function as a competitive reinforcement contingency with college student participants is a worthy contribution to the methodology of laboratory research.

## Conclusions

The study examined whether differences in performance would occur under varying percentages of incentive pay given competitive alternative activities, and further, whether any observed performance differences could be attributed to the time spent working. As discussed, the computer games did appear to be competitive sources of reinforcement for the participants. However, although prior studies have consistently reported that incentive pay improves work performance (e.g., Dickinson & Gillette, 1993; Frisch & Dickinson, 1990; LaMere et al., 1996; Leary et al., 1990; Riedel et al., 1988), such was not the case in the current study. Without confirmation that incentives affect performance, it was not possible to assess the relative effectiveness of higher percentages of incentive pay in improving performance. Thus, while performance was a function of time spent working and time spent working was a function of the pay system, the original objectives of the study, to determine the relative effects of the percentage of incentive pay on performance in situations with competitive alternative activities and the extent to which potential performance differences were due to time spent working, were not realized.

The absence of distinguishable between-group performance differences and the considerable within-group variability appear to be due to the experimental task. Signal detection tasks of the kind used in the present study have resulted in similar across-participant performance differences in previous research (e.g., Badalamente & Ayoub, 1960; Holland, 1958; Mackworth, 1948; Nolan, 1996). In the current study, all participants demonstrated the ability to perform the task under training conditions. However, training screens contained a higher percentage of defects than the experimental screens, perhaps making the contrast between good and bad beaks easier to detect. Some previous researchers have found signal detection to be a function of the

percentage of defects present (e.g., Baddeley & Colquhoun, 1969; Colquhoun, 1961; Fortune, 1979; Harris, 1968). Moreover, participants in the current study received immediate feedback during training but did not receive any feedback during the experimental session. This, too, may account for differences in performance between training and experimental sessions.

The data from the current study suggest that more effective training strategies should be employed to ensure that participants can skillfully perform the task under experimental conditions. As evident from the scatter plots, participants used very different strategies. Furthermore, some reported that they changed their strategy until they found the one that they thought to be most effective. Participants could be instructed in the use of effective strategies and allowed more time to practice with feedback. Once they had reached some criterion performance level, feedback could be eliminated and the varying pay conditions introduced. As recommended by Nolan (1996), those who were unable to achieve criterion could be eliminated from the study. Future studies could also employ a different type of task, one that was not so susceptible to the between-subject variability observed with the current task, and/or adopt single-subject research designs that eliminate experimental error due to within-group variability.

It may also be the case that performance feedback is necessary in order for incentive pay to be effective. All previous studies demonstrating the effectiveness of incentive pay in improving performance included feedback. Perhaps the effectiveness of incentive pay is mediated by information concerning ongoing performance. It is interesting to note that, although the differences between the performance of participants in both incentive groups combined and that of the participants in the base pay condition were not large enough to be statistically significant, there was a



performance improvement. Future studies could explore the degree to which feedback might increase the effectiveness of incentive pay.

**Appendix A**  
**Campus Recruitment Flyer**

# Research Participants Needed

For Study of Performance  
under Incentive Pay  
Students Earn about **\$10**  
for about 2 Hours

Contact Grainne 349-2314

Research Grainne 349-2314	Research Grainne 349-2314	Research Grainne 349-2314	Research Grainne 349-2314	Research Grainne 349-2314	Research Grainne 349-2314	Research Grainne 349-2314
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**Appendix B**  
**Class Recruitment Announcement**

### Recruitment Announcement

Hi! My name is Grainne Matthews. I am a graduate student in the Psychology department. I am looking for people to participate in a study about the effects of incentive pay on work performance. If you participate in the study, your task will be to examine computer screens of figures and select defective figures using the computer mouse. You would participate in one two- to three-hour session on either a Saturday or Sunday in either October or November that we would plan according to your schedule as much as possible. There would be a 30-minute introductory phase for which you would receive \$3.00. Then there would be an experimental phase during which you would work at a computer for 70 minutes. Finally you would complete a short questionnaire which will take approximately 10 more minutes. You would have the opportunity to take regular breaks to play computer games. Your pay would be based on your work performance. If you work at an average level during the work phase, you would receive approximately \$7 for 70 minutes. In total you would receive approximately \$10 for 2 hours of your time. You could make more depending on your performance.

To participate in the study you must be at least 18 years old, able to work with the computer keyboard and mouse, able to see the figures on the computer screen, be available at a scheduled session time, and most of all, you should enjoy playing computer games. I will determine your eligibility when we schedule your session. Participation is completely voluntary. If you do participate, you may leave the study at any time. Your decision to participate or not to participate will not affect your grade in this or any other class. Are there any questions? If you would like to participate or would like more information, please print your name, phone number, and the best time for me to try to contact you on the lists I am about to pass out. I will contact you in the next couple of days. Thank you for your time.

**Appendix C**  
**Participation Criteria Screening**

Name: \_\_\_\_\_ Date & Time: \_\_\_\_\_ Eligible/Ineligible

Phone: \_\_\_\_\_ Researcher: \_\_\_\_\_ Alternate

1. Participants need to be at least 18 years old to give consent to participate. Are you at least 18 years old? (Age? \_\_\_\_\_) Yes No
2. Participants need to be able to work with a computer mouse and keyboard to do the work task and play the computer games. Are you able to work with a mouse and keyboard? Yes No
3. Participants need to have regular or corrected vision to see the figures on the computer screen. Do you have regular or corrected vision? Yes No
4. Participants will be paid for their time and performance (average \$10). If you participate in this study, how do you plan to spend the money you earn? \_\_\_\_\_  
\_\_\_\_\_
5. While working, participants will be able to take breaks to play a variety of computer games.
  1. Do you like to play computer games? Yes No
  2. What are your favorite games? \_\_\_\_\_
  3. How often do you play? \_\_\_\_\_
  4. How long do you play each time? \_\_\_\_\_
6. Have you taken, or are you currently taking, Org Psy (Psy 344/444)? Yes No
7. Are you available for a 3-hour session on either a Saturday or a Sunday in November? Yes No
8. Do you know anybody else who may be participating in the study? Yes No  
(Name: \_\_\_\_\_ )

**Appendix D**  
**Informed Consent**



## Incentive Pay and Productivity

Grainne A. Matthews and Alyce M. Dickinson

Western Michigan University

Department of Psychology

My name is Grainne Matthews and I am a graduate student in the Department of Psychology. You are invited to participate in a research study on the effects of incentive pay on work performance.

### Participation Requirements

To participate in the study you must be at least 18 years old, able to work with the computer keyboard and mouse, have regular or corrected vision, be available at scheduled session times, enjoy playing computer games, have financial need, not have completed Psy 344 or 444 Organizational Psychology, and understand the incentive system. We will confirm today that you are eligible. If you are not eligible or decide not to participate, you will receive \$3.00 for this introductory phase. If you are eligible, you will be invited to continue in the experimental phase. You will receive the \$3.00 for this phase plus the money you earn during the experimental phase after the session is over.

### Work Task

The work task consists of a simulated quality control inspection task. You will examine computer screens that have figures on them, and identify the defective ones by selecting them using the computer mouse. You will have the opportunity to take regular breaks to play computer games.

### Nature and Duration of the Study

During this introductory phase, I will first ask you several questions to determine whether you are eligible to participate. If you are eligible, I will explain the incentive pay system and you will answer a brief quiz to ensure that you understand

how you will earn your pay. If you answer the questions on the quiz correctly, you will be introduced to the work task and the computer games. This introductory phase will last approximately 30 minutes. During the experimental phase, you will examine computer screens of figures for 70 minutes. As indicated earlier, you will have the opportunity to take breaks to play computer games during this work period. After the work period you will complete a brief questionnaire about the study, which will take approximately 5 minutes. Your pay will depend on your work performance but is estimated to be approximately \$7.00 for the 70-minute work period. Together, the introductory and experimental phases will take about 110 minutes, and you will receive about \$10.00 in total compensation.

#### Circumstances That May Lead to Termination

During the work period the computer program will handle everything so none of the researchers will be in the room. We will remain outside in case we are needed but the door will be closed. If you attempt to access any of the other programs on the computer, either while working or playing a game, the research program will quit. You will not be able to restart the program and return to work. Information on your performance will not be saved so we will not be able to pay you for your work. For this reason, do not attempt to access any other programs. If you do cause the research program to quit during the work period, you will be offered the opportunity to schedule another session. If you are unavailable for another session or if you cause the program to quit during your second session, you will be dismissed from the study. In that case, you will only be paid for the introductory phase.

#### Risks and Benefits

The study offers minimal risk to you as a participant. However, you may feel fatigue or mild stress during the work period. You will have the opportunity to take regular breaks to play computer games. You may withdraw from the study at any time

without prejudice or penalty. If you withdraw before the end of the work period, you will receive the amount of money earned up to that point, including your pay for attending this introductory phase. As in all research, there may be unforeseen risks to the participant. If an accidental injury occurs, appropriate emergency measures will be taken; however, no compensation or treatment will be made available to the subject except as otherwise stated in this consent form. The benefit to you as a participant in the study is the opportunity to earn money. The study may help to clarify how incentive systems improve work productivity. This information may help organizations design the most effective and acceptable incentive systems for their employees.

### Confidentiality

All information obtained in the study will remain completely confidential. A code number will identify all records relating to your participation. When the researcher presents the results publicly, it will not be possible to identify you. By signing this consent you give permission for the researcher to publicly present information obtained in the study.

The researcher will answer any questions you may have about the research after the study is completed. If you have any questions concerning the study, you may call Grainne Matthews (349-2314). In addition, you may contact Dr. Dickinson, the faculty advisor, at 387-8313. The participant may also contact the Chair, Human Subjects Institutional Review Board (387-8293) or the Vice President for Research (387-8298) if questions or problems arise during the course of the study.

Your signature below indicates that you understand the above information and agree to participate in the study.

---

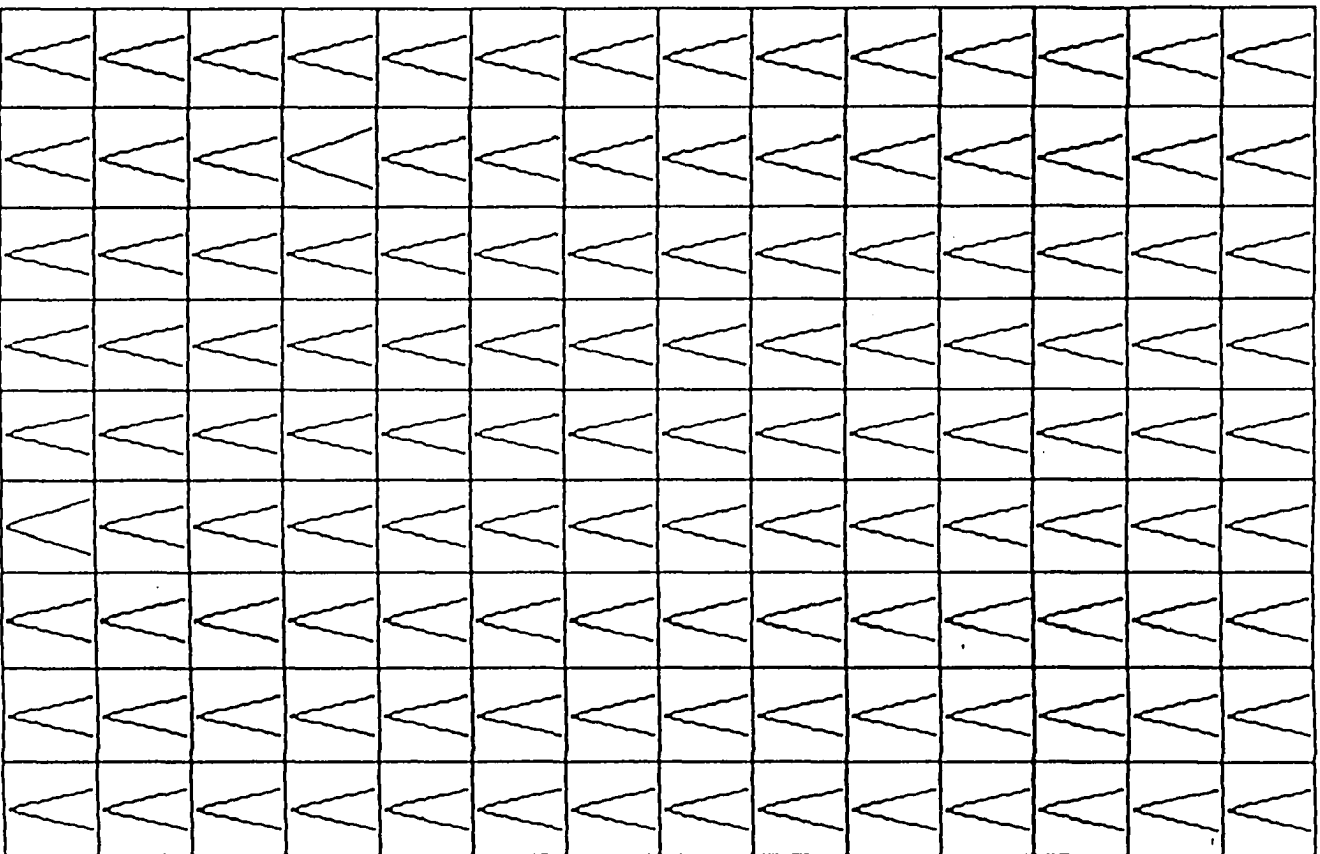
Participant Signature

---

Date

Please keep the colored copy of this form for your records.

**Appendix E**  
**Sample Work Task Screen**



Start

Done

Next Screen

**Appendix F**  
**Computer Game Survey**

### Computer Game Survey

My name is Grainne Matthews and I am a graduate student in the Psychology Department. I am trying to find out what computer games college students play and how much time they spend playing. I would like you to complete a brief anonymous survey about your use of computer games. This is totally voluntary and totally anonymous. Do not put your name or identification number on the survey. Your responses will not be shared with your instructor or affect your grade in this or any class in any way. Please complete the survey even if you never play any computer games. If you have any questions, please raise your hand. I will pass out the surveys and you may pass them to the end of the row when you are finished.

1A. Are you?      Male    Female      1B. How old are you?

2. Do you ever play computer games?    Yes    No

3. If you do, please list your favorite games. Please note if they are share/freeware (S/F) or commercial (C).

Type    Name of Game

S/F C 1. \_\_\_\_\_

S/F C 2. \_\_\_\_\_

S/F C 3. \_\_\_\_\_

S/F C 4. \_\_\_\_\_

S/F C 5. \_\_\_\_\_

4. How often do you play, on average?

1	2	3	4	5	6	7	8	9	times a day
1	2	3	4	5	6	7	days a week		
1	2	3	4	times a month					

Or write in a better response \_\_\_\_\_

5. How long do you play each time on average?

5-15 min \_\_\_\_ 15-30 min \_\_\_\_ 30-60 min \_\_\_\_ 1-2 hr \_\_\_\_ 2-4 hr \_\_\_\_

Or write in a better response \_\_\_\_\_

Thank you! Please pass your survey to the end of the row.

**Appendix G**  
**Computer Game Survey Results**



Computer Games Listed in Order of Popularity by Gender

Rank	Both Genders	Female	Male
1	Solitaire	Solitaire	Football
2	Mortal Kombat	Tetris	Mortal Kombat
3	Tetris	Mortal Kombat	Hockey
4	Football	Minesweeper	Solitaire
5	Hockey	Golf	Golf
6	Golf	Board Games	Race Cars
7	Race Cars	Hearts	Sim City
8	Minesweeper	Race Cars	Basketball
9	Sim City	Sonic	Baseball
10	Sonic		Minesweeper

1. 468 students surveyed; 35% male and 62% female.

2. 54% do not play computer games; 24% of those who do not play are male and 74% are female. 37% of the male and 64% of the female students do not play computer games. 43% of the male and 19% of the female students who do not play are over 20 years old.

3. 46% do play computer games; 47% of those who play are male and 49% are female. 63% of the male and 36% of the female students do play computer games. 39% of the male and 21% of the female students who do play are over 20 years old.

**Appendix H**  
**Work Task and Incentive Pay Instruction Script**

### Incentive Pay Instructions

#### 0% Incentive Group

“As you know, your task is to examine screens of figures and indicate which figures are defective. You will receive \$7 for the 70 minute work period. Please work as quickly and as accurately as you can. Do you have any questions about the way that you will earn your pay?”

#### 10% and 100% Incentive Groups

“The third form in your manila folder is the Incentive Quiz. As you know, your task is to examine screens of figures and indicate which figures are defective.”

#### 10% Incentive

“You will receive \$6.30 for the 70-minute work period. In addition, you will earn 1¢ for each screen you complete correctly. The total amount of money that you will receive at the end of the work period depends on the number of screens you complete correctly.”

#### 100% Incentive Quiz

“The amount of money that you will receive at the end of the 70-minute work period depends totally on the number of screens you complete correctly. You will earn 10¢ for each screen correctly completed.”

#### 10% and 100% Incentive groups

“A correctly completed screen is a screen on which you have selected all the defective figures and none of the nondefective figures. The computer program will subtract the number of screens on which you have made an error from the number of screens you have completed. Do you have any questions about the way that you will earn your pay? Please complete the quiz about the incentive system. Do not include the \$3 you earn for this Introductory Phase of the study in your calculations.”

**Appendix I**  
**Incentive System Quiz**

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_

### 100% Incentive

As you know from the Informed Consent form, your task is to examine screens of figures and indicate which figures are defective. The amount of money that you will receive at the end of the 70-minute work period depends totally on the number of screens you complete correctly. You will earn 10¢ for each screen of figures you complete correctly. A correctly completed screen is a screen on which all defective figures are selected and no nondefective figures are selected. The computer program will subtract the number of screens on which you have made an error from the number of screens you have completed.

Please answer the following questions based on the incentive system described above. You must score 100% on this questionnaire in order to be eligible for the study. You may retake the quiz one time.

1. Mary completes 100 screens correctly. How much would she earn?
2. Matt completes 150 screens but misses defective figures on 10 screens.

How much would he earn?

3. Manuel completes 75 screens but identifies nondefective figures as defective on 5 screens. How much would he earn?

4. Marisha doesn't complete any screens correctly during the work period.

How much would she earn?

Thank you! Please pass your form to the researcher as soon as you are done.

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_

### 10% Incentive

As you know from the Informed Consent form, your task is to examine screens of figures and indicate which figures are defective. You will receive \$6.30 for the 70-minute work period. In addition, you will earn 1¢ for each screen you complete correctly. The total amount of money that you will receive at the end of the 70-minute work period depends on the number of screens you complete correctly. A correctly completed screen is a screen on which all defective figures are selected and no nondefective figures are selected. The computer program will subtract the number of screens on which you have made an error from the number of screens you have completed.

Please answer the following questions based on the incentive system described above. You must score 100% on this questionnaire in order to be eligible for the study. You may retake the quiz one time.

1. Mary completes 100 screens correctly. How much would she earn?
2. Matt completes 150 screens but misses defective figures on 10 screens.

How much would he earn?

3. Manuel completes 75 screens but identifies nondefective figures as defective on 5 screens. How much would he earn?

4. Marisha doesn't complete any screens correctly during the work period.

How much would she earn?

Thank you! Please pass your form to the researcher as soon as you are done.

**Appendix J**  
**Means and Standard Deviations for Performance Variables**

Table J1

Means and Standard Deviations for Number of Screens Completed Correctly

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	58	39	59	23	50	29	56	31
2	44	28	71	26	68	30	61	30
Overall	51	35	65	25	59	31	59	32

Table J2

Means and Standard Deviations for Hits

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	154	95	162	55	142	77	152	77
2	131	71	195	78	194	72	175	78
Overall	143	84	179	69	168	78	164	80



Table J3

## Means and Standard Deviations for Misses

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	53	161	28	50	14	18	31	96
2	23	23	32	41	24	21	26	30
Overall	38	116	30	45	19	20	29	83

Table J4

## Means and Standard Deviations for False Alarms

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	10	15	13	33	23	44	25	33
2	38	122	4	8	34	69	16	78
Overall	24	85	8	23	29	58	21	67

**Table J5**  
**Means and Standard Deviations for Total Errors**

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	63	23	40	60	38	46	47	101
2	61	131	38	46	57	77	51	88
Overall	62	146	38	52	48	63	49	108

**Table J6**  
**Means and Standard Deviations for Percentage of Defective Beaks Selected**

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	86	19	87	14	92	5	89	14
2	87	10	89	12	89	10	88	10
Overall	86	15	88	12	91	8	88	13

Table J7

Means and Standard Deviations for Percentage of Screens Completed Correctly

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	72	23	77	20	76	18	75	20
2	73	22	81	14	77	21	77	19
Overall	73	22	79	17	77	19	76	20

Table J8

Means and Standard Deviations for Number of Incorrect Screens

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	25	49	17	20	13	12	18	31
2	18	18	21	22	20	16	19	19
Overall	22	37	19	21	17	14	19	28

Table J9

## Means and Standard Deviations for Total Screens Completed

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	83	71	76	31	63	37	74	49
2	62	35	92	43	87	31	81	38
Overall	73	57	85	38	76	35	78	47

**Appendix K**  
**Analysis of Variance for Performance Variables**

<u>F</u>										
Source	<u>df</u>	Correct Screens	Hits	Misses	False Alarms	Total Errors	% Defects	% Correct Screens	Incorrect Screens	Total Screens
Incentive (I)	2	1.90	2.00	0.64	1.13	0.54	1.20	0.97	0.33	0.69
Game (G)	1	0.88	1.91	0.16	0.69	0.05	0.01	0.18	0.02	0.54
I x G	2	2.64	2.25	0.80	0.78	0.17	0.30	0.06	0.74	2.65
Within-group error	100	(889)	(5747)	(5051)	(3678)	(9197)	(150)	(390)	(648)	(1864)

Note. Bonferroni F critical (5, 101, .05) = 3.77. Bonferroni F critical (5, 101, .01) = 4.67. Values enclosed in parentheses represent adjusted mean square errors.

**Appendix L**  
**Means and Standard Deviations for Time Variables**

Table L1

Means and Standard Deviations for Time Spent Working in Minutes and Seconds

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	49:23	4:59	58:03	8:08	58:34	8:15	55:24	8:19
2	55:35	9:12	63:06	5:40	64:55	4:10	61:33	7:31
Overall	52:24	7:53	60:43	7:17	61:49	7:09	58:32	8:42

Table L2

Means and Standard Deviations for Time Playing Games in Minutes and Seconds

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	16:49	5:28	9:42	7:29	8:02	7:47	11:25	7:53
2	9:06	2:33	5:21	4:23	3:38	3:44	5:49	2:16
Overall	13:05	5:46	7:22	6:21	5:46	6:22	8:34	6:53



Table L3

Means and Standard Deviations for Percentage of Game Opportunities Accepted

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	88%	27	56%	37	50%	37	65%	37
2	94%	25	64%	45	45%	46	68%	44
Overall	91%	26	60%	41	48%	41	65%	39

Table L4

Means and Standard Deviations for Length of Breaks in Computer Activity in Minutes and Seconds

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	3:47	4:29	2:15	2:57	3:24	2:59	3:11	3:23
2	5:19	8:30	1:11	2:17	1:57	1:58	2:49	5:15
Overall	4:32	6:41	1:54	2:38	2:24	2:36	2:54	5:04

Table L5  
Means and Standard Deviations for Number of Breaks in Computer Activity

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	6	5	4	3	7	5	6	5
2	9	7	5	6	5	4	6	6
Overall	7	6	5	5	6	5	6	6

**Appendix M**  
**Analysis of Variance for Time Variables**

F						
Source	df	Time Working	Time Playing	% Game Opportunities	Length of Breaks	Number of Breaks
Incentive (I)	2	18.35****	15.59****	12.52****	3.53	2.49
Game (G)	1	19.03****	25.73****	0.14	0.19	0.08
I x G	2	0.09	1.01	0.03	1.46	2.02
Within-group error	100	(171386)	(111563)	(1399)	(66782)	(27)

Note. Bonferroni  $\underline{F}$  critical (5, 101, .05) = 3.77. Bonferroni  $\underline{F}$  critical (5, 101, .01) = 4.67. Values enclosed in parentheses represent adjusted mean square errors.

\*p < .05. \*\*p < .01. \*\*\*p < .001. \*\*\*\*p < .0001.

**Appendix N**  
**Money Earned and Cost of Correct Screens**

Table N1  
Means and Standard Deviations for Money Earned

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	7	0	6.89	.23	4.99	2.93	6.23	3.08
2	7	0	7.01	.26	6.78	3.01	6.92	3.75
Overall	7	0	6.95	.25	5.91	3.07	6.58	3.46

Table N2  
Means and Standard Deviations for Cost Per Correct Screen

Game Opportunity	Incentive Pay Percentage							
	0%		10%		100%		Overall	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4	36	82	15	11	10	0	12	16
2	25	23	11	5	10	0	17	48
Overall	31	60	13	9	10	0	14	36

**Appendix O**  
**Human Subjects Institutional Review Board Approval**

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899  
616 387-8293

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WESTERN MICHIGAN UNIVERSITY

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Date: October 20, 1995

To: Grainne Aisling Matthews

From: Richard Wright, Chair

Re: HSIRB Project Number 95-10-05

*Richard A. Wright*

This letter will serve as confirmation that your research project entitled "Effects of alternative activities on productivity under two different percentages of incentive pay" has been approved under the **expedited** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you must seek specific approval for any changes in this design. You must also seek reapproval if the project extends beyond the termination date. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: October 20, 1996

xc: Alyce Dickenson, PSY



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