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Differential Effects of Individual and Group Pay Contingencies on Individual Performance

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DIFFERENTIAL EFFECTS OF INDIVIDUAL AND GROUP PAY CONTINGENCIES ON INDIVIDUAL PERFORMANCE

by

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Individual productivity of high performers was compared under an individual monetary incentive system and a 10-member group monetary incentive system. Subjects were 4 college students, each assigned to a simulated 10-person group. Subjects individually performed four computerized work tasks (SYNWORK) simultaneously, and the total number of points earned on the tasks was the main dependent varible. A within-subject reversal design was used, with hourly pay (A), individual (B) and group (C) monetary incentives implemented in an ABCB pattern. Subjects, when working under the group incentive pay condition, were told that the number of points they earned during each session would be automatically combined with the points earned by nine other individuals, and their pay would be based on the group's average. All subjects showed improved performance under the individual incentive pay condition, compared to hourly pay. Three of the four subjects performed at lower levels under the group incentive pay condition than under hourly pay. The fourth subject showed steady performance increases across time. Accuracy remained high across all conditions for all subjects. In a post-study questionnaire, subjects reported they preferred, and were most satisfied with, the individual incentive condition. They also chose to work under individual incentives in the future. Results suggest that high performers work harder under individual incentives, when their pay is directly related to their performance. Further, these performers prefer individual incentives over other pay systems, and find individual incentives more satisfying.

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Judith A. Honeywell-Johnson

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CHAPTER I

INTRODUCTION

In today's global society, businesses are finding it necessary to downsize, streamline, and improve productivity in order to compete in the world market. Frederick, Post and Davis (1992, p. xxi) state:

> The last decade of the twentieth century is witnessing an immense transformation of business systems everywhere-from tightly regulated markets to freer markets, from centralized authoritarian controls to more horizontal systems, from a monopoly on decision making by a few to more widespread participation by widening circles of employees. . .

This shift was documented by a recent survey conducted by the Hay Group consulting firm. Ninety-one percent of the 500 large and medium US companies surveyed had significantly altered their organizational culture. In addition, 73% acknowledged the need to realign their pay systems to reflect those changes, and 54% had already begun to do so (Flannery, Hofrichter, & Platten, 1996). Toward this end, companies are turning away from traditional hourly wage systems and adopting pay-for-performance plans, a change that began in the early 1980's according to O'Dell and McAdams (1987). These researchers examined the trend of "nontraditional reward systems" for the American Productivity Center, and reported that "More gainsharing, pay-for-knowledge, small group incentive, lump-sum bonus and two-tier plans have been adopted in the last five years than in all of the prior twenty years" (p. 9).

Although pay-for-performance plans vary widely in design, they all have one common element: Employees are given a bonus, incentive, or wage based on their performance, or the performance of their group, department, or organization. Moreover, they are designed to treat compensation as a production cost, making the

relationship between wages and profitability visible to organizational officials. Thus, officials can control and monitor the cost as they do other economic indices, which helps them improve the organization. "Just as companies seek to maximize the cost/benefit ratio in return on capital investment, they must also maximize the return on their investment in *human* capital" (Buyniski, 1995, p. 62). Because of this, corporate leaders increasingly view pay-for-performance plans as a necessary part of the organizational culture (Rock & Berger, 1991). These plans have even been proposed as solutions to the country's macroeconomic problems, with democrats promoting them as the "key to improving the nation's industrial competitiveness," and proposing tax breaks for companies that adopt them (Murray, 1987, p. D1).

While there are many forms of alternative pay systems (e.g., pay-for-knowledge, lump-sum bonuses, two-tiered wage systems), there are four basic plans that use a predetermined formula to tie compensation to objective operational or economic measures: individual incentives, group incentives, gainsharing, and profit sharing (Abernathy, 1989; McAdams & Hawk, 1992). Although some refer to other types of plans as "pay-for-performance" systems, without an announced formula and objective measures, pay cannot truly be contingent on worker performance (Abernathy, 1989; Mitchell, Lewin, & Lawler, 1990). Table 1 identifies the defining features of the four basic pay-for-performance plans and indicates the extent to which the incentives are linked to individual performance.

Individual incentives are based only on the performance of the employee; they do not rely on the performance of others. Furthermore, employees receive "a predetermined amount of money for every unit of work they produce" (Wilson, 1995, p. 115). In contrast, group incentives (sometimes referred to as "team incentives") rely on both the performance of the employee and that of others in the employee's

Table 1

Basic Pay-for-performance Plans

Type of Plan	Description	Incentive Linked to Individual Performance?
Individual Incentives	Incentives based on individual performance	Yes
Group Incentives	Incentives based on group performance	Yes, but the extent depends upon group size and the disbursement method.
Gainsharing	Incentives based on the performance of an organizational unit	No, but some exceptions exist depending upon the measure and size of the unit.
Profit Sharing	Incentives based on the profits of the organization	No

designated group. Rollins (1989) defines a group incentive plan as "a unit wide bonus system that is designed to reward all eligible members of a group for improved performance" (p. 40). Similarly, Heneman and Von Hippel (1995) describe group based reward systems as plans that "measure group performance and reward individuals on the basis of how well the group performs" (p. 63). The group may consist of only two members, or the employees of an entire department but irrespective of the number of group members, the amount of the reward is based on the performance of the entire group (Schuster & Zingheim, 1992). Although the amount of money available for disbursement is dependent on the group's performance, the incentives can be calculated and divided equally among group members or differentially

awarded based on member contribution. The extent to which rewards are linked to individual performance depends upon the size of the group as well as the disbursement method. Gainsharing plans typically reward individuals based on departmental, divisional, or organizational economic goals. In gainsharing, the performance of any one employee often has little influence over the critical measure, and therefore is less related to the reward received. Unlike incentives that are paid to employees in frequent salary checks, gainsharing bonuses are typically distributed monthly or quarterly (Buyniski, 1995). Profit sharing rewards are based on the success of the entire organization, and are usually calculated annually. As with gainsharing, an individual's performance has little effect on the critical measure, if any, and, as a result, there is little relation between the employee's performance and the amount of the bonus. Profit sharing awards, as well as some gainsharing awards, are often placed in the employee's retirement or 401K account, and thus the employee does not receive the money for years.

As noted by Dickinson and Gillette (1993) and Mitchell et al. (1990), it is difficult to determine the relative prevalence of pay-for-performance systems because surveyors have adopted different definitions and inclusion criteria for pay plans. For example, Lawler, Ledford, and Mohrman (1989) included sales commissions and executive bonus plans as individual incentive systems but Peck (1990) excluded them. Similarly, McAdams and Hawk (1992) excluded any plan (such as profit sharing and gainsharing) that deferred rewards to a savings or pension plan. Nonetheless, in terms of the four basic types of plans, most have concluded that profit sharing is the most common, followed closely by individual incentives, then group incentives and, finally, gainsharing (Gowen, 1991; Mitchell et al., 1990; O'Dell & McAdams, 1987). When discrepancies have arisen, they have been due to the reversal of the prominence of profit sharing and individual incentives (Lawler et al., 1989; Peck, 1990). In addition,

Peck (1990) found gainsharing and group incentive plans to be similarly prevalent (13% and 12%, respectively). Peck's 1990 research bulletin findings distributed by The Conference Board were replicated in a 1994 Hay Group survey. This later survey, however, found greater interest in group incentives with 39% of the respondents reporting that they were considering some form of team based pay (Gross, 1995).

Although they are not widely used, group incentive systems are currently found in a variety of industries where the work requires group rather than individual effort. Peterson (1992), for example, identified six manufacturing industries in which at least 50% of incented employees were covered by group plans: meat packing, corrugated and solid fiber boxes, clay sewer pipes, wood household furniture, candy and other confectionery, and brick and structural clay. Because group pay systems are consistent with the work team philosophy that has become prevalent in US companies, Flannery et al. (1996) predict that their number will increase greatly in upcoming years.

In evaluations, conducted primarily through surveys, group incentive plans based on operational measures have fared well. Evaluations have examined the type of plan (e.g., profit sharing, gain sharing, group incentives, and individual incentives) as well as whether payouts are based on operational or financial measures, or a combination of the two. Operational measures include indices of productivity, quality, safety, attendance, and cost reduction. In contrast, financial payouts are based on profit and loss measures such as profits, earnings, and/or return on investment calculations (McAdams & Hawk, 1992). If group plans use financial measures, they are typically referred to as "profit-sharing" or "gain-sharing;" if they use operational measures, they are usually categorized as "group incentive systems." However, the correspondence is not perfect. For example, some gainsharing plans distribute awards based on the profitability of the department, but profitability is directly linked to group operational measures. Moreover, in some cases, the worker's share is determined by

the extent to which his/her performance contributes to the group output. These hybrid plans may be classified as either financial or operational plans. With respect to comparative evaluations of effectiveness and acceptance by employees, in 1989, Rollins indicated "There is increasing evidence from a variety of independent sources that suggest . . . one nontraditional reward system is more effective and better accepted than any other: the productivity-based group incentive plan" (p. 40). In one survey, 75% of the 185 companies who used small group incentives reported positive effects (O'Dell & McAdams, 1987). In another, 81% reported favorable reactions by employees and, while broad-based plans such as gainsharing and profit sharing scored slightly higher in terms of favorable employee reaction, no other reported incentive plan scored higher in the category of improved results (McCoy, 1992). In that survey, 67% of the organizations reported bottom-line improvements.

Several factors may account for the relative success of operational-based group incentive systems. To influence employee behavior, there must be an obvious link between the worker's pay and performance (Conrad, 1994; Dickinson & Gillette, 1993; Jensen & Murphy, 1990; McNally, 1988). Conrad (1994), for example, asserted that in order to benefit from a pay system "organizations must design systems that indeed do link rewards to performance" (p. 157). The tighter the link, the greater the influence on employee performance (Conrad, 1994; Lawler, 1990; McAdams & Hawk, 1992). Most financial plans base payouts on corporate or divisional economic indices. Operational indices not only provide a more direct measure of worker performance, but also measure at lower levels in the organization (e.g., the department or team level). Both features increase a plan's "line of sight," which refers to the extent to which an employee feels that he/she can actually influence results, and hence pay (Lawler, 1990; McAdams & Hawk, 1992). Similarly, Perry (1988) maintains that plans such as profit

sharing are not effective motivators because "most employees have little influence on profits" (p. 52).

The size of the payout group also affects the link between worker performance and pay. In small groups, workers can substantially influence the group's performance. However, "as the group size increases, the capacity of an individual worker to control his or her wages under group incentive conditions decreases" (Honeywell, Dickinson, & Poling, 1997, p. 262). Blinder (1990) refers to this as the "1/nth problem," in which "n" represents the number of employees in the group. As "n" increases, worker performance is likely to decrease. Because operational group incentive plans typically cover significantly fewer employees than profit sharing or gainsharing, they are likely to be more successful. Finally, as indicated earlier, group incentives are typically distributed much more frequently than profit sharing or gainsharing bonuses, which is another factor that correlates with the effectiveness of pay-for-performance systems (Lawler, 1990; McAdams & Hawk, 1992).

Table 2 summarizes experimental (as opposed to survey) studies of productivity-based group incentive systems. The studies span from 1952 to 1997, and were published in a variety of journals by researchers from different disciplines. The following sections discuss the major findings of these studies with respect to: (1) the effects of individual versus group incentives and group size on performance and satisfaction, (2) the effects of individual versus group incentives on social interactions, (3) the effects of group incentive distribution methods on performance and satisfaction, and (4) task structure.

Table 2

Summary of Productivity-based Group Incentive Studies

Authors	Subjects	Dependent Variables	Independent Variables	Results
Allison, Silverstein, & Galante, 1992	Teaching assistants of handicapped children (N=12)	1. Behaviors completed 2. Social acceptability	Hourly pay with feedback and feedback with individual, group cooperative, and group competitive incentives	1. Performance higher under incentives, and highest under cooperative incentives 2. Acceptability higher with cooperative incentives
Campbell, 1952	Employees in two factories	1. Productivity 2. Ability to calculate incentives 3. Satisfaction	Group incentives with groups of under 20 to over 100	1. Performance & ability to calculate incentives decreased as group size increased 2. For those who could calculate incentives, satisfaction was not affected; for those who couldn't, satisfaction decreased as size increased

Table 2-Continued

Authors	Subjects	Dependent Variables	Independent Variables	Results
Farr, 1976	College students (48 groups of 3)	1. Cards sorted 2. Pay fairness 2. Satisfaction	Hourly pay, individual incentives, and group incentives that were equally or differentially divided	1. Performance higher with incentives, and highest with group differential pay 2. Group differential pay rated least fair 3. No differences in satisfaction with task or pay
Honeywell, Dickinson, & Poling, 1997	College students (2 groups of 10)	1. Cards sorted 2. Satisfaction	Individual and group incentives	1. No difference in performance 2. No difference in satisfaction
London & Oldham, 1977	College students (35 groups of 2)	Cards sorted	Individual and group incentives based on high, low, or average performance	Performance highest under individual & high performer group incentives

Table 2-Continued

Authors	Subjects	Dependent Variables	Independent Variables	Results
Marriott, 1949	Production workers in two companies	Productivity	Group incentives, with groups of under 10 to over 50	Performance decreased as group size increased
Miroff, Naylor, Lubeach, Greenberg, Gillen, Sitarsky, & Duncan, 1993	College students (4 groups of 5)	Widgets produced	1. Hourly pay & group incentives 2. Additive or discretionary tasks	1. Performance higher under incentives 2. Performance comparable for types of tasks
Roberts & Leary, 1990	College students (5 groups of 2, 4, or 9)	1. Widgets produced 2. Attendance	Individual & group incentives	No difference in performance or attendance
Smoot, 1997	College students (6 groups of 3)	1. Widgets produced 2. Cost per widget	Hourly pay, group & individual incentives (linear, positively & negatively accelerating)	1. Performance higher under incentives 2. Performance comparable for group and individual incentives

Table 2-Continued

Authors	Subjects	Dependent Variables	Independent Variables	Results
Stoneman & Dickinson, 1989	College students (8 groups of 2, 4, 5, or 9)	Parts produced	Individual & group incentives	No performance differences
Weinstein & Holzbach, 1973	College students (21 groups of 3)	Correctly coded surveys	1. Group incentives that were equally or differentially divided 2. Additive or conjunctive tasks	Performance highest with the differentially divided pay and additive task
Zywiczynski, Thurkow, Vunovich, & Shimamune, 1992	College students (2 groups of 4)	% of positive and negative social interactions	Individual & group incentives	1. Positive interactions slightly greater with group incentives 2. No change in negative interactions

Individual Versus Group Incentives and Group Size: Performance and Satisfaction

As indicated earlier, compensation experts maintain that pay and performance must be linked in order for pay to affect performance (Conrad, 1994; Dickinson & Gillette, 1993; Jensen & Murphy, 1990; Lawler, 1990; McAdams & Hawk, 1992; McNally, 1988). Moreover, the stronger the link, the higher the performance. Individual incentives provide the strongest connection between performance and pay, because incentives are based solely on the performance of the individual. With group incentives, the worker's pay depends upon the group's productivity, and hence workers have less control over their earnings. Furthermore, that control decreases as the group size increases. As a result, performance may suffer accordingly.

Dierks and McNally (1987) argue that group rewards decrease the performance of top performers because they see their earnings reduced by less productive group members. Poor performers, on the other hand, continue to perform below average because they benefit from the labor of others. Dickinson and Gillette (1993) contend that the poor performer "free rider effect" becomes more pronounced as the size of the group increases. With larger groups, workers perceive that their rewards will not be significantly reduced by their own low productivity.

As discussed earlier, Blinder (1990) also states that incented performance is a function of the number of group members: Given the formula 1/n, with n equaling the number of group members, as "n" increases, performance decreases. Similarly, Lawler (1990) notes that as the group size increases, workers no longer feel that they can influence the productivity of the group and, as a result, do not perform as well. Mullen, Johnson, and Drake (1987) appeal to the "other-total ratio" to explain why workers in small groups outperform those in larger ones. The other-total ratio is an algorithm derived from self-attention theory, and mathematically defined as "the

number of people in the other subgroup divided by the sum of both the number of people in the other subgroup and the number of people in one's own self subgroup" (p. 144). The theory predicts that individuals will work harder when their other-total ratios are higher, that is, when they are part of a small subgroup of the organization. For example, if an employee works in an office of 20 employees and is on a project team with two other employees, his other-total ratio is .85 [17/(17+3)]. If the worker is part of an eight-member team, his other-total ratio is .60 [12/(12+8)]. Because the worker has greater "self-attention" in the small group, he would perform better.

Although the preceding analyses predict that performance will be higher under individual incentives than group incentives, and decrease as the size of the group increases, the effectiveness of group incentives may depend upon the size of the group. In small groups, workers can influence the group's productivity substantially, markedly raising or lowering their own earnings. Thus, small group incentives may be as effective as individual incentives.

Productivity is not the only concern when analyzing the effects of incentive systems. Employee acceptance is critical to the success of any pay system as well. Moreover, Mawhinney (1984) has insightfully argued that organizational interveners have an ethical responsibility to evaluate employee satisfaction: "We propose to jointly improve productivity and quality of work life (job satisfaction). But we rarely measure satisfaction" (p. 27). "Unless the contingencies designed to improve productivity are patently positive (joy producing), some technology for estimating the condition it produces in people must be employed" (Mawhinney, 1984, p. 7). Employee reaction to incentive systems has been assessed primarily through surveys, and these data, as they relate to group incentive systems, were presented earlier. The current section reviews reaction data from four studies that examined individual and group incentives, or group size (Allison, Silverstein, & Galante, 1992; Campbell, 1952; Farr, 1976;

Honeywell et al., 1997). As noted by Mawhinney (1984), few researchers have included such measures in their studies.

Performance

Seven studies have compared the effects of individual and group incentives on performance, with groups ranging in size from two to twelve members (Allison et al., 1992; Farr, 1976; Honeywell et al., 1997; London & Oldham, 1977; Roberts & Leary, 1990; Smoot, 1997; Stoneman & Dickinson, 1989). Farr (1976) examined the effectiveness of four types of pay on the performance of three-person groups: hourly pay, individual incentives, equally-distributed group incentives, and differentially-distributed group incentives. In the equal-distribution condition the incentives earned by the group were equally divided. In the differential-distribution condition, the highest performer received 50% of the available incentives, the middle performer 33%, and the lowest performer 17%. A between-group experimental design was used. Subjects sorted computer data cards that were punched with various combinations of holes. Both individual and group incentives resulted in significantly higher productivity than hourly pay. Individual and equally-distributed group incentives resulted in similar productivity, while differentially-distributed group incentives resulted in the highest productivity.

In a 1977 study, London and Oldham compared hourly pay, individual incentive pay and three types of group incentive pay using two-person groups. In the group incentive conditions, incentives were based on the average performance of the two performers, the performance of the high performer, or the performance of the low performer. In the latter two conditions, both group members received the amount of incentives earned by the high or low performer, respectively. The experimental design was a between group design, and the task consisted of sorting computer cards into piles

based on the 12-hole pattern punched in each card. Productivity was comparable for the individual and high-performer group incentive conditions, and significantly greater for these two conditions than for the other pay conditions.

Smoot (1997) examined individual and group incentives with six three-member groups. Subjects were college students who assembled pop bead widgets when exposed to the following pay conditions: flat rate, individual incentive, and group incentive. Three types of incentive pay scales were examined: linear, positively accelerating and negatively accelerating. In the linear condition, subjects earned the same amount of money for each widget, regardless of the number assembled. In the positively accelerating condition, the amount of the per piece incentive increased as production increased and, conversely, in the negatively accelerating condition, the amount decreased as production increased. Subjects were exposed to one type of pay scale under both individual and group pay conditions in a within-subject multiple-baseline design. Individual and group incentives increased productivity above that found with flat rate pay, and resulted in comparable performance levels.

Reasoning that group incentives may be less effective in larger groups, Stoneman and Dickinson (1989) compared the effect of individual and group incentives with groups of two, four, five, and nine using an ABA experimental design. In this design each subject was exposed to individual incentives and group incentives in a group of a particular size (A = individual incentives and B = group incentives with N members). Subjects assembled parts made from bolts, nuts and washers. Individual performance was comparable under the two pay systems. Furthermore, overall group productivity was similar for all groups, regardless of size.

Roberts and Leary (1990) replicated Stoneman and Dickinson (1989), comparing hourly pay with individual and group incentives for groups of two, four, and nine members. The design was a single-subject withdrawal design. In two related

experiments, 46 college students assembled widgets made from pop beads during 15-minute work sessions. Subjects assembled more widgets when they received incentives than when they were paid hourly, but assembled a comparable number when they received individual and group incentives, again regardless of group size.

Allison et al. (1992) compared the performance of a group of 12 employees under four conditions: individual feedback with hourly pay, and individual feedback with individual, cooperative group or competitive group incentives. In the individual incentive condition, each subject received an incentive equal to p($20.00) where p equaled the percentage of target behaviors performed by that subject. In the cooperative group incentive system, the worker's incentive was determined by multiplying $20.00 by the average percentage of target behaviors completed by the group. In the competitive group condition, the total amount of available incentives ($200.00) was divided equally among the top three performers. Performance was better when staff received incentives, regardless of the type. The cooperative incentives produced the highest performance, but the differences between conditions were small. While a statistically significant difference was found between the cooperative and individual incentive condition, differences between the cooperative and competitive and between the competitive and individual conditions were not statistically significant.

Honeywell et al. (1997) examined the effects of individual and group incentives with two groups of ten, noting that the most common sized incentive group in work settings is ten (Peck, 1990). College students sorted pre-punched cards onto boards with corresponding wooden dowels. An alternating treatments design was used in which group and individual incentive pay were alternated during each successive 20-minute session for 14 sessions. Performance did not differ under group and individual incentives.

The results of the preceding studies have been consistent: All have found small group incentives to be at least as effective as individual incentives with groups of two to twelve. While London and Oldham (1977) reported that rewards based on average performance and divided equally were not as effective as individual incentives, this finding appears to be an anomaly.

No well-controlled studies have examined larger groups, although two field studies have been reported. In these studies, each worker received an incentive that was based on the group's productivity, with the amount pro-rated based on the worker's hourly pay and hours worked (Campbell, 1952; Marriott, 1949). In Marriott (1949) the groups ranged in size from under ten to over fifty, and in Campbell (1952), from under twenty to over one-hundred. In both, group productivity decreased as the size of the group increased.

Without further investigation, it is not possible to delineate the variables responsible for the discrepancies between the studies reviewed earlier and the two field studies, but they may include group size, length of exposure to the pay systems, the amount of the incentives, and/or differing types of social interactions. Nonetheless, the current research suggests that group incentives will sustain the performance of individuals when they are members of small groups, specifically, groups that range in size from two to twelve members.

Satisfaction

Farr (1976) compared the effects of hourly pay, individual incentives and two types of group incentives (equally or differentially divided) on pay fairness and satisfaction with three-person groups. Pay fairness and satisfaction with one's own performance were assessed using 7-point Likert scales. A modified Job Description Index (Smith, Kendall, & Hulin, 1969) was used to measure satisfaction with the task,

pay, the experimenter and other subjects. Subjects in the differential reward group were more satisfied with their fellow subjects than those in the other pay conditions, however, all other measures of satisfaction were comparable for subjects exposed to individual and group incentives. Individual and equally-distributed group incentives were perceived to be equally fair, while differentially-distributed group incentives were reported to be unfair. Thus, even though subjects in the differential reward group were more satisfied with their fellow subjects, they also found the pay system to be less fair than subjects in any other pay condition. To summarize, ratings of satisfaction and fairness were equivalent for individual and equally-distributed group incentives, while differentially-distributed group incentives were found to be less fair than either.

Honeywell et al. (1997) probed the extent to which members of two ten-person groups found individual and equally-divided group incentives satisfying and demanding, using 5-point Likert rating scales. All subjects, regardless of how well they performed, rated the two incentive systems similarly on both factors. However, when asked which pay system they would choose to work under, high performers chose individual incentives while low performers chose group incentives. These data may reflect the fact that high performers earned more money when paid individual incentives while the reverse was true for low performers.

Allison et al. (1992) assessed reactions to individual incentives, group cooperative incentives and group competitive incentives using verbal ratings and behavioral choice. The 12 workers rated their satisfaction with the three types of pay on a 7-point Likert scale. In addition, after exposure to all incentive conditions, they were asked to choose the incentive system for the following week. Staff voted privately, and were told that a simple majority would be used to determine which pay condition would be implemented. Ratings of satisfaction were moderately high and comparable for all types of incentives, however, all of the staff selected the group

cooperative incentives for the final week of the study. Thus, while moderately satisfied with all types of pay, these workers preferred the equally-divided group cooperative incentives when forced to choose among them.

Campbell (1952) analyzed the effects of incentives on employee satisfaction with in-tact work groups, ranging in size from under 20 to over 100. He also assessed whether workers could calculate the amount of their incentives, to determine if "knowledge of results" would affect their attitudes. The satisfaction of employees who could not calculate their earnings decreased as group size increased, while the satisfaction of those who could calculate their wages was not affected by group size. While the data are correlational, they suggest that such self-generated feedback, or what Lawler (1990) refers to as a clear "line of sight," may influence worker satisfaction with large group incentives. Bettenhausen (1991), reviewing non-incented group performance, reported that "A meta-analysis of eight US studies revealed that as work groups got larger, members were more likely to be dissatisfied..." (p. 354). Thus, group incentives, or the feedback associated with them, may mitigate decreases in satisfaction in larger groups.

The results of the preceding studies suggest that worker satisfaction with individual and equally-divided group incentives is, in general, comparable. Honeywell et al. (1997) did find that while high performers rated the two types of incentives similarly, when asked which they preferred to work under, all chose individual incentives. These data may be of import to managers who desire a workplace where productivity and satisfaction are positively correlated. On the other hand, Allison et al.'s (1992) staff members also rated individual and group incentive systems similarly, but selected equally-divided group incentives as their subsequent pay method. The discrepancy between Honeywell et al. and Allison et al. may be due to differences in the amount earned by subjects when paid individual and group incentives. Honeywell

et al.'s top performers earned more in the individual incentive condition. Allison et al. did not provide individual data or earnings, thus it is not possible to determine whether there were notable high and low performers. If all staff members performed comparably, then their earnings would have been similar in the individual and cooperative group incentive conditions, eliminating the amount earned as a reason to prefer one over the other.

Finally, it should be noted that subjects in Farr's study (1976) found differentially-divided incentives to be less fair than either individual or equally-divided group incentives. This finding will be discussed further in the "Incentive Distribution Method" section.

Individual and Group Incentives: Social Interactions

Although group interaction has been studied extensively (see Bettenhausen, 1991), the effects of group incentives on such interactions have not. With non-incented groups, interaction among group members has been found to affect performance. For example, Walsh, Henderson, and Deighton (1988) found that the amount of interaction among group members was positively related to the group's performance. Others have reported that group members who interacted more were more likely to complete their tasks (Hiltz, Johnson, & Turoff, 1986) and have a more accurate perception of their productivity within the group (Ambrose & Kulik, 1988; Schnake & Drumler, 1987). Because group incentives are based on the group's productivity, members have a vested interest in how well others perform, and hence may initiate attempts to influence their performance. Group members may, for example, remind others that increases in productivity will raise pay, suggest how others can improve their performance, and praise and criticize the work of others. In turn, these interactions may influence productivity. Both the extent and nature of interactions evoked by group incentives are

of interest, as positive ones can create a pleasant working environment, while negative ones can create a stressful one.

Zywiczynski, Thurkow, Vunovich, and Shimamune (1992) compared the effects of individual and group incentives on the social interactions of college students. Two groups of four subjects worked on crossword puzzles, sharing a dictionary. Group incentives increased the number of positive interactions, but did not change the number of negative ones. In contrast, Honeywell (personal communication, 1996) videotaped the interactions of two 10-member groups under individual and group incentive conditions and found no difference. The discrepancy may be due to the type of tasks used in the two studies. Zywiczynski et al.'s task required subjects to interact when sharing the dictionary, while subjects in Honeywell et al. could complete their card sorting task independently and without interaction. Results from Littlepage (1991) lend credence to this explanation. Littlepage examined the number of comments made by members of two-, five- and ten-person groups when performing an independent task and a shared task. Subjects made considerably more comments when working on the shared task. Clearly, more research is warranted.

Incentive Distribution Method: Performance and Satisfaction

Group incentives can be equally distributed to members or differentially divided based on a formula that considers the performance of the group and the individual's contribution to it. When group incentives are differentially distributed, the link between a worker's performance and pay is strengthened, and thus higher performance may occur. On the other hand, differential distribution methods may create intra-group competition and perceptions of unfairness if one member benefits from the poorer performance of another and/or if the amount of the incentive does not accurately or reasonably reflect member contributions. For example, consider the situation where the

top performer is awarded a large percentage of the available incentives. His performance may differ only slightly from that of the other members, yet his incentive is considerably higher. Moreover, another member of the group would benefit economically if the top performer did not perform as well. While competition might increase productivity, it may also have deleterious effects, as members may attempt to hinder the performance of others.

Performance

Four studies have investigated ways of dividing incentives among group members (Allison et al., 1992; Farr, 1976; London & Oldham, 1977; Weinstein & Holzbach, 1973). Weinstein and Holzbach (1973) equally or differentially distributed rewards to members of 21 three-person groups. Subjects coded questionnaire responses onto standardized answer forms, and the group earned $.06 for every correctly coded questionnaire. In the equal reward condition, each member received one-third of the group's earnings, while in the differential reward condition, the highest performer received one-half, the second highest performer received one-third, and the lowest performer received one-sixth. Group performance was significantly greater with differential rewards than with equal rewards.

Farr (1976) extended Weinstein and Holzbach's study by examining the same group incentive distribution methods and comparing them with hourly pay and individual incentives. As indicated in a preceding section, individual and equally-divided rewards resulted in similar performance, while, consistent with Weinstein and Holzbach (1973), differentially-divided rewards resulted in the highest performance.

London and Oldham (1977) distributed rewards equally to both members of a two-person group, but based the amount of the incentives on their average performance, the performance of the high performer or the performance of the low

performer. The high performer group incentives resulted in greater productivity than the other types of group incentives, and were as effective as individual incentives.

Allison et al. (1992) analyzed the effects of three incentive distribution systems on group member performance: individual, cooperative group incentives and competitive group incentives. In the cooperative group condition, a condition analogous to equally-divided rewards, each of the 12 employees received the same incentive, which was based on the performance of the total group. In the competitive group incentive condition, only the three best performers received an incentive, but the amount of the incentive was considerably higher than that in the other pay conditions. Cooperative and competitive group rewards resulted in comparable performance.

In summary, differentially-divided rewards have been found to be more effective or as effective as equally-divided rewards. These results are not surprising because differentially-distributed rewards strengthen the association between an individual's performance and pay. On the other hand, a word of caution seems appropriate. The types of differential reward systems that have been examined to date have competitive features, and thus may have detrimental long-term effects. Over time, group members may come to hinder the performance of others in order to claim the top spot and, hence, the much greater reward. Moreover, if one group member consistently outperforms the others, the other group members may decrease their performance. These and other potential problems of competitive reward programs have been well addressed by Daniels (1989, 1994).

Abernathy (1996) has developed a unique differential incentive program that does not have competitive features. In this program, the total amount of money available for disbursement is based on group profitability measures. A specific portion of those monies is reserved for individual workers depending upon their current salary. The incentive received by the individual is then based on his/her personal "scorecard."

This program has several notable features. First, employee incentives are linked to organizational economic measures. Second, the amount of money available for incentives is dependent upon the group's performance, promoting cooperation. Third, because a proportion of the proceeds is reserved for each individual, workers are not vying against one another: A worker does not profit from another's misfortune. Finally, an individual's pay is linked to his/her performance by the personal scorecard. This type of differential reward program has yet to be experimentally investigated.

London and Oldham (1977) found that equally-divided rewards based on the performance of the high performer were more effective than those based on the average performance of the group. These results are conceptually more difficult to explain than is the effectiveness of differential reward systems. London and Oldham (p. 40) appealed to equity theory for an explanation, noting that low performers whose pay was based on high performers improved their performance over time: "Over trials, the subject may have come to expect the other participant to be the higher performer and hence felt obligated to contribute at a higher level. In accord with equity theory, performance may have been increased to resolve overpayment."

Satisfaction

As reported earlier, Farr's (1976) subjects found differentially-divided rewards to be less fair than either individual or equally-divided incentives. Similarly, when Allison et al.'s (1992) staff were allowed to choose cooperative or competitive group rewards, they unanimously selected the cooperative group rewards. These findings clearly indicate a preference for equally-distributed, rather than differentially-distributed, group rewards. Thus, a pay system that offers equal pay for different performance is more appealing than one that offers substantially different pay for potentially small differences in performance. The competitive nature of differentially-

distributed rewards may account for this preference, as Weinstein and Holzbach's (1973) subjects perceived that differentially-divided group rewards led to significantly greater competition than did equally-divided rewards.

Thus, although differentially-divided rewards resulted in high performance, subjects did not prefer them, indicating that they promoted competition and were unfair. On the other hand, equally-distributed incentives have been found to be as effective as individual incentives for small groups, and were perceived as fair. Given these data, managers who wish to use group incentives would be wise to favor equally-distributed group rewards, or group incentive programs that do not contain competitive contingencies, like the one offered by Abernathy (1996).

Task Structure

Steiner (1972) developed a taxonomy that classifies group tasks into four categories: disjunctive, conjunctive, additive and discretionary. With a disjunctive task, the group output is considered to be the best individual performance from the group, but individual efforts are not identified or rewarded. The group may assign the task to one member, or all may complete the same task with the group selecting the performance that constitutes its output. Conjunctive tasks differ in that all group members provide a unique contribution to the group's output, and thus the group can only perform as well as the lowest performer. The additive task also requires each member to participate, but each individual's performance is added together to produce an aggregate group output. One member's performance is not dependent upon another's. With a discretionary task, the group is permitted to determine what individual members will do and how individual contributions will be combined to form the group's output (i.e., assign the total task to one group member, assign different

parts of the task to different group members, or ask each member to complete the same task, adding the results together).

The intra-group consequences for the individual performer are quite different for these types of tasks, and thus they might lead to differences in overall group productivity. Because of this Steiner's (1972) taxonomy has led to rich conceptualizations of how task structure may affect group performance (e.g., Littlepage, 1991; Shaw, 1981). Furthermore, it has been used to classify tasks in several research studies (e.g., Frank & Anderson, 1971; Kerr & Bruun, 1983; Laughlin, 1980). However, no definitive data exist to indicate how non-incented group performance is affected by tasks that are structured differently. Further, few studies have examined how group incentives affect the performance of tasks that are structured differently, or how task structure influences the effectiveness of different types of group incentives.

In a study discussed earlier, Weinstein and Holzbach (1973) differentially or equally-divided incentives among three subjects who worked on an additive or conjunctive task. The dependent variable was the number of correctly coded questionnaires. In the additive task condition, each subject coded all of the questionnaire problems onto an answer form while in the conjunctive condition, each coded one problem and then passed the questionnaire to another group member. Subjects who performed the additive tasks were more productive, regardless of whether incentives were equally or differentially divided. Productivity was highest when the task was additive and rewards were differentially distributed.

Miroff et al. (1993) examined group member performance (n=5) on additive, conjunctive and discretionary tasks under flat rate pay, and performance on additive and discretionary tasks under equally-divided group incentives. In the additive condition each subject completed his/her own widgets, made from pop beads. In the conjunctive

condition the experimenter assigned different widget production tasks to specific group members such that each worker completed one portion of the widget. In the discretionary task condition, subjects still shared the production tasks, but they were free to create their own division of labor. A combined single subject and group design was used. Two of the groups initially performed the conjunctive and additive tasks under flat rate pay, and then received group incentives for the additive task. The other two groups performed the additive task, followed by the conjunctive and discretionary tasks under flat rate pay. These groups were then incented on the discretionary task. Thus, group members received incentives on either the additive or discretionary task. When the discretionary and additive tasks were incented, performance was higher than it was for the non-incented tasks, regardless of task structure, for all but one of the groups. Performance was consistently higher on the additive and discretionary tasks when they were incented. Further, despite the fact that performance on the non-incented discretionary task was lower than it was on the non-incented additive task, the incented performance of the tasks did not differ. It should be noted that the discretionary task results are difficult to interpret as the subjects in that condition were allowed to choose how they structured the task, and the structure they chose is not known. Thus, the structure chosen for the non-incented phase may have differed from that chosen for the incented phase, with either potentially resembling additive or conjunctive tasks.

In both of the studies, group incentives increased productivity on additive tasks. Miroff et al. (1993) found that incentives also increased the performance of a discretionary task, and that incented performance was comparable for additive and discretionary tasks. Weinstein and Holzbach (1973), on the other hand, found that incented performance was higher for an additive task than it was for a conjunctive task. Weinstein and Holzbach suggest that conjunctive tasks constrain the performance of

high performers because high performers can only be as productive as the least productive member of the group. These results are important because while additive tasks have been used in most studies, many tasks in work settings are conjunctive.

Conclusions

The effects of productivity-based group incentives have been analyzed in well-controlled studies with college students, and field studies with employees in organizations. When contrasted with hourly pay, group incentives increased performance in all investigations. Six studies found group incentives produced performance levels that were equal to or better than those produced by individual incentives (Allison et al., 1992; Farr, 1976; Honeywell et al., 1997; London & Oldham, 1977; Roberts & Leary, 1990; Stoneman & Dickinson, 1989). Only one study reported that performance was lower with equally-divided rewards than with individual incentives (London & Oldham, 1977). In addition, subject satisfaction with group and individual incentives was comparable in four studies (Allison et al., 1992; Campbell, 1952; Farr, 1976; Honeywell et al., 1997), although high performers preferred individual incentives in one (Honeywell et al., 1997). Combined, these results indicate that small group incentives can sustain high levels of performance and satisfaction among employees.

Research on the effects of the distribution of group incentives revealed significant differences in performance under different distribution methods (Allison et al., 1992; Farr, 1976; London & Oldham, 1977; Weinstein & Holzbach, 1973). Differentially-divided rewards were found to be more effective than equally-divided rewards in two of the studies (Farr, 1976; Weinstein & Holzbach, 1973). The third study found differentially-divided rewards to be as effective as equally-divided rewards (Allison et al., 1992), and London and Oldham (1977) found equally-divided rewards

were more effective when they were based on the behavior of high performers rather than that of low performers. In addition, two studies examined subject satisfaction under the different incentive distributions, and found equally-divided rewards to be more satisfying than differentially-distributed rewards (Allison et al., 1992; Farr, 1976). Together, these results show that performance was higher when rewards were differentially distributed, yet satisfaction was lower.

Laboratory studies found group incentives to be equally effective with groups ranging in size from two to nine members (Roberts & Leary, 1990; Stoneman & Dickinson, 1989), while two field studies reported large group productivity declined as group size increased (Campbell, 1952; Marriott, 1959). No researcher has examined large groups in the laboratory, but clearly, group size may account for the differences.

Two studies analyzed the effects of group incentives in conjunction with the type of work task the participants completed (Miroff et al., 1993; Weinstein & Holzbach, 1973). Both found that the incentives improved performance. In Miroff et al. (1993) productivity was comparable on additive and discretionary tasks when group members received incentives. Weinstein and Holzbach (1973) found performance to be higher when members performed an additive, rather than a conjunctive, task. Despite the similarity of these findings, there is not enough research conducted in the area to draw significant conclusions.

Overall, the results of laboratory investigations are consistent with the findings of surveys of productivity-based group monetary incentive programs. Both have found that these pay systems increase productivity and satisfy workers.

The Current Study

The purpose of the current study was to compare the effects of individual and group incentives (n = 10) on the productivity and satisfaction of high performers, using

a simulated group experimental procedure. As discussed earlier, compensation experts maintain that individual performance is likely to suffer in groups because members lose control over their earnings (Blinder, 1990; Dickinson & Gillette, 1993; Dierks & McNally, 1987; Lawler, 1990). However, previous studies that examined groups of 2 to 12 found group incentives to be just as effective as individual incentives (Allison et al., 1992; Farr, 1976; Honeywell et al., 1997; London & Oldham, 1977; Roberts & Leary, 1990; Stoneman & Dickinson, 1989).

Decreases in group productivity are most likely to result when high performers earn less money under group incentives, and lower their performance accordingly. Because low performers earn more when paid group incentives than when paid individual incentives, they would be less likely to alter their performance. Thus, one would expect to see performance changes only in groups where there are distinctive high performers. Moreover, it is likely that those changes would be more pronounced in larger groups, because in small groups, particularly groups of two or three, a high performer can substantially influence the group's productivity, and hence his/her own earnings.

Even though most work groups consist of 10 members (Peck, 1990), only three experimental studies have examined group incentives with groups of more than three (Allison et al., 1992; Honeywell et al., 1997; Stoneman & Dickinson, 1989). Of those, two do not provide data that are relevant to the effects of group incentives on high and low performers. Allison et al. (1992) did not report individual data or earnings, and therefore it is not possible to determine whether workers performed differently from one another. Stoneman and Dickinson (1989) did provide individual data, however, there were no discernible high or low performers in their nine person group, and therefore pay was comparable under the individual and group incentive conditions.

There were high and low performers in Honeywell et al.'s (1997) two 10-person groups, and all performed comparably under individual and group incentives. However, pay differences between conditions were quite small, ranging in size from $.02 to $1.00, with a mean of $.29. These relatively small differences could account for the failure to find performance differences. A detailed analysis of the data supports this possibility. When Honeywell et al. (1997) statistically analyzed their results, they collapsed the data across the two groups. When the data for the two groups were analyzed separately, however, performance was lower during the group incentive conditions for one of the groups. Furthermore, this group contained the highest performers with the highest pay differentials between the individual and group incentive conditions. These suggestive results merited further study.

Experimental investigation of large groups has probably been hindered by logistical problems. Large groups require increased funding, subjects, and subject schedule coordination. A simulated group procedure, like the one used in the current study, more easily permits such research to be conducted. Moreover, such simulations allow researchers to isolate the effects of their independent variables from idiosyncratic group social interactions that may confound results and lead to across study differences (Guerin, 1994; London & Oldham, 1977; Mullen, Johnson, & Anthony, 1994). Group social interactions may play an important role when group contingencies alter performance, nonetheless, their effects should be systematically studied.

Small simulated groups have been used in a number of experiments examining the effects of group membership on performance (i.e., Harcum & Badura, 1990; Kerr & Bruun, 1983; Szymanski & Harkins, 1987; White, Kjelgaard, & Harkins, 1995) The results have been consistent with investigations of interacting groups (i.e., Brickner, Harkins, & Ostrom, 1986; Harkins & Szymanski, 1989; Weldon & Gargano, 1988; Williams, Harkins, & Latane', 1981). London and Oldham (1977)

used two-person simulated groups to examine the effects of group incentives, and, again, results were similar to those obtained with interacting groups (Farr, 1976; Miroff et al., 1993; Smoot, 1997; Weinstein & Holzbach, 1973). While it remains to be seen whether simulations of large groups where social interactions are more varied validly reflect the performance of interactive groups, the above results are promising.

Recently, computer simulations have been used to examine group performance. Garson (1994) applauded the use of computer simulations in social science studies, stating that "simplifying the overwhelming complexity of human interaction . . . is, in fact, the whole challenge to social science" (p. 478). Similarly, Mullen et al. (1994), in their computerized simulation of groups, noted "any differences that emerge between subjects' responses to in-groups and out-groups, or between subjects' responses to smaller groups and larger groups, cannot be attributed to different amounts of experience with one group relative to another" (p. 256).

Computers have a further advantage, in that networking is now commonly used for group work and interactions. No doubt this development has led to the use of computerized simulations in studies of work team performance (for a review see Weaver, Bowers, Salas, & Cannon-Bowers, 1995). Furthermore, when groups are simulated on networked computers, it lends plausibility to the notion that the subject is indeed part of a larger group.

Not surprisingly, researchers have examined whether the performance of computer-linked groups is similar to the performance of face-to-face groups. Although face-to-face work groups have been found to perform better on tasks that require extensive interaction and negotiation, such as group problem solving tasks (Hiltz et al., 1986; Hollingshead, McGrath, & O'Connor, 1993; Siegel, Dubrovsky, Kiesler, & McGuire, 1986), they have performed comparably on tasks that require independent contributions to the final product, as is the case with generative tasks (Hollingshead et

al., 1993). Because the task used in the current study was of the latter kind, there is reason to believe that the performance of interacting group members would be similar to computer-linked subjects.

Of particular import to the current research, the results of Mullen et al. (1994) provide evidence that group size can be successfully manipulated in a computerized simulation. In that study, subjects who perceived their sub-group to be 25% or 75% of the total group responded differently on a classification task.

Taken together, the results of simulation research indicate that a computerized simulation can be validly used to examine the effects of group incentives. Moreover, it can do so economically while eliminating uncontrolled sources of variability. Balcazar, Shupert, Daniels, Mawhinney, and Hopkins (1989), when addressing simulated studies of pay-for-performance, noted that "simulation researchers can provide a great service to those working in the field if they study phenomena which are modeled from but cannot be effectively or economically evaluated in the field" (p. 35).

The current study differed from previous ones in several ways. First, groups were simulated with networked computers. This feature enabled the examination of four "groups" of ten in a realistic work environment. Prior studies examined only one or two groups, which limits the extent to which findings can be generalized to other groups. Second, the performance of high performers was examined. As indicated earlier, group incentives are most likely to affect group performance by decreasing the performance of top performers, yet high performers were present in only one study to date. Third, the pay scale was constructed so that there would be a meaningful difference in earnings under the individual and group incentive conditions. In addition, to ensure the value of the monetary incentive, subjects were screened for financial need. This feature was added in response to Stoneman and Dickinson's (1989) concern that "Results may differ if the amount of money subjects can earn is greater, or if subjects

must rely on their earnings to meet living expenses, as employees must do" (p. 148). Fourth, sessions were longer than in previous laboratory studies, and a work break procedure was added. Incentives may affect performance primarily by decreasing the time subjects spend engaging in pleasurable off-task activities (Dickinson & Gillette, 1993). While off-task activities have been offered in previous studies, when sessions are short subjects can, with little fatigue or effort, work diligently for the entire session in order to maximize their earnings. This may mask potential performance differences when subjects are paid individual and group incentives. Moreover, subjects have not engaged in off-task activities in prior group incentive studies even though they have been available. To increase the likelihood that subjects would take breaks, work breaks were offered to subjects during the sessions, which they could accept or reject. This type of procedure did result in off-task behavior in a study that examined individual monetary incentives (Dickinson & Matthews, 1997).

CHAPTER II

METHODS

Subjects

Subjects were four undergraduate students recruited from Western Michigan University through Introductory Psychology courses (see Appendix A for the recruitment script) and an advertisement at the Student Employment Referral Service, A100 Ellsworth Hall (see Appendix B). Two of the four subjects were recruited from psychology classes, while the other two were recruited from the Student Employment Referral Service. No special vocational background was required of the subjects, and there was no attempt to recruit a certain number of males or females. Subject selection was primarily based upon the availability of the subjects during the duration of the study, a minimum level of computational skill, and subject understanding of the pay conditions following a brief instructional session. In addition, subjects' responses to a questionnaire were screened for financial need and the participation of close friends. The questionnaire is provided in Appendix C. All subjects reported that they would use their earnings to pay bills or purchase entertainment items (i.e., a stereo). Finally, subjects were asked to identify any of their friends who had volunteered to participate in the study. Given the small number of subjects, friendships between subjects could add extraneous uncontrollable variables to the study (i.e., individual competition), and thus two prospective subjects who reported friendships with other subjects were screened out of the study.

Subjects were also screened out of the study if they failed to pass either of two quizzes testing their basic computational skills and understanding of each pay

condition. The computation quiz tested their ability to add two three-digit numbers accurately. The quiz consisted of 20 addition problems taken directly from the research task (see Appendix D). In order to pass the quiz, subjects were required to correctly solve at least 90% of the problems (18 problems) with only one remediation. For subjects to perform the research task adequately they had to be able to add these types of problems in their heads. Therefore, calculators and scratch pads were not allowed during the testing session. All subjects passed the arithmetic quiz without remediation. Three of the subjects correctly solved 100% of the problems on the first try, with the fourth subject solving 95% of the problems.

The pay condition quiz was given to all subjects after a brief discussion of each pay system during a meeting prior to the study (see Appendix E). In order to pass the quiz, subjects were required to answer 100% of the questions correctly, with only one remediation allowed. If subjects did not score 100% on their first try, the researcher asked them to review the incorrect answers and allowed them to remediate their scores. In addition, subjects were asked to make all calculations on the quiz, in order to determine the cause of any errors (i.e., calculation error or error in logic). To decrease the chance of calculation errors, a calculator was available to all subjects taking the pay condition quiz. Two of the subjects correctly answered 100% of the questions on the first try and two answered all questions correctly after one remediation. The latter two subjects quickly corrected their mistakes when asked, indicating that their initial errors were due to carelessness, rather than lack of understanding. Although 6 subjects were determined to be eligible for the study according to the above criterion, only 4, 2 females and 2 males, completed the study. Two subjects dropped out of the study after eight and ten sessions, and their data are not included in the results.

Subjects received hourly pay, individual monetary incentives and group monetary incentives as detailed in the Independent Variable section. In addition, subjects were given $10.00 for completing the study and attending a debriefing session. All four of the subjects who completed the study received the bonus. The two subjects who withdrew before the study was completed received the amount of money they earned during their participation, but did not receive the bonus.

As required by the Human Subjects Institutional Review Board (HSIRB), an informed consent form was signed by each subject prior to the onset of the study. A copy of the informed consent form is contained in Appendix F. The HSIRB research approval letter is provided in Appendix G.

Setting

The study was conducted in the Western Michigan University computer laboratory located in Room 2202 Sangren Hall. The laboratory contained 15 Pentium computers which were connected through a Local Area Network (LAN). The computers were aligned in four rows, approximately three feet apart. Each subject had a work area consisting of a computer with headphones, a keyboard and a mouse.

Alternative Activities

During each session, a computer adjacent to each subject's work area was turned on, providing alternative activities (i.e., e-mail access, computer games). A break room containing vending machines, pay phones and bathrooms was located next to the computer lab and provided additional competing activities. Subjects were given the opportunity to engage in the alternative activities whenever they desired, and were also offered three 5-min work breaks during the 120-min session. After 30 min, the

experimenter announced "It has been about half an hour if you would like to take a break," at which time subjects could break from the task or continue working. This type of break procedure has been found to increase off-task behavior (Dickinson & Matthews, 1997). Points were not deducted for non-responding on the experimental SYNWORK task as that would have discouraged off-task activities. Alternative activities were offered because the main effect of incentives may be to decrease the time spent engaging in pleasurable off-task activities rather than to increase task proficiency or speed (Dickinson & Gillette, 1993).

Work Task

The subjects performed a computerized task called SYNWORK, which is a synthetic work environment that has been tested in both field and laboratory studies (Elsmore, 1994; Elsmore, Naitoh, & Linnville, 1992; Salthouse, Hambick, Lukas, & Dell, in press; Savu, 1991). SYNWORK has two important features that simulate a real work setting: concurrent tasks and measurable outcomes for completion of those tasks. Subjects engaged in four concurrent sub tasks, one in each quadrant of the computer screen (a copy of the computer screen is shown in Appendix H). Using only the mouse to point and click to different areas of the screen, the subjects earned points each time they completed a task during the session. As indicated earlier, points were not deducted for non-responding. Points from each task were added together to provide a cumulative point score. Point scores were not available to subjects while performing the task.

Memory Sub Task

In the upper left quadrant of the screen was a memory sub task. At the onset of each session, a sample list of six letters was displayed for 5 s. After 5 s, the list was replaced by a box containing the phrase "Retrieve List." The subject was able to view the list again at any time during the session by clicking on the box containing the phrase. After a 20-s inter-trial interval, a sample letter appeared in a box below the phrase. This letter was either a letter from the signal list shown at the onset of the session, or from a non-signal list of six letters that was not shown to the subject. The sample letter remained visible for 10 s, or until the subject indicated "yes" or "no" by clicking on the corresponding boxes below the sample. With a "yes" response the subject indicated that the sample letter was a member of the signal list shown at the onset of the session. A "no" response indicated the sample letter was not a member of the signal list, and thus a member of the non-signal list. There was no time limit for this task, and a new sample letter appeared 20 s after the last response. Subjects received 10 points for correctly identifying the sample letter. In addition, a penalty of 10 points was charged for each detection error or list retrieval.

Computational Sub Task

The upper right quadrant of the screen contained a computational sub task. The task consisted of two randomly selected numbers, both less than 1,000, displayed in an addition problem. The answer was displayed as "0000." Subjects solved the problem by clicking on one of two boxes below each digit in the answer. The "+" box caused the digit to increase by one digit, and the "-" box caused it to decrease by one digit. When subjects solved the problem, they clicked on the "done" box, and a new addition

problem appeared. Subjects received five points for each correct answer, and lost five points for each incorrect answer. There was no time limit for this task.

Visual Monitoring Sub Task

A visual monitoring sub task was presented in the lower left quadrant of the computer screen. In this task, subjects were required to keep a continuously moving pointer (at five pixels/s) from reaching the ends of a line (20 pixels long) by clicking on a box labeled "reset," which reset the pointer to the center of the line. Points were awarded to subjects based on the proximity of the pointer to the end of the line at the time it was reset. The maximum award was 10 points for resetting the pointer when it was at the end of the line. Subjects did not receive any points for resetting the pointer while it was in the center of the line, and were allocated points for resets at other pointer positions according to the following formula (Elsmore, 1994):

$$\text{points awarded} = \text{INT}\left(\text{Max points} \times \frac{\text{Distance from center}}{\text{Max distance}}\right)$$

Auditory Monitoring Sub Task

In the lower right quadrant of the screen an auditory monitoring sub task was presented. Every 5 s, one of two brief tones sounded through the subjects' headphones. The tone was either a low frequency (1046 Hz) "non-signal" or a high frequency (1319 Hz) "signal." The subjects' task was to click on the box labeled "high sound report" when they heard the high frequency signal. An accurately identified signal was rewarded with 10 points, however, falsely identifying a non-signal resulted in the deduction of 10 points. Correct responses were those which occurred after a

high frequency signal, and before the next tone sounded. All other responses were incorrect and resulted in a deduction of points.

The multiple sub tasks allowed for a more thorough analysis of subject performance than a unitary task. While the monitoring tasks had a ceiling performance level (i.e., 100%) beyond which subjects could not improve, the computational sub task did not, enabling subjects to continuously improve their performance (similar to many production tasks used in group incentive research). Moreover, the monitoring sub tasks required constant attention to the computer screen, and off-task behavior would decrease accuracy (percent correct) as well as rate. Thus, the effects of incentives on different types of concurrent tasks could be analyzed.

Dependent Variables

The main dependent variables were the total number of points and sub task points accumulated by subjects during each session. Secondary dependent variables consisted of the percent of correct responding and time-on-task. The computer automatically recorded the preceding data for each session, and saved them in a data file that was accessed through the SYNIANAL analysis program (Elsmore, 1994). In addition, each response was recorded and plotted in a cumulative record using the SYNICUM program. The cumulative records were inspected for changes in response rates and response patterns.

Subjective information was also collected from subjects. At the end of the study, subjects were given a satisfaction and stress level questionnaire that asked them to rate each pay condition on a number of characteristics (see Appendix I). Differences in satisfaction and stress as a function of the type of pay system were analyzed.

Independent Variable

Each subject was exposed to hourly pay, individual monetary incentives and simulated group (n = 10) monetary incentives. Subjects worked alone, however, during the group pay condition they were told that their pay was based on the pooled performance of a group of 10 subjects.

Hourly Pay Condition

In the hourly pay condition, subjects earned $10.00 for every two-hour session they attended, regardless of their work performance. The number of points earned during the session was displayed on the computer screen at the end of each session.

Individual Incentive Condition

During the individual incentive phases, subjects received a piece-rate pay of $.10 for every 100 points earned (see Appendix J for a copy of the pay scale). Subjects who performed at two standard deviations below the mean performance of pilot subjects who were performing at their maximum levels (10,400 points), earned $10.40 for the session. Thus, subjects received pay comparable to that under the hourly pay condition if they earned at least 10,400 points. As subjects accumulated more points, their compensation increased. As in the hourly pay condition, the number of points earned during the session was displayed on the computer screen at the end of the session.

Group Incentive Condition

During the group pay condition, the subject's session score was averaged into the simulated group mean, and subjects received $.10 for every 100 points in the group

average. For example, if the group averaged 10,400 points per member, each member received $10.40 for the session. As in the individual incentive condition, if the group average was higher, the subject's compensation was higher. Unlike the other two conditions, subjects did not receive their individual point total at the end of each session. Rather, the group average was displayed on the computer screen. In order to determine that average, data from pilot subjects were combined with the subject's session score, according to the following formula:

$$\text{Group average score} = \frac{(\text{Mean score} * 9) + \text{Subject score}}{10}$$

The "mean score" (11,400 points) equaled the score that was 1.5 standard deviations below the mean performance of pilot subjects who were performing at their maximum levels. This criterion was used to establish the subjects as high performers in the group. All four subjects performed above this criterion, and thus were "high performers."

The subjects, when placed in the group condition, received a group average score that was lower than their individual score, and thus received less pay under the group incentive condition than they received under the individual incentive condition. To review the rationale for this feature of the study, if high performers do not perform differently under individual and group incentives, it is unlikely that average or low performers would do so, although this remains an empirical issue. Only one study has examined whether high, medium and low performers respond differently to individual and group incentives, and that study reported that they did not (Honeywell et al., 1997).

For all conditions, the researcher maintained a written tally of the subjects' performance and earnings for each session (see Appendix K). Subjects received

feedback regarding their performance (or the group's performance in the group incentive condition) after each session, and were exposed to each pay condition for several sessions during the study. Subjects were paid after their last scheduled session each week. If subjects completed an experimental phase before that session, they were paid at the end of the phase, and again after their last session of the week for sessions completed in the new phase. Thus, if a subject's last session in a phase was on Tuesday, the subject was paid for work completed Saturday through Tuesday after Tuesday's session, and then received payment for work completed Wednesday through Friday on Friday.

Experimental Design

A within-subject experimental design was used in which subjects were exposed to each of the pay conditions in an ABCB sequence, with A = hourly pay, B = individual incentive pay, and C = group (n = 10) incentive pay. In order to assess sequence effects it would have been better to counterbalance the sequence of exposure across subjects, exposing two subjects to the ABCB sequence and two to an ACBC sequence, however, the latter would not have permitted a determination of whether the subjects were high performers prior to the group incentive condition.

Experimental sessions lasted 120 min. Subjects participated in no more than two sessions a day, with a minimum of five sessions under each pay condition. If performance was not stable after five sessions, subjects continued to perform under that pay condition until performance stabilized or until they completed 10 sessions, whichever occurred first. Subject performance was considered stable after the subject completed three consecutive sessions in which performance varied by no more than 1000 points. This criterion was based on a visual and statistical analysis of the

performance of pilot subjects performing at their maximum rates, and represents .5 standard deviation from the mean performance of those subjects. To diminish any carry over effects between sessions, subjects had at least a two-hour break between sessions, and the experimenter discussed the current pay condition with the subject immediately before each session.

Experimental Procedure

In order to most closely simulate a real work environment, subjects were asked to work 10 to 20 hours per week. In actuality, the weekly schedules of subjects ranged from 6 to 26 hours. Subjects scheduled their sessions with the experimenter one week in advance.

Before the study began, the primary researcher described each of the pay systems to the subjects, and explained how sessions would be conducted. In addition, prior to the first session in a pay condition, the experimenter reminded subjects of the parameters of that pay system. Therefore, before the first session under hourly pay, the researcher reminded subjects that they would earn $10.00 for the session, irrespective of their performance. Prior to the first session in the individual incentive phases, the experimenter reminded subjects that they would be paid solely on the number of points they earned during the session ($.10 for every 100 points), and gave them a copy of the incentive pay scale. Similarly, before the first group incentive session, the experimenter explained that the subject's score was going to be combined with the scores of nine other group members, and that his/her pay was dependent on the group average.

Before each of the other experimental sessions, subjects were informed of the current pay condition. During the session, the experimenter either left the room or

remained in the front of the room facing away from the subjects (experimenters were not able to leave the room during all sessions because they had to monitor and prevent potential interruptions from laboratory technicians and users who were not aware that the study was being conducted and had their own keys to the two entrances). In either case, the experimenter did not observe or monitor the performance of subjects. After every half hour, the experimenter returned to the room, or turned to address the subjects, and stated "It's been about half an hour if you would like to take a break." The computer program automatically ended after 120 min and displayed the number of points earned. When subjects stood up from the computer and removed their headphones, the experimenter confirmed their next scheduled session and thanked them for attending the session. If the session was the last session of the week, subjects were paid.

CHAPTER III

RESULTS

Task Performance

Subject performance on the SYNWORK program varied under the different pay conditions. Figure 1 displays the average number of points earned per session by each subject. Inspection of the graphs reveals significant differences in performance between the hourly and individual incentive pay conditions. During the hourly pay condition, average point scores ranged from 11,078 to 12,717, while they ranged from 13,537 to 14,125 during the first individual incentive pay condition. Each subject increased his or her average performance by at least 1,000 points. Three of the four subjects earned more points in the hourly pay condition than the group incentive condition, while the fourth (Subject 3) earned fewer. However, it should be noted that performance in the group pay condition may have been affected by the preceding individual incentive condition, rendering the latter comparison problematic.

Three subjects (Subjects 1, 2 and 4) earned more points in both of the individual incentive pay conditions than the group incentive pay condition. All three showed initial increases in performance when they switched from group to individual incentives, however, their performance then gradually decreased. Nonetheless, their final performance was higher than their final performance in the group incentive

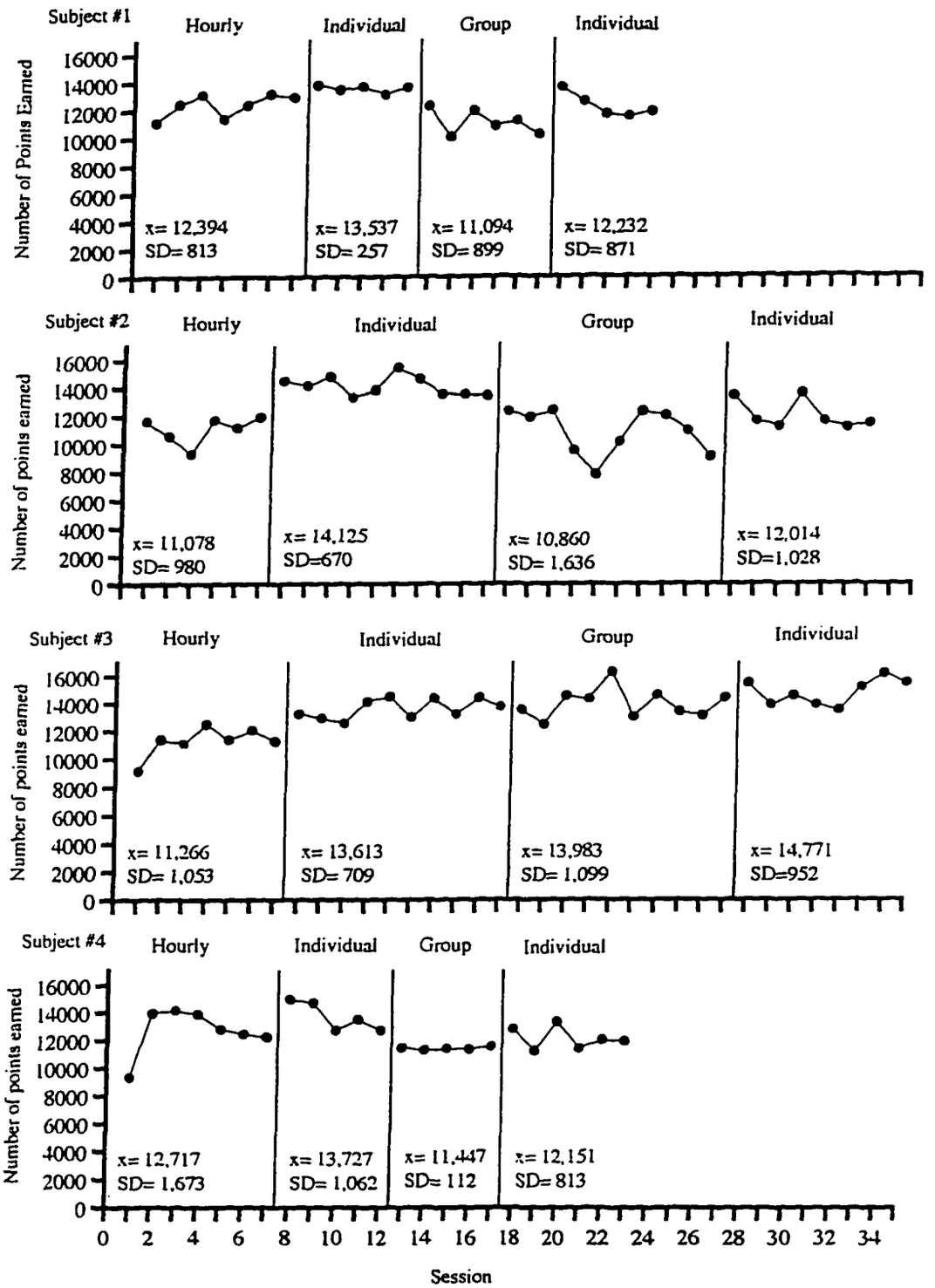


Figure 1. Cumulative Number of Points Earned per Session by Subject.

condition. Subject 3's performance increased across incentive conditions and therefore it is not possible to attribute changes to the type of incentive pay.

Figure 2 displays the number of points each subject earned on the sub tasks during each session. The total point scores of subjects varied systematically with their performance on the math sub task. This is understandable because subjects controlled the number of math problems they completed, and hence the number of points they earned. In contrast, the computer controlled the presentation rate of the memory, visual and auditory sub tasks, limiting the response rate of subjects. Thus, the leveling of performance on these tasks was due to a ceiling effect imposed by the computer. Appendix L contains tables of each subject's composite and sub task scores for each session, providing a more complete picture of the relationship.

Figure 3 displays each subject's percent accuracy on each of the sub tasks during each session. Three subjects (Subjects 1, 2 and 4) performed at 90% accuracy or better on the memory, computational and visual monitoring sub tasks. Subject 3 performed with at least 92% accuracy on the computational and auditory monitoring tasks. She initially performed the memory task with 80% accuracy, reaching 90% after the eighth session. Subjects' accuracy on the auditory monitoring task varied widely during the study, with the performance ranging from 46% to 100%. Moreover, it decreased over time for all subjects. It was not, however, systematically affected by changes in the pay system.

Break Behavior

Subjects' break behavior was analyzed to determine the effects of the incentive conditions on work breaks. The time spent on each sub task during each session was automatically recorded by the computer. The computer recorded these data inaccurately during the group incentive condition, thus the data are available only for the hourly pay

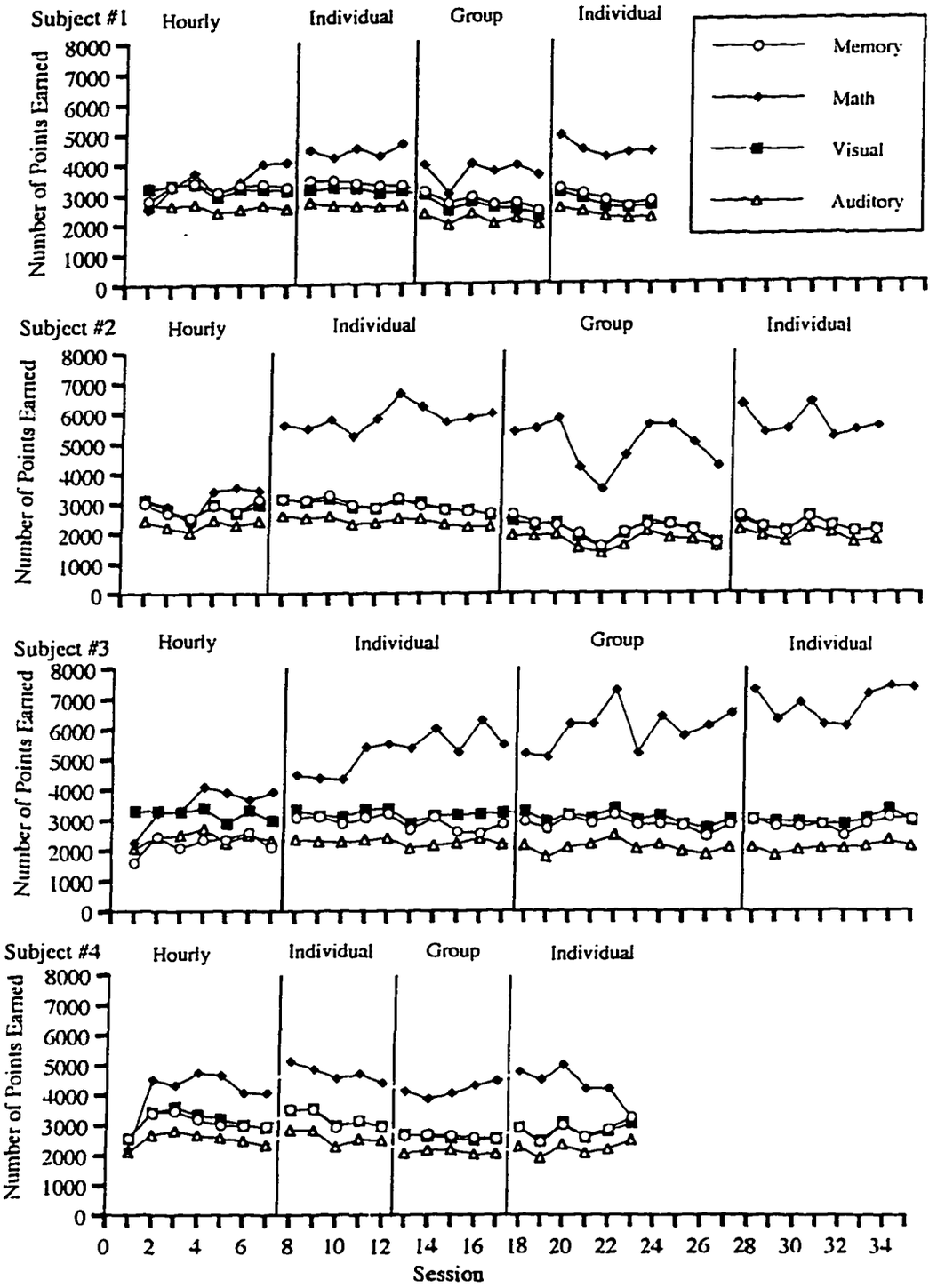


Figure 2. Number of Points Each Subject Earned per Session on Each of the Sub Tasks.

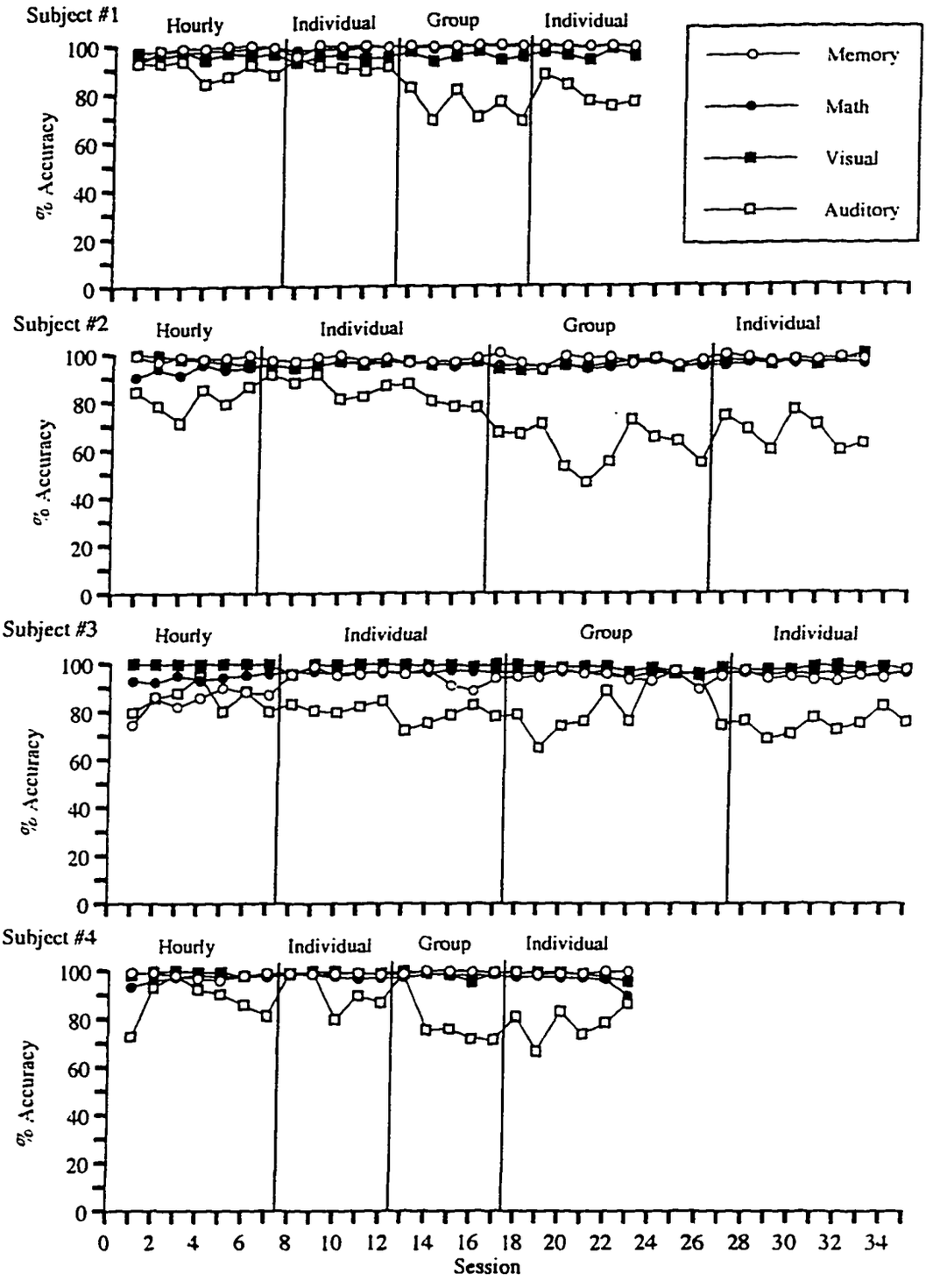


Figure 3. Percent Accuracy of Each Subject on Each of the Sub Tasks During Each Session.

and individual incentive conditions. The data from the two individual incentive conditions were averaged. Figure 4 displays the average time that subjects spent on each sub task per session during the hourly pay and individual incentive conditions. All subjects spent more time working during the individual incentive condition, with average differences of 350, 608, 238, and 74 seconds for Subjects 1, 2, 3, and 4, respectively. In addition, they spent a majority of their time on the math task during each condition, and more time on math during the individual incentive condition than the hourly pay condition. Subjects 1, 2, 3, and 4 spent an average of 218, 850, 872, and 47 more seconds on math during the individual incentive condition, respectively. Three of the subjects (1, 2, and 4) spent less time on the memory task during the individual incentive condition (100, 103, and 35 seconds, respectively) and Subjects 1, 2, and 3 spent less time on the auditory task during the individual incentive condition (66, 91, and 24 seconds, respectively). Two subjects (Subject 2 and 3) spent less time on the visual monitoring task during individual incentive condition (48 and 675 seconds, respectively), while Subjects 1 and 4 spent more time on the visual task (298 and 55 seconds, respectively).

The time on task data is supported by a visual analysis of cumulative records produced for each session. Appendix M contains cumulative records representative of each subject's typical performance during hourly, individual and group incentive sessions. Responses are represented on the cumulative records by a vertical pen mark, while the pen moves horizontally across the page as time passes. Thus, high response rates are indicated by steeper lines and slower response rates are shown with more horizontal lines. The time that subjects spent not responding is indicated on the records by the thick line with the gradual slope. Subjects appear to display higher response rates during the individual and group incentive conditions than the hourly pay condition, although the extent of the differences is unclear. Although differences in

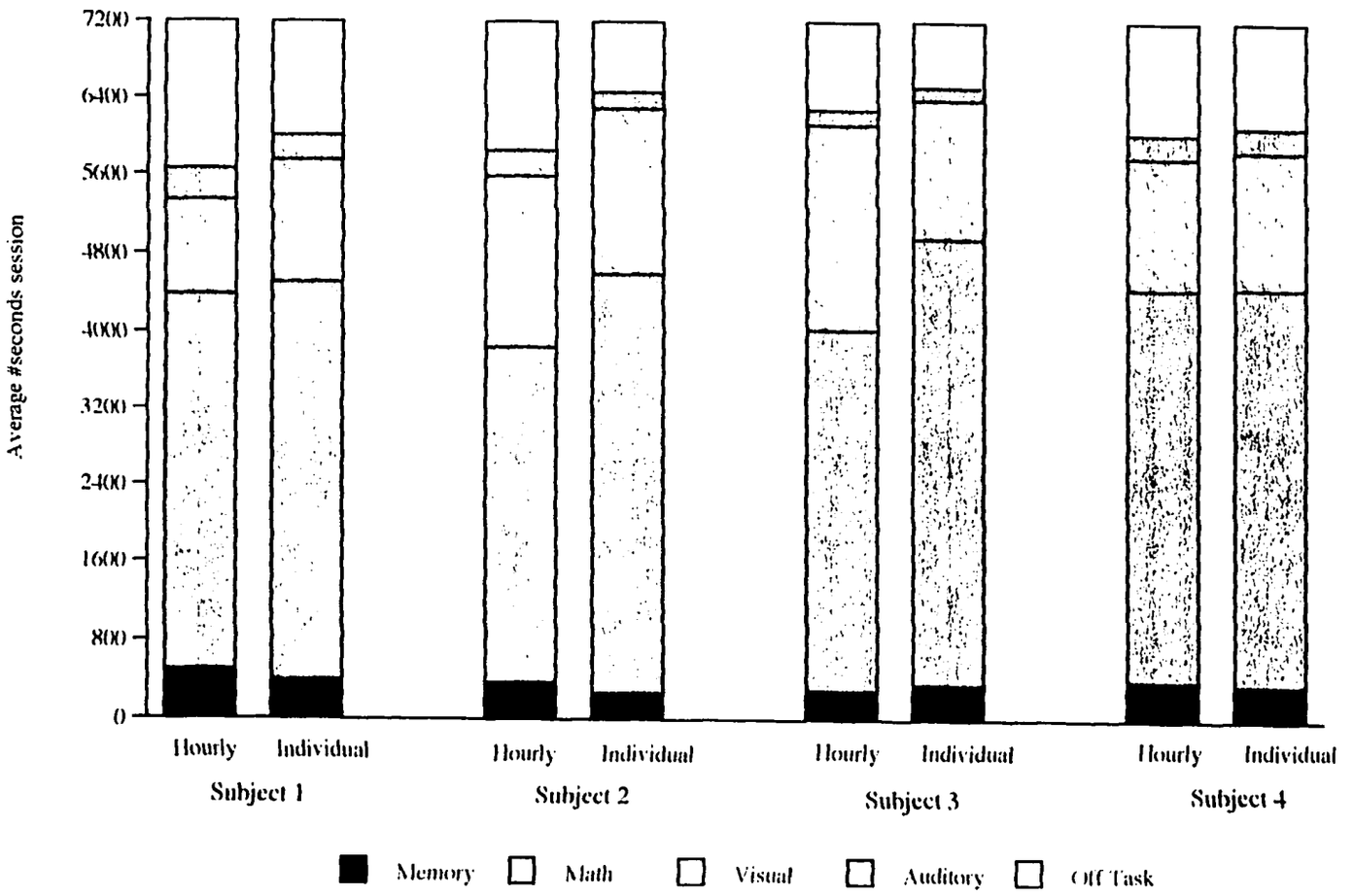


Figure 4. Average Number of Seconds Each Subject Spent on Each Sub Task During Hourly and Individual Incentive Conditions.

response rates across conditions is difficult to determine clearly, the periods of time the subjects spent without responding can be easily identified by the lapses in the record. All subjects spent more time on task in the individual incentive condition than in the hourly pay condition. Three subjects (Subjects 1, 2, and 4) decreased their time on task when switched from individual to group incentives, however, time on task remained comparable during the second individual incentive pay condition. Thus, subjects spent more time on task during the individual incentive condition than the group incentive or hourly pay conditions, which indicates that their higher performance under individual incentives may be due to the increased time on task.

Amount of Money Earned

Table 3 displays the average amount of money earned per session by each subject in the three pay conditions. All four subjects earned the least amount of money in the hourly pay condition. Group incentive pay was considerably lower than individual incentive pay, with average differences ranging from $1.53 to $2.52. With the exception of Subject 3, the largest differences occurred when subjects switched from individual incentive pay to group incentive pay, with those differences averaging $1.95 to $2.78 per session. Subjects 1, 2 and 4 earned less in the group incentive pay condition than the individual incentive pay condition, and also performed lower. In contrast, Subject 3 earned less when she switched from individual to group incentives, but performed better. When re-exposed to individual incentives, she earned considerably more and performed higher than she had during the preceding group and individual incentive conditions.

Table 3

Average Amount of Money Earned per Session by Each Subject in Each Pay Condition

Subject	Hourly	Individual Incentives	Group Incentives	Individual Incentives
1	$ 10.00	$ 13.60	$ 11.40	$ 12.26
2	$ 10.00	$ 14.18	$ 11.40	$ 12.18
3	$ 10.00	$ 13.66	$ 11.71	$ 14.80
4	$ 10.00	$ 13.80	$ 11.46	$ 12.20

Preference, Satisfaction, Stress and Validation of the Independent Variable

On a post-experimental questionnaire, subjects ranked the pay systems in terms of which they most preferred, found satisfying, and found stressful. In addition, subjects indicated which pay system they would choose to work under in the future. Table 4 displays the top-ranked responses to each of the questions. All subjects preferred individual incentive pay the most and hourly pay the least. Similarly, all found individual incentives to be the most satisfying, and chose to work under that pay system in the future. All subjects indicated that they chose individual incentives as the most preferred and satisfying condition because they received more pay in that condition. Three subjects reported that group incentive pay was the most stressful, while the fourth found individual incentive pay to be so. Three of the four subjects found hourly pay to be the least stressful, with the fourth identifying individual pay as least stressful. Taken together, even though most of the subjects found hourly pay to be the least stressful, they favored individual incentive pay the most.

Table 4

Top-ranked Questionnaire Responses

Subject	Most Preferred	Most Stressful	Most Satisfying	Future Choice
1	Individual	Group	Individual	Individual
2	Individual	Individual	Individual	Individual
3	Individual	Group	Individual	Individual
4	Individual	Group	Individual	Individual

The integrity of the group simulation was assessed by asking subjects, on the questionnaire, to identify the number of people they thought participated in their work group. All reported that there were 10 members in their group.

CHAPTER IV

DISCUSSION

Performance

The results of this study suggest that high performers in 10-member groups produce more under individual incentives than group incentives. Three of the four subjects showed decreased performance under group incentives with the fourth exhibiting an initial increase in behavior when switched from group to individual incentives. Further, three of the subjects earned fewer points under group incentives than hourly pay. These changes in performance occurred without changes in subject accuracy, which remained consistent across all conditions for all subjects. These results contradict those of previous studies (Farr, 1976; Honeywell et al., 1997; Stoneman & Dickinson, 1989). However, only two (Honeywell et al., 1997; Stoneman & Dickinson, 1989) investigated comparable group sizes (10 and 9, respectively), which positions them as the primary focus of the discussion.

This study is of import because it examined the behavior of high performers who received realistically lower wages under a group monetary incentive system than under an individual monetary incentive system. Each subject received an average of $1.84 less per session during the group incentive condition. This amount is considerably greater than the average differentials found in Stoneman and Dickinson (1989) and Honeywell et al. (1997). Stoneman and Dickinson found an average difference across all of their subjects (high and low performers) of $.49. Honeywell's high performers (subjects who performed above the average performance level), a more relevant comparison, had an average pay difference of $.41 per 20-minute session, a

small absolute difference. The greater pay differential could explain why performance was lower in the group monetary incentive condition, in contrast to other studies.

In addition to the pay differential, this study also differs from previous ones in its use of a simulated work group. Subjects each worked individually, believing that they were part of a work group (n = 10) linked through a computer network. This simulation allowed an analysis of the incentive effects without confounds due to social interactions among group members. The absence of social interaction in the present study may have contributed to its unique results. It is not yet clear how group incentives affect social interactions or how such interactions influence the performance of group members. Nonetheless, social factors such as feedback, visual cues and group recognition undoubtedly affect performance. In the prior studies, for example, group recognition and praise may have sustained the performance of the top performers even though they received less pay during group incentive conditions. Moreover, it may be more aversive for group members to decrease their performance in the presence of colleagues.

Researchers studying social loafing found individual feedback and accountability prevents decreases in performance for members of non-incented work groups (e.g., Harkins, 1987; Harkins & Szymanski, 1988, 1989; Jackson & Harkins, 1985; Williams et al., 1981). Thus, feedback may have the same effect on incented work groups. The feedback subjects received about their performance in the current study differed from the feedback subjects received in Honeywell et al. (1997) and Stoneman and Dickinson (1989). In the present study, the computer displayed the number of points the individual earned at the end of every hourly pay and individual incentive session. In the group incentive condition, the computer displayed only the average number of points earned by the group. Thus, subjects received either individual or group feedback, but never both. In Honeywell et al. and Stoneman and

Dickinson, subjects received individual and group feedback during both the individual and group incentive conditions. In addition, each subject knew the performance of every other group member in both conditions, permitting comparisons. Above average performers could be recognized by co-workers or automatically reinforced by their performance, sustaining their performance during the group incentive condition.

It is also possible that the length of the current sessions and/or the study impacted the results. To simulate part-time employment as much as possible, every effort was made to schedule subjects for 10 to 20 hours of work each week. Work hours actually ranged from 6 to 26 hours per week. Sessions were two hours long, and subjects worked approximately five days a week for four to six weeks. Stoneman and Dickinson (1989) conducted 45-minute sessions, three times a week for seven weeks and Honeywell et al. (1997) ran seven 20-minute sessions per day for two consecutive days. As indicated by Honeywell et al., the duration of the study "may directly affect responses to the pay contingencies" (p. 273). In the current study, extended exposure to the pay contingencies may have brought behavior under their control to a greater extent than in previous studies.

Break Behavior

Although researchers have hypothesized that monetary incentives improve performance by increasing the amount of time subjects spend on the incented task (e.g., Dickinson & Gillette, 1993), the current study is the first to document that effect. All subjects spent more time on task during the individual incentive pay condition than the hourly pay condition. This increase in time on task corresponds with an increased performance score under the individual incentive condition, and thus may be the cause of the increased performance. Unfortunately, due to a computer error, time on task data for the group incentive condition were lost. A visual analysis of the cumulative

records suggests that, in general, subjects took more breaks when switched from individual to group incentives. However, subjects continued to take comparable breaks during the second individual incentive phase. With the exception of one subject, performance was lower during the second individual incentive condition compared to the first, reflecting the longer breaks. Nonetheless, the performance of the three subjects was still greater during the second individual incentive than the group incentive condition. Additional research is required to precisely determine whether such performance differences are due to the time spent on task.

Satisfaction, Stress and Preference

All subjects reported that the individual incentive pay condition was the most satisfying and preferred pay condition, citing the amount of money earned as the reason for their choice. Further, all subjects chose this pay system as the one they wanted to work under in the future. The findings replicate Honeywell et al. (1997) who also found that high performers preferred individual incentive pay over group incentive pay. As indicated earlier, these ratings could be due to the amount of money subjects earned under each type of pay system, as all earned the most when paid individual incentives. It should be noted, however, that subjects generally performed better in the individual incentive pay conditions as well. Thus, subjects reacted more favorably when they worked harder and earned more than when they did not work as hard and earned less.

Future Research

Participants in this study performed lower when paid group monetary incentives than when paid individual incentives. These results contradict those of previous studies that examined groups of comparable sizes. The obvious extensions are to determine the reasons for the differences. The most unique feature of the current study was its focus

on high performers who experienced a greater pay differential between individual and group incentive conditions than subjects in previous studies. Therefore, further investigation of the effects of pay level on performance would advance understanding of the discrepancies. A parametric study in which pay differentials were systematically manipulated would show the extent to which they affect performance under individual and group monetary incentive systems.

The effects of individual and comparative feedback on the performance of incented group members should also be examined. In prior studies, participants received both types of feedback when paid individual and group incentives and their performance was comparable. In the current study, subjects received feedback only with respect to the group's performance during the group incentive condition, and individual feedback during the individual incentive conditions. As suggested by the results of the studies on social loafing, individual and comparative feedback may sustain individual performance in incented groups. It is therefore likely that the difference in feedback may have caused the difference in performance results.

Another extension of this research would be an investigation of the differential effects of individual and group incentives on the performance of simulated and face-to-face work groups. Specifically, an analysis of the social interactions that occur in the face-to-face work group and their effects on performance would provide a better understanding of the extent to which results obtained with simulated work groups can be generalized to face-to-face work groups.

A replication of the current study, investigating the effects of individual and group incentives on high and low performers would extend the current results. Group incentives have been said to decrease group performance primarily by decreasing the performance of high performers. Thus, high performers were used in the current study and a decrease was found. Now that a performance difference was identified for high

performers working in a group, investigation into the performance of low and average performers under the same conditions may expand our understanding of the causes for the differences in group performance under group incentives.

After the causes for the current performance differences are better understood, further investigations could be conducted using the simulated group procedure. Simulated groups would allow researchers to more easily examine the effects of group incentives on larger groups in the laboratory, and isolate the variables that affect incented group performance, including group size.

Appendix A

Recruitment Script

Recruitment Script

Hello! My name is Judy Honeywell. I am looking for individuals to participate in a study designed to investigate worker performance under different pay conditions. If you decide to participate in the study, you will be asked to engage in a computer task. The task has four components: a memory task, addition problems, visual monitoring task, and auditory monitoring task.

Participation will require you to attend at least 20 two hour sessions, for a minimum of forty hours of your time, not to exceed sixty-four hours. You will be paid based on your performance, and will guaranteed a minimum of $60.00 for completing the study.

Your assistance is completely voluntary. If you participate, you may leave the study at any time. If you do leave the study early, you will be paid the amount of money you earned during your participation. Your willingness to volunteer for, or withdraw from, the study will not affect your course grades in this or any other class.

If you would like to participate, please print your name and phone number on the lists I am about to pass out.

I will be contacting you within the next few days to arrange a time that we can meet and discuss the study in detail.

Thank you for your time!

Appendix B

Student Employment Subject Recruitment Advertisement

Western Michigan University
Student Employment Referral Service
A-100 Ellsworth Hall
(616) 387-2809 FAX
(616) 387-2725 PHONE

DATE_____
INITIALS_____
JOB # _____
FILE NAME_____

Employer Judy Honeywell

Street 3625 Kenbrooke Court Suite/Apt. #_____

City Kalamazoo State MI Zip 49006 - Confidential? Y / N

Phone(616) 372-1057. Ext. Confidential? Y / N

FAX( ) - Confidential? Y / N

Initial Contact:
First Judy
Last Honeywell
Title Doctoral Student
Best Time Any

Alternate Contact:
First_____
Last_____
Title_____
Best Time_____

TITLE (on campus?) Research Subject

# of Jobs 12 Suggested Major Any

Job Category (CIRCLE ONE) Arts & Sciences Babysitting Business Driving
Education Engineering Fine Arts Food General
Health & Human Industrial Office Personal Retail

Wage/Hour (not a range) $5.00 Avg. hours/week (not a range) 10

Job Duties Attend two-hour sessions (self-arranged) where you will work on a computer task.

DEADLINE_____

Special application instructions?_____

How to Apply:
____Phone for Appointment
____Apply in Person
____Send Resume to Employer
____On Campus Interviews

Other Information: (Ask these)
____Within walking distance
____Pay Increase Possible
____Non-Smoking Environment
____Handicap Access

WE POST POSITIONS FOR 30 DAYS ATTACH A "THANK YOU" CARD

Appendix C

Subject Financial Need Screening Questionnaire

Subject Number _____

Please complete the following questions. All information you provide will remain confidential.

1. If you participate in the study, how do you plan to spend the money earned?

2. Do you currently hold a job? YES NO

3. If you have a job, how long have you had it?

4. If you do not have a job, how long has it been since you held a job (in years, months)?

5. Do you receive any financial aid? YES NO

6. How did you learn about the study? (Please check one)

   ____ Student Employment Referral Services

   ____ Psychology class

7. Do you know anyone that has signed up to participate in the study? Please list their names.

8. If you know anyone that might be interested in signing up for the study, please refer them to Judy Honeywell at 372-1057.

Appendix D

Computation Skills Quiz

Computational Math Quiz Subject:_____

Please solve the following addition problems in your head. Do not use a calculator, scratch pad or other assistance.

561 514	684 185	609 361	895 170
432 130	827 524	230 353	404 488
501 557	524 615	424 402	844 922
453 823	990 790	940 795	807 630
207 670	223 857	641 205	663 851

Appendix E

Pay Condition Questionnaire

PAY CONDITION QUESTIONNAIRE SUBJECT NUMBER: _____

HOURLY PAY SYSTEM:
Individuals are paid $10.00 for each session worked, regardless of performance.

INDIVIDUAL INCENTIVE PAY SYSTEM:
Individuals are paid $.10 for every 100 points accumulated during the session.

GROUP INCENTIVE PAY SYSTEM:
Individuals are paid $.10 for every 100 points accumulated during the session, **determined by the group's average number of points.**

Answer the following questions based on the above pay systems.

1. Sally earned 14,000 points during a session. Sally's group earned an average of 13,000 points.

   A. What amount would Sally earn under the GROUP INCENTIVE pay system?

   B. What amount would Sally earn under the INDIVIDUAL INCENTIVE pay system?

2. Don earned 10,000 points during a session. Don's group earned an average of 12,500 points.

   A. What amount would Don earn under the HOURLY pay system?

   B. What amount would Don earn under the INDIVIDUAL INCENTIVE pay system?

3. Virginia earned 13,500 points during a session. Virginia's group earned an average of 13,000 points.

   A. What amount would Virginia earn under the GROUP INCENTIVE pay system?

   B. What amount would Virginia earn under the HOURLY pay system?

Appendix F

Informed Consent Form

Western Michigan University
Department of Psychology

Differential Effects of Individual and Group Pay Contingencies on Individual Performance

J. A. Honeywell and A. M. Dickinson

My name is Judy Honeywell, and I am a graduate student in the Department of Psychology at Western Michigan University. You are being invited to participate in a research study. The purpose of this study is to investigate the effects monetary incentives on work performance.

As a participant in this study, you will be asked to engage in a computerized task for at least 20 sessions, each session lasting two hours. The computer task consists of four concurrent sub-tasks, one in each quadrant of the computer screen: a memory task, addition problems, a visual monitoring task, and an auditory monitoring task. You will be able to get up, take a break, enjoy other activities available (i.e., magazines, playing cards, homework) at any time during the study.

This research involves minimal risk to you as a participant. As a subject, your time commitment will be at least 40 hours. You may be asked to work more hours, which will not exceed a total of 80 hours of your time. However, you may encounter fatigue or mild stress while performing the task. As described below, you may withdraw from the study at any time if this occurs, or work on other activities. 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.

You will receive monetary compensation for your participation in the study. You will be paid three different ways during the study. In one pay condition, you will be paid $10.00 for attending each session, regardless of your performance during that session. In a second pay condition, the total amount of money you will earn will depend upon how many points you earn during the session. In a third pay condition, the total amount of money you earn will depend upon how many points are earned by you and nine other individuals. Compensation will be at least $60.00, which includes a $10.00 bonus for completing the study and attending a debriefing session after the study. You may earn more money depending upon your performance and the performance of the other nine individuals. The information obtained from this study may allow businesses to better design pay systems that satisfy both the organization and the employee.

All information obtained in this study will remain strictly confidential. When the results are publicly presented, no one will be able to identify who you are. As a participant, a code number will be assigned to you and will be used to identify your data. By signing this informed consent you will be giving permission for data obtained in this study to be presented in professional presentations and publications.

Your participation in this study is entirely voluntary. You may withdraw from the study at any time without repercussions. If you do withdraw, you will receive the amount of money that you have earned up to that point. Your participation in the study, or your withdrawal from the study, will not affect your grades in any of your courses. During the debriefing session after the study, the experimenter will answer any questions and explain how your data will help us learn more about monetary incentives.

If you have any questions concerning this study you may call Judy Honeywell at 372-1057. In addition, Dr. Dickinson, the faculty advisor for the study, can be reached at 387- 8313. The participants may also contact the Chair, Human Subjects Institutional Review Board (387- 8293), or the Vice President for Research, at 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 attached copy of this form for your records.

Appendix G

HSIRB Research Approval Letter

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899
616 387-8293

WESTERN MICHIGAN UNIVERSITY

To: Dr. Alyce M. Dickinson
Judith A. Honeywell

From: Richard A. Wright, Chair
Human Subjects Institutional Review Board

Subject: HSIRB Project # 96-09-13

Date: September 13, 1996

This is to inform you that your project entitled "Differential Effects of Individual and Group Pay Contingencies," has been approved under the expedited category of research. This approval is based upon your proposal as presented to the HSIRB, and you may utilize human subjects only in accord with this approved proposal.

Your project is approved for a period of one year from the above date. If you should revise any procedures relative to human subjects or materials, you must resubmit those changes for review in order to retain approval. Should any untoward incidents or unanticipated adverse reactions occur with the subjects in the process of this study, you must suspend the study and notify me immediately. The HSIRB will then determine whether or not the study may continue.

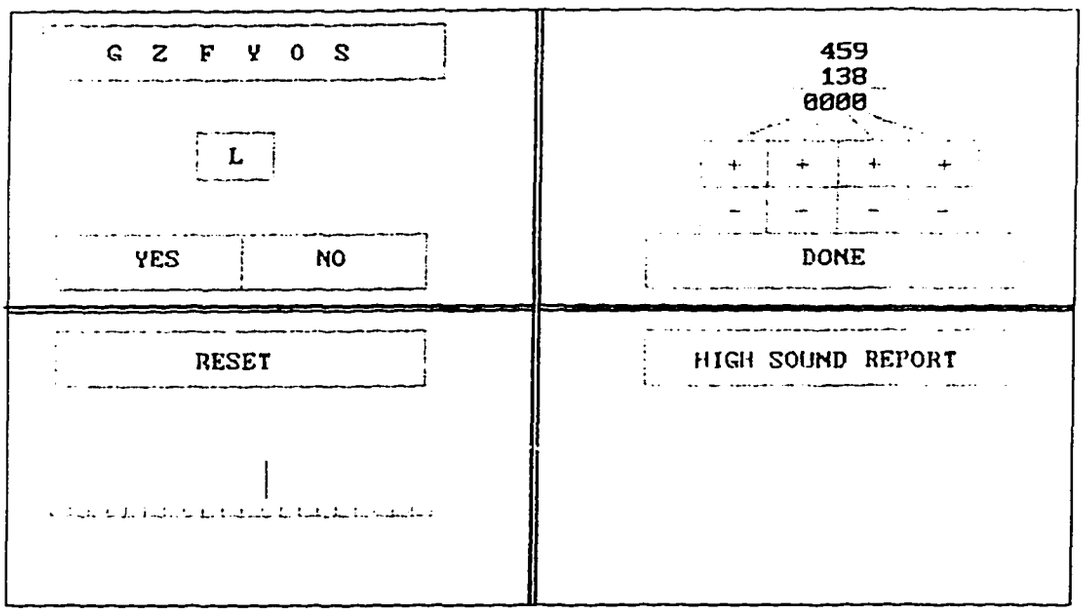
Please be reminded that all research involving human subjects must be accomplished in full accord with the policies and procedures of Western Michigan University, as well as all applicable local, state, and federal laws and regulations. Any deviation from those policies, procedures, laws or regulations may cause immediate termination of approval for this project.

Thank you for your cooperation. If you have any questions, please do not hesitate to contact me.

Project Expiration Date: September 13, 1997

Appendix H

Computer-based Task Sample Screen



Appendix I

Satisfaction and Stress Level Questionnaire

Satisfaction and Stress Questionnaire

Subject Number: _____

Instructions: Please write short answers to the following questions.

1. Originally, what did you believe to be the purpose of this research?

2. Now, what do you believe to be the purpose of the study?

3. If your answers to 1 and 2 are different, when did you change your belief?

   _____ During the Hourly pay condition
   _____ During the Individual Incentive pay condition
   _____ During the Group Incentive pay condition

4. Rank the pay conditions based on which you preferred the most:

   1. Most preferred: _____
   2. Second most preferred: _____
   3. Least preferred: _____

5. Please describe why you ranked them as you did:

6. Rank the pay conditions based on which was the most stressful to you:

   1. Most stressful: _____
   2. Second most stressful: _____
   3. Least stressful: _____

7. Please describe why you ranked them as you did:

8. Rank the pay conditions based on which was the most satisfying to you:

   1. Most satisfying: _____
   2. Second most satisfying: _____
   3. Least satisfying: _____

9. Please describe why you ranked them as you did:

10. In the future if you had the choice, which pay system would you choose to work under?

11. How many other people participated in your incentive group during the group incentive condition? _____

12. How do you know that?

13. Additional Comments:

Appendix J

Pay Scale

INCENTIVE PAY SYSTEM
($0.10/ 100 points)

Composite Score	Pay	Composite Score	Pay	Composite Score	Pay
100	$0.10	4000	$4.00	7900	$7.90
200	$0.20	4100	$4.10	8000	$8.00
300	$0.30	4200	$4.20	8100	$8.10
400	$0.40	4300	$4.30	8200	$8.20
500	$0.50	4400	$4.40	8300	$8.30
600	$0.60	4500	$4.50	8400	$8.40
700	$0.70	4600	$4.60	8500	$8.50
800	$0.80	4700	$4.70	8600	$8.60
900	$0.90	4800	$4.80	8700	$8.70
1000	$1.00	4900	$4.90	8800	$8.80
1100	$1.10	5000	$5.00	8900	$8.90
1200	$1.20	5100	$5.10	9000	$9.00
1300	$1.30	5200	$5.20	9100	$9.10
1400	$1.40	5300	$5.30	9200	$9.20
1500	$1.50	5400	$5.40	9300	$9.30
1600	$1.60	5500	$5.50	9400	$9.40
1700	$1.70	5600	$5.60	9500	$9.50
1800	$1.80	5700	$5.70	9600	$9.60
1900	$1.90	5800	$5.80	9700	$9.70
2000	$2.00	5900	$5.90	9800	$9.80
2100	$2.10	6000	$6.00	9900	$9.90
2200	$2.20	6100	$6.10	10000	$10.00
2300	$2.30	6200	$6.20	10100	$10.10
2400	$2.40	6300	$6.30	10200	$10.20
2500	$2.50	6400	$6.40	10300	$10.30
2600	$2.60	6500	$6.50	10400	$10.40
2700	$2.70	6600	$6.60	10500	$10.50
2800	$2.80	6700	$6.70	10600	$10.60
2900	$2.90	6800	$6.80	10700	$10.70
3000	$3.00	6900	$6.90	10800	$10.80
3100	$3.10	7000	$7.00	10900	$10.90
3200	$3.20	7100	$7.10	11000	$11.00
3300	$3.30	7200	$7.20	11100	$11.10
3400	$3.40	7300	$7.30	11200	$11.20
3500	$3.50	7400	$7.40	11300	$11.30
3600	$3.60	7500	$7.50	11400	$11.40
3700	$3.70	7600	$7.60	11500	$11.50
3800	$3.80	7700	$7.70	11600	$11.60
3900	$3.90	7800	$7.80	11700	$11.70

Composite Score	Pay	Composite Score	Pay	Composite Score	Pay
11800	$11.80	16000	$16.00	20200	$20.20
11900	$11.90	16100	$16.10	20300	$20.30
12000	$12.00	16200	$16.20	20400	$20.40
12100	$12.10	16300	$16.30	20500	$20.50
12200	$12.20	16400	$16.40	20600	$20.60
12300	$12.30	16500	$16.50	20700	$20.70
12400	$12.40	16600	$16.60	20800	$20.80
12500	$12.50	16700	$16.70	20900	$20.90
12600	$12.60	16800	$16.80	21000	$21.00
12700	$12.70	16900	$16.90	21100	$21.10
12800	$12.80	17000	$17.00	21200	$21.20
12900	$12.90	17100	$17.10	21300	$21.30
13000	$13.00	17200	$17.20	21400	$21.40
13100	$13.10	17300	$17.30	21500	$21.50
13200	$13.20	17400	$17.40	21600	$21.60
13300	$13.30	17500	$17.50	21700	$21.70
13400	$13.40	17600	$17.60	21800	$21.80
13500	$13.50	17700	$17.70	21900	$21.90
13600	$13.60	17800	$17.80	22000	$22.00
13700	$13.70	17900	$17.90	22100	$22.10
13800	$13.80	18000	$18.00	22200	$22.20
13900	$13.90	18100	$18.10	22300	$22.30
14000	$14.00	18200	$18.20	22400	$22.40
14100	$14.10	18300	$18.30	22500	$22.50
14200	$14.20	18400	$18.40	22600	$22.60
14300	$14.30	18500	$18.50	22700	$22.70
14400	$14.40	18600	$18.60	22800	$22.80
14500	$14.50	18700	$18.70	22900	$22.90
14600	$14.60	18800	$18.80	23000	$23.00
14700	$14.70	18900	$18.90	23100	$23.10
14800	$14.80	19000	$19.00	23200	$23.20
14900	$14.90	19100	$19.10	23300	$23.30
15000	$15.00	19200	$19.20	23400	$23.40
15100	$15.10	19300	$19.30	23500	$23.50
15200	$15.20	19400	$19.40	23600	$23.60
15300	$15.30	19500	$19.50	23700	$23.70
15400	$15.40	19600	$19.60	23800	$23.80
15500	$15.50	19700	$19.70	23900	$23.90
15600	$15.60	19800	$19.80	24000	$24.00
15700	$15.70	19900	$19.90	24100	$24.10
15800	$15.80	20000	$20.00	24200	$24.20
15900	$15.90	20100	$20.10	24300	$24.30

Appendix K

Data Recording Form

Honeywell Dissertation- Subject Number _____

		Subtask Scores				Subtask % Correct					
Session	Score	Mem.	Math	Visual	Aud.	Mem.	Math	Visual	Aud.	# Corr.	Pay
TRNG											
1											
2											
3											
4											
5											
6											
7											
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Appendix L

Subjects' Raw Data

Subject 1

Number of Points Earned per Session

Session	Composite	Memory	Math	Visual	Auditory
1	11,166	2,810	2,500	3,196	2,660
2	12,469	3,290	3,225	3,314	2,540
3	13,143	3,400	3,715	3,348	2,680
4	11,423	3,090	3,010	2,923	2,400
5	12,410	3,300	3,420	3,190	2,500
6	13,191	3,350	4,025	3,176	2,640
7	12,954	3,240	4,065	3,129	2,520
8	13,803	3,460	4,465	3,158	2,720
9	13,462	3,450	4,195	3,207	2,610
10	13,663	3,360	4,515	3,198	2,590
11	13,131	3,280	4,255	3,026	2,570
12	13,627	3,280	4,645	3,092	2,610
13	12,281	3,060	3,940	2,961	2,320
14	10,059	2,680	2,985	2,434	1,960
15	11,941	2,890	3,980	2,731	2,340
16	10,852	2,630	3,710	2,532	1,980
17	11,213	2,690	3,915	2,458	2,160
18	10,218	2,420	3,590	2,258	1,950
19	13,598	3,160	4,910	3,028	2,500
20	12,588	2,970	4,420	2,818	2,380
21	11,648	2,760	4,160	2,528	2,200
22	11,490	2,550	4,325	2,485	2,130
23	11,838	2,740	4,360	2,568	2,170

Subject 2

Number of Points Earned per Session

Session	Composite	Memory	Math	Visual	Auditory
1	11,647	2,990	3,160	3,097	2,400
2	10,597	2,660	2,900	2,820	2,210
3	9,339	2,530	2,295	2,484	2,030
4	11,753	2,930	3,410	2,973	2,440
5	11,187	2,720	3,530	2,677	2,260
6	11,947	3,140	3,440	3,957	2,410
7	14,508	3,160	5,615	3,143	2,590
8	14,452	3,110	5,485	3,047	2,510
9	14,787	3,280	5,790	3,147	2,570
10	13,341	2,950	5,235	2,856	2,300
11	13,858	2,860	5,825	2,833	2,340
12	15,445	3,180	6,650	3,125	2,490
13	14,630	2,910	6,225	3,025	2,470
14	13,560	2,780	5,705	2,785	2,290
15	13,528	2,720	5,840	2,768	2,200
16	13,443	2,650	5,980	2,603	2,210
17	12,349	2,640	5,385	2,404	1,920
18	11,920	2,310	5,480	2,250	1,880
19	12,408	2,260	5,835	2,353	1,960
20	9,527	1,980	4,170	1,877	1,500
21	7,805	1,550	3,450	1,495	1,310
22	10,176	2,030	4,590	1,976	1,580
23	12,339	2,270	5,620	2,389	2,060
24	12,044	2,280	5,620	2,304	1,840
25	10,952	2,080	4,990	2,122	1,760
26	9,082	1,650	4,215	1,677	1,540
27	13,408	2,570	6,280	2,468	2,090
28	11,635	2,210	5,330	2,185	1,910
29	11,232	2,020	5,440	2,072	1,700
30	13,582	2,530	6,350	2,542	2,160
31	11,610	2,230	5,175	2,215	1,990
32	11,174	2,030	5,410	2,054	1,680
33	11,457	2,060	5,545	2,102	1,750

Subject 3

Number of Points Earned per Session

Session	Composite	Memory	Math	Visual	Auditory
1	9,164	1,600	2,230	3,284	2,050
2	11,380	2,440	3,215	3,295	2,430
3	11,103	2,070	3,285	3,258	2,490
4	12,517	2,340	4,090	3,387	2,700
5	11,370	2,350	3,905	2,875	2,240
6	12,049	2,580	3,665	3,314	2,490
7	11,281	2,090	3,910	2,971	2,310
8	13,255	3,070	4,490	3,335	2,360
9	12,918	3,110	4,385	3,133	2,290
10	12,573	2,860	4,335	3,108	2,270
11	14,160	3,070	5,410	3,340	2,340
12	14,493	3,200	5,510	3,383	2,400
13	12,994	2,680	5,370	2,884	2,060
14	14,367	3,080	6,005	3,132	2,150
15	13,221	2,600	5,240	3,161	2,220
16	14,408	2,550	6,290	3,188	2,380
17	13,745	2,860	5,475	3,230	2,180
18	13,540	2,940	5,175	3,275	2,150
19	12,483	2,700	5,070	2,943	1,770
20	14,563	3,130	6,180	3,163	2,090
21	14,323	2,890	6,170	3,073	2,190
22	16,303	3,160	7,275	3,378	2,490
23	13,038	2,820	5,195	2,983	2,040
24	14,621	2,860	6,420	3,151	2,190
25	13,396	2,800	5,785	2,841	1,970
26	13,120	2,450	6,100	2,720	1,850
27	14,438	2,830	6,515	3,013	2,080
28	15,459	3,040	7,305	3,014	2,100
29	13,880	2,780	6,315	2,955	1,830
30	14,569	2,760	6,860	2,939	2,010
31	13,907	2,850	6,150	2,847	2,060
32	13,499	2,480	6,105	2,854	2,060
33	15,188	2,870	7,150	3,048	2,120
34	16,177	3,070	7,420	3,367	2,320
35	15,492	3,020	7,385	2,967	2,120

Subject 4

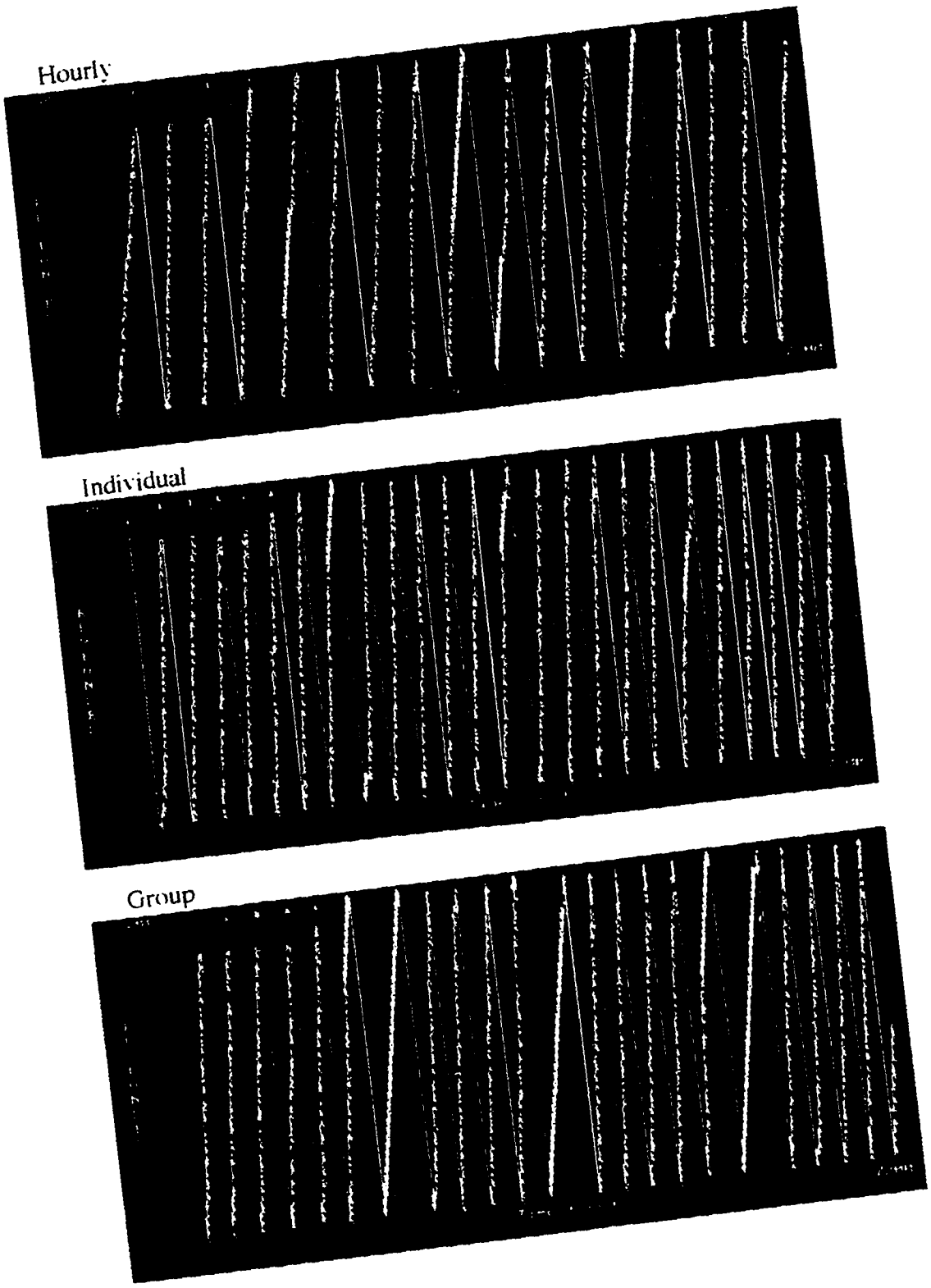
Number of Points Earned per Session

Session	Composite	Memory	Math	Visual	Auditory
1	9,361	2,550	2,175	2,536	2,100
2	13,964	3,380	4,505	3,409	2,670
3	14,163	3,450	4,325	3,588	2,800
4	13,897	3,170	4,740	3,327	2,660
5	12,813	2,980	4,055	3,208	2,570
6	12,472	2,960	4,060	2,982	2,470
7	12,260	2,950	4,060	2,920	2,330
8	14,958	3,520	5,120	3,488	2,830
9	14,709	3,500	4,855	3,534	2,820
10	12,718	2,910	4,560	2,978	2,270
11	13,507	3,150	4,705	3,122	2,530
12	12,744	2,910	4,400	2,954	2,480
13	11,516	2,640	4,125	2,691	2,060
14	11,308	2,680	3,865	2,613	2,150
15	11,418	2,640	4,045	2,563	2,170
16	11,398	2,580	4,310	2,488	2,020
17	11,597	2,540	4,475	2,542	2,040
18	12,844	2,890	4,775	2,909	2,270
19	11,242	2,410	4,495	2,457	1,880
20	13,355	2,980	5,000	3,075	2,350
21	11,442	2,610	4,200	2,572	2,060
22	12,059	2,870	4,210	2,789	2,190
23	11,966	3,230	3,205	3,041	2,490

Appendix M

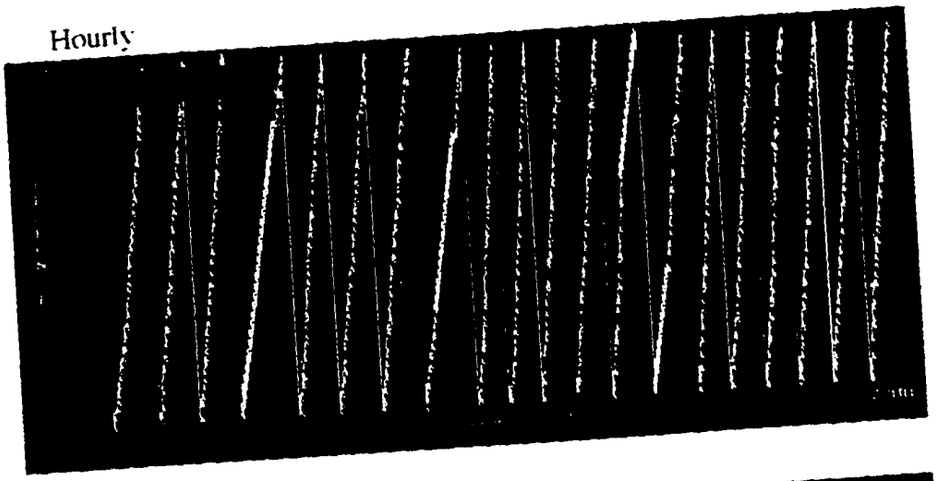
Cumulative Records

Subject 1

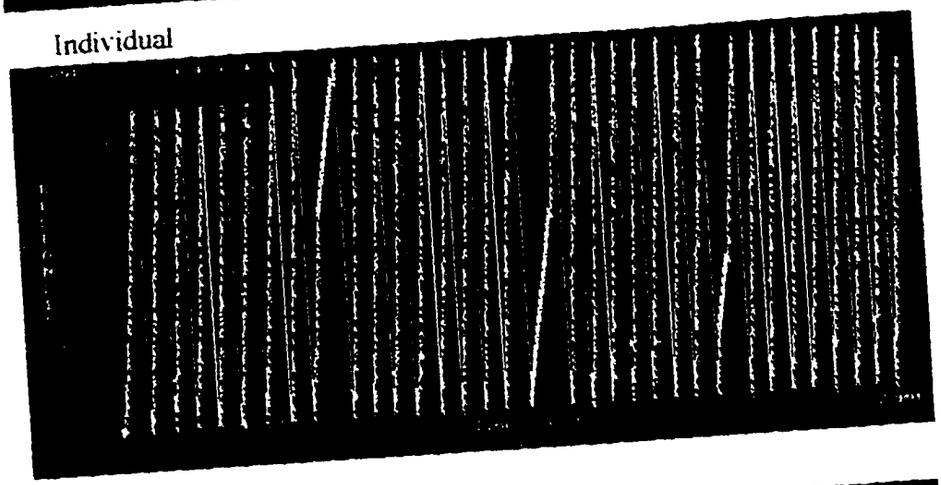


Subject 2

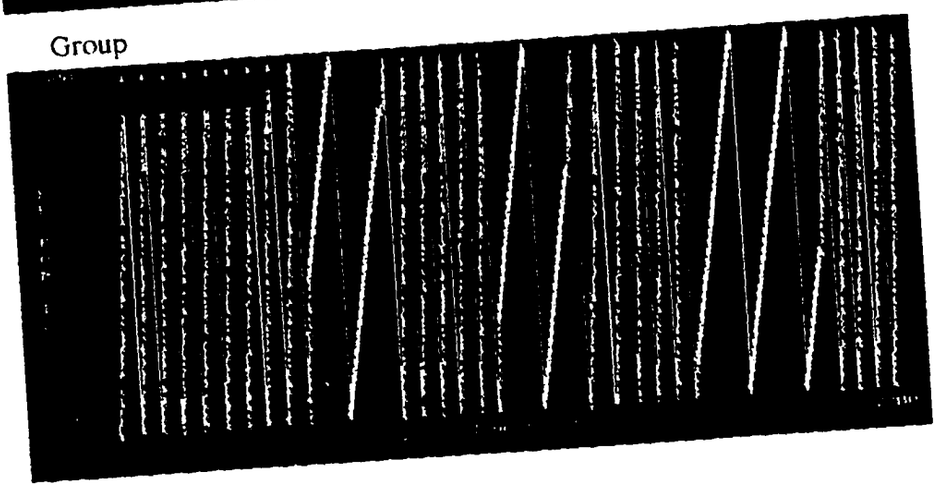
Hourly



Individual



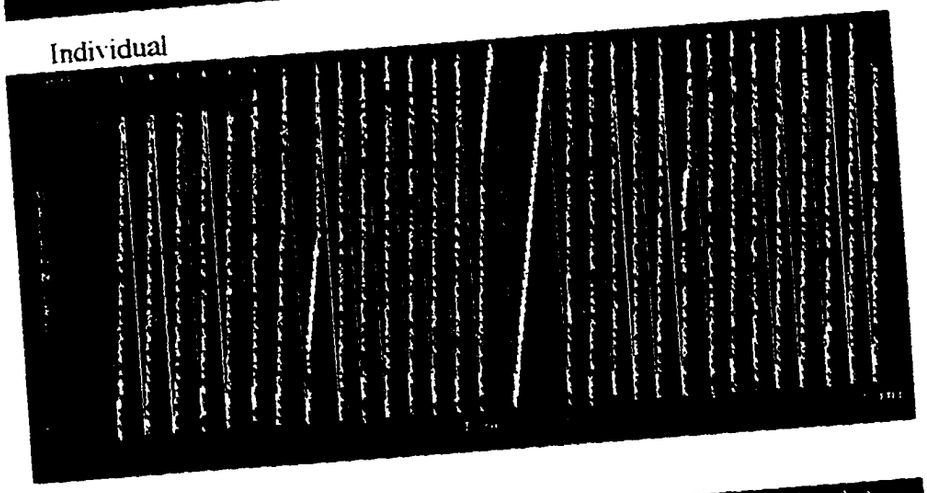
Group



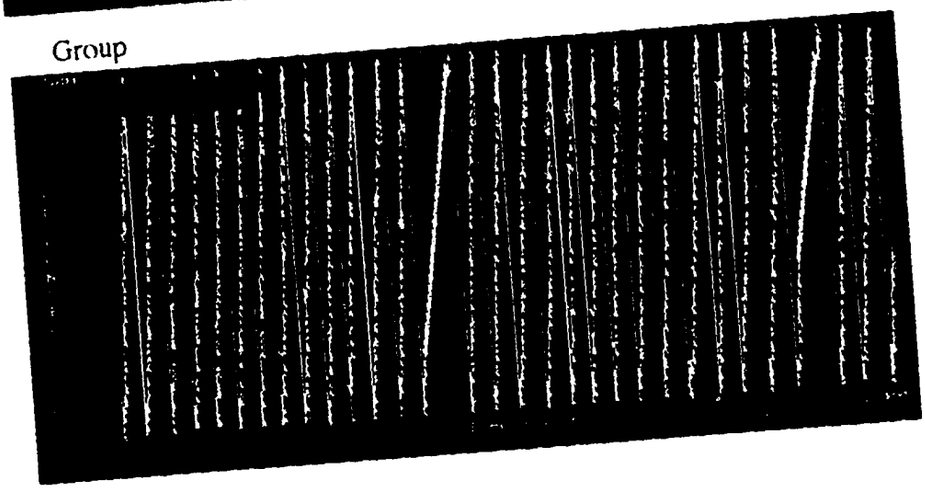
Subject 3

Hourly

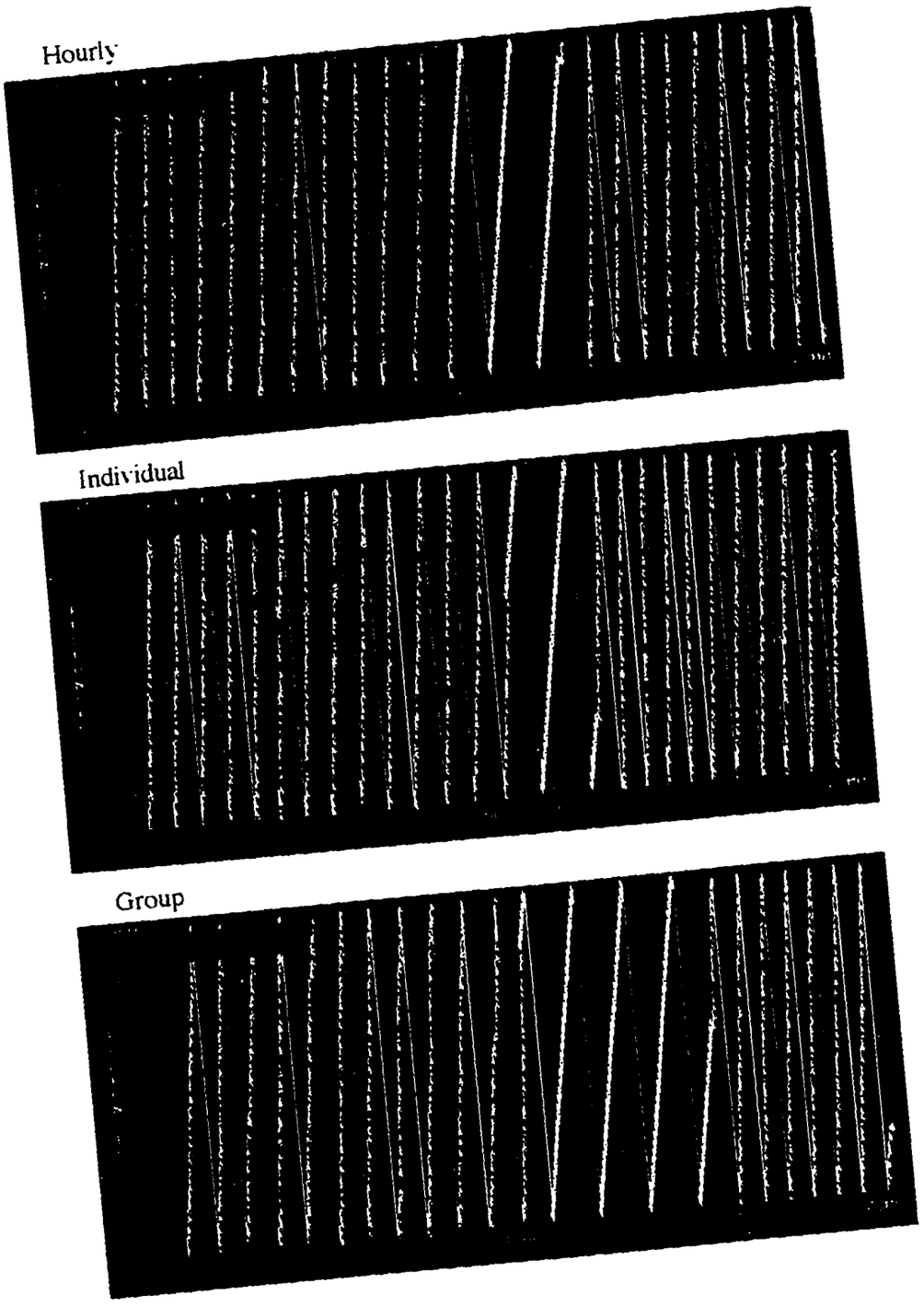
Individual



Group



Subject 4



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