The Effects of Individual and Social Comparison Graphic Feedback on Incented Performance

Yngvi Freyr Einarsson

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THE EFFECTS OF INDIVIDUAL AND SOCIAL COMPARISON GRAPHIC FEEDBACK ON INCENTED PERFORMANCE

by

Yngvi Freyr Einarsson

A thesis submitted to the Graduate College in partial fulfillment of the requirements for the degree of Master of Arts Psychology
Western Michigan University
December 2016

Thesis committee:

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This study examined whether graphic displays of individual performance and graphic displays of the individual performance of each group member would increase performance when individuals were paid monetary incentives. All participants were paid piece-rate pay and there were three conditions: (a) no feedback, (b) graphic display of individual performance, and (c) graphic display of the performance of each group member. Participants were 80 undergraduate students who performed a computerized data entry task. The main dependent variable was the number of correctly completed entries. A monotone ANCOVA was used to detect performance differences, using data from the first session as a covariate to control for keyboard proficiency. As hypothesized, the group that received graphic displays of the performance of each group member performed the highest, followed by the group that received graphic displays of individual performance, and then by the group that did not receive feedback. The results indicate that both types of graphic feedback can enhance incented performance, in contrast to the results of studies that have examined other types of feedback (e.g., Johnson, Dickinson, & Huitema, 2008). The findings also extend VanStelle (2012), who found that those who received graphic displays of the performance of each group member performed significantly better than those who received graphic displays of only their own performance when they were paid hourly.
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I feel privileged for the opportunities that my education at Western Michigan University has afforded me. During my time here I have been introduced to a substantial number of awe-inspiring graduate students, faculty, and professionals in the field of behavior analysis. From them I have learned so much about my field of science, about science in general, and about the application of behavior analysis in organizations and society. I am even lucky enough to be able to call some of them my friends and/or mentors today.

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Yngvi Freyr Einarsson
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INTRODUCTION

Feedback has been, and continues to be, the most commonly used intervention in organizational behavior management (OBM) (Alvero, Bucklin, & Austin, 2001; Balcazar, Hopkins, & Suarez, 1985-1986; Balcazar, Shupert, Daniels, Mawhinney, & Hopkins, 1989; Nolan, Jarema, & Austin, 1999; VanStelle et al., 2012). In the latest review of articles published in the *Journal of Organizational Behavior Management (JOBM)*, VanStelle et al. (2012) reported that during the past three decades feedback was implemented in 65% to 71% of all interventions, either alone or in combination with other performance management procedures. There are several reasons for its popularity. In comparison to other interventions, feedback, when used alone, is low cost and simple, and can have a significant impact on performance (Alvero et al., 2001; Balcazar et al., 1985-1986; Prue & Fairbank, 1981). Also, performance measures are the bedrock of any effective intervention and once those measures have been developed, it takes relatively little additional effort to create a feedback system that not only complements the intervention but may enhance its effectiveness (Balcazar et al., 1985-1986; Bucklin, McGee, & Dickinson, 2003; Condly, Clark, & Stolovich, 2003; Johnson, Dickinson, & Huijtema, 2008).

Although various definitions of feedback have been proposed by individuals in the OBM field, most have two common features: Feedback is based on the past performance of an individual or group and its purpose is to “guide”, “adjust”, or “alter” future performance (Brethower, 1972; Connellan, 1978; Daniels & Bailey, 2014; Prue & Fairbank, 1981; Rummler & Brache, 1995). For example, Prue and Fairbank (1981) defined feedback as information about the quantity or quality of past performance that provides “…the recipient with as much
information as is necessary to specifically identify instances of appropriate and inappropriate goal-directed behavior …” (p. 9). Similarly, over thirty years later, Daniels and Bailey stated that in order for information to be feedback it must tell performers where they stand in relation to a target or goal and it must tell them what to do to improve. These definitions conform to the historical roots of the term “feedback” in psychology in general, which originated from cybernetics and control systems engineering (Duncan & Bruwelheide, 1985-1986; Peterson, 1982), wherein “feedback allows for error correction in that the information about the present state or functioning of a system is used to control the future state or functioning of that system” (Duncan & Bruwelheide, 1985-1986, p. 93).

The possible behavioral functions of feedback have been discussed for many years (Alvero et al., 2001; Balcazar et al., 1985-1986; Duncan & Bruwelheide, 1985-1986; Peterson, 1982; Prue & Fairbank, 1981). Feedback has been conceptualized as a conditioned reinforcer (e.g., Komaki, Barwick, & Scott, 1978), a discriminative stimulus (e.g., Daniels & Bailey, 2014), rule-governed analogies of a conditioned reinforcer and a discriminative stimulus (e.g., Agnew & Redmon, 1992), and as a motivating operation (MO) (e.g., Agnew, 1998). Attempts to identify and isolate the behavioral function(s) of feedback across studies and applications have been hampered by the fact that feedback applications differ considerably. For example, Ford (1980), in one of the earliest reviews of feedback in OBM, identified and classified feedback applications along several dimensions in order to systematize and thus lead to greater understanding of “…this cumbersome and disorganized aggregation of methods and procedures” (p. 183). In 1982, Peterson even argued that behavior analysts would be best served by eliminating the use of the word feedback and by instead providing a more detailed description of the actual components used and the process by which they were communicated to performers.
When considering the functions of feedback abstractly, without reference to a particular application, it is now widely acknowledged that feedback can serve any one of the functions mentioned earlier or several of the functions at once (Balcazar et al., 1985-1986; Duncan & Bruwelheide, 1985-1986; Mangiapanello & Hemmes, 2015; Peterson, 1982; Prue & Fairbank, 1981). Perhaps Peterson captured the conceptual crux of the question most succinctly, stating:

The question about which function it [feedback] serves or even whether it serves a dual function is inappropriate. Feedback, or information about past performance, can potentially serve any of a number of behavioral functions. It is, first and foremost, a physical stimulus, irrespective of which form it takes, and therefore could have some or all of the possible behavioral effects of any stimulus. (p. 101)

Identification of the behavioral function(s) of feedback in particular applications is also complicated because (a) in ongoing management procedures, feedback both precedes and follows the targeted performance, (b) organizational contingencies that may influence the effectiveness of feedback are complex and often not specified, and (c) the conditioning histories of employees, particularly within the organization, are unknown. Further, OBM interventions tend to be molar rather than molecular, precluding analyses of moment-to-moment behavior-environment relations and effects (Michael, 2004; Olson, Laraway, & Austin, 2001).

Although the behavioral function of feedback has been elusive, or perhaps because it has been elusive, Balcazar et al. (1985-1986), capitalizing on Prue and Fairbank’s (1981) identification of feedback parameters used in OBM applications, evaluated the effectiveness of feedback applications by parameter. Their review included applied studies published in four major journals over a 10-year period. Alvero et al. (2001) replicated this review for applied studies published in the same journals between 1985 and 1998. Both reviews determined the
percentage of feedback applications with particular parameters that resulted in consistent, mixed, or no effects.

While not the purpose of these reviews, they, along with VanStelle et al. (2012), reveal the difficulty of determining the relative effectiveness of individual feedback components: (a) feedback procedures are often used with other interventions (i.e., goal setting and rewards), (b) different feedback procedures are often used together (i.e., vocal praise and graphic feedback), and (c) feedback procedures vary along many different dimensions (i.e., individual vs. group, written vs. graphic, private vs. public) and thus cannot be exclusively categorized. For example, both Balcazar et al. (1985-1986) and Alvero et al. (2001) found that a majority of studies, 63% and 71% respectively, implemented feedback with other interventions. Additionally, when VanStelle (2012) reexamined the studies included in Alvero et al., she ascertained that 84% of the feedback-alone studies used multiple types of feedback. One-hundred percent of the feedback-alone studies (N=52) published in JOBМ the following decade (1998-2009) used multiple types of feedback (VanStelle, 2012). Finally, feedback procedures classified together vary. In the studies reviewed by Alvero et al., graphic feedback differed with respect to the type of performance displayed (individual, group, or individual and group) and privacy (private or public). All told, for graphic feedback applications that were classified together, the graphic displays were presented in seven different ways. The content and privacy of the feedback, as well as the different combinations, could influence its effectiveness.

While these structural reviews of feedback provide useful guidance and underscore the flexibility of feedback, only direct experimental comparisons can isolate the effects of a particular feedback parameter and assess its effectiveness relative to others. Johnson (2013) addressed the need to identify the parameters of feedback that result in its successful application
and his examination of the effects of objective versus evaluative feedback provides an example of the importance of a clear component analysis. In a well-controlled laboratory simulation, Johnson investigated the effects of (a) no feedback, (b) objective feedback, (c) evaluative feedback, and (d) objective and evaluative feedback combined. Participants who received objective feedback or evaluative feedback improved their performance by 17%. Participants who received both improved their performance by 30%. Statistical analyses confirmed the differences, indicating that performance under the combined feedback condition was significantly higher than under the other three conditions, and performance under the other two feedback conditions (objective alone and evaluative alone) was significantly higher than under the no feedback condition.

VanStelle (2012), similar to Johnson (2013), conducted an experimental simulation to determine the relative effects of different feedback parameters. VanStelle noted discrepancies in the results reported by Balcazar et al. (1985-1986) and Alvero et al. (2001) with respect to a basic content parameter: whether feedback displays depict individual performance, group performance, or both. Balcazar et al. found that displays depicting group performance and those depicting both individual and group performance had similar effects on performance. In contrast, Alvero et al. (2001) found that displays showing group performance had considerably better effects than those showing both. Goltz, Citera, Jensen, Favero, and Komaki (1989), in a field study, found results that were inconsistent with both reviews. They found that displays of individual and group performance resulted in significantly better performance than displays of group performance.

Because of the above discrepancies related to feedback content and the fact that feedback on individual performance has been the most common type of feedback provided to workers in
OBM studies (Alvero et al., 2001; Balacazar et al., 1985-1986), VanStelle (2012) compared the effects of graphic feedback displays that depicted the individual’s performance (a) alone, (b) along with the group’s average performance, or (c) along with the individual performance of each member of the group. Although these three types of displays had not been directly compared before, prior studies had isolated the effects of each of them, which is another reason why VanStelle (2012) chose to compare these particular contents.

Graphic displays of individual performance have enhanced performance when added to (a) individualized goal setting and vocal feedback (Wilk & Redmon, 1998) and (b) graphic displays of the group’s average performance (Goltz et al., 1989). Graphic displays of the individual performance of each member of the group have enhanced performance when added to (a) task clarification (Anderson, Crowell, Hantula, & Siroky, 1988; Crowell, Anderson, Abel, & Sergio, 1988) and (b) goal-setting and graphic displays of the group’s average performance (Ludwig, Geller, & Clarke, 2010). It should be noted that although the combined results of Goltz et al. and Ludwig et al. appear to demonstrate that displays of both individual performance and the group’s average performance result in higher performance than displays of only the group’s performance, in Goltz et al., performance failed to reverse when individual performance was removed from the feedback display and in Ludwig et al. the enhancing effects of the individual feedback may have been influenced by the preceding goal-setting intervention.

In VanStelle’s study (2012), participants were randomly assigned to one of the three graphic display groups that depicted: individual performance (IP), individual and the group’s average performance (IGP), or the individual performance of each group member (IPGM). They performed a computerized data entry task that simulated the job of a medical data entry clerk and the dependent variable was the number of correctly completed patient records. Each participant
completed five 30-minute sessions. Performers in the IP, IGP, and IPGM conditions completed an average of 14%, 21%, and 31% more records, respectively, during their fifth session than during their first. A monotone ANCOVA revealed that participants in the IPGM condition completed significantly more records than those in the IGP condition, who, in turn, completed significantly more records than those in the IP condition.

The current study extended the study conducted by VanStelle (2012), examining whether graphic displays of individual performance and graphic displays of the individual performance of each group member would increase performance when individuals were paid monetary incentives. Although several studies have documented that workers who receive feedback perform better when they are paid monetary incentives than when they are paid hourly (Frisch & Dickinson, 1990; Gaetani, Hoxeng, & Austin, 1985; Stajkovic & Luthans, 2003), the results of studies that have examined whether workers who receive monetary incentives perform better when they receive feedback have been inconclusive (Bucklin et al., 2003; Johnson et al., 2008; Smoot & Duncan, 1997). As noted by Johnson et al., in addition to being practically important, the question of whether feedback enhances the effectiveness of monetary incentives is conceptually interesting because incentives are themselves a form of feedback. The main purpose of the current study was to determine whether feedback displays that have been shown to increase performance when individuals are paid hourly (VanStelle, 2012) would also increase performance when individuals are paid monetary incentives. This determination is consistent with advice Balcazar et al. (1985-1986) offered thirty years ago: namely, that feedback systems should be studied under particular reinforcement systems in order to determine how to construct them so that they will augment the reinforcement system.
Several authors have discussed why feedback might enhance the effectiveness of behavioral consequences and, more specifically, monetary incentives. (Balcazar et al., 1985-86; Bucklin et al., 2003; Duncan & Bruwelheide, 1985-86; Fairbank & Prue, 1982; Johnson et al., 2008; Smoot & Duncan, 1997). Balcazar et al. (1985-1986) suggested that feedback might initially evoke more productive behavior as a discriminative stimulus because of generalization. That is, in the past, when feedback has been provided to individuals, it is likely that it has been correlated with differential rewards, and thus the discriminative effects of feedback generalize to the current situation. Once higher levels of performance occur, they might then be maintained by additional monetary incentives. Moreover, given the correlation of the feedback with varying amounts of incentives, the feedback would be likely to become a discriminative stimulus in the current situation, maintaining its evocative effect.

Another possibility is that feedback may function as a conditioned reinforcer because of being paired with the monetary incentives. In many situations, feedback is provided more frequently and immediately than monetary incentives. Behavior analysts have repeatedly maintained that behavioral consequences should be provided as immediately and frequently as possible in order to maximize their effectiveness (Braksick, 2007; Brown, 1982; Daniels & Bailey, 2014; Petrock, 1978). Thus, feedback may improve performance because it is a more immediate and frequent consequence.

If feedback functions as a more potent discriminative stimulus, conditioned reinforcer, or both when incentives are present than when they are absent, the frequency of feedback would be expected to influence its effectiveness more when individuals are paid incentives than when they are paid hourly. Results of a study conducted by Kang, Oah, and Dickinson (2003) support this analysis. In that study, participants who were paid incentives performed significantly better when
they were given feedback after every experimental session than participants who were given feedback after every fourth session. Feedback frequency did not affect the performance of participants who were paid hourly.

Many behavior analysts have argued that feedback, as typically delivered in work settings, violates the temporal requirements of discriminative stimuli and conditioned reinforcers (Agnew & Redmon, 1992; Peterson, 1982). Specifically, even though performance feedback is often more frequent and immediate than incentives, feedback is still presented too far before or after the targeted performance to function as a discriminative stimulus or conditioned reinforcer. Instead, these authors have suggested the effects of feedback can best be explained in terms of rule control (Malott, 1993). That is, the feedback serves to evoke self-statements related to the delayed contingencies, which then directly evoke productive behavior. Feedback is more likely to evoke such rule statements and, in turn, rule statements are more likely to evoke productive behavior, if feedback is correlated with functional consequences (Bucklin et al., 2003; Kang et al., 2003). Regardless of how feedback affects performance, all of the preceding analyses suggest that feedback will be more effective when it is correlated with functional, differential consequences such as monetary incentives, and thus could, when presented more immediately and frequently, enhance their effectiveness.

Many individuals have also suggested that feedback may function as a motivating operation (Bucklin et al., 2003; Duncan & Bruwelheide, 1985-86; Johnson et al., 2008; Peterson, 1982). As a motivating operation, feedback may increase the reinforcing value of work accomplishments that precede the receipt of incentives and evoke behavior that results in those accomplishments; however, the motivating operations relevant to the incentives are just as likely to have those effects and their presence provides a more parsimonious explanation. On the other
hand, it may be useful at this point to distinguish between objective and evaluative feedback because it is quite possible, as suggested by Johnson (2013), that evaluative feedback, unlike objective feedback, may function as a motivating operation.

Objective feedback can be defined as measureable, factual data about past performance that does not indicate and/or is not related to how well an individual is performing. Historically, this type of feedback has been referred to as “knowledge of results” (Annett, 1969; Ilgen, Fisher, & Taylor, 1979). In contrast, evaluative feedback indicates how well the individual is performing in comparison to some metric and, further, is often accompanied by social approval or disapproval. Individuals who have studied the effects of feedback have, over the years, repeatedly stated that those effects depend not only on its specificity and the extent to which it is correlated with functional, differential rewards, but also the extent to which it permits the performer to assess his or her own performance (Annett, 1969; Ilgen et al., 1979; Kopelman, 1986; Prue & Fairbank, 1981). No doubt because of this, most current definitions of performance feedback, similar to the ones provided earlier (Daniels & Bailey, 2014; Prue & Fairbank, 1981), include a reference to an evaluative or comparative metric (i.e., a goal, target, or performance standard). Evaluative feedback, in contrast to objective feedback, may function as a motivating operation by revealing a difference between current and acceptable or noteworthy performance. That is, it may, as a reflexive conditioned motivating operation (Michael, 1982, 2007), make a decrease in the difference reinforcing, and evoke behavior that decreases the difference. This effect would be independent of the incentives, but supplement the motivating operations related to the incentives. Further, as analyzed by Johnson (2013), objective feedback, in addition to evaluative feedback, may be required for maximum effects because the objective feedback
indicates ongoing current performance; that is, it provides the data necessary for comparison between current performance and the evaluative metric.

The current study compared the effects of two types of graphic feedback displays. One displayed only the individual’s performance; the other displayed the individual’s performance along with the performance of others. While both of these displays provide objective feedback, they differ considerably with respect to evaluative feedback. Graphic individual feedback permits individuals to assess how well they are performing in comparison to their past performance; however, it does not contain an explicit evaluative metric. In contrast, when the individual performance of all group members is displayed, the performance of others provides a very salient evaluative metric: ranking within the group. An analysis of why this latter type of feedback may enhance performance, although speculative, will be considered next.

Due to a long reinforcement history of social consequences, individuals typically have a history of being reinforced for performing well in a group and punished for performing poorly (Guerin, 1993, 1994; McGinnies, 1970). Perhaps more importantly, only a few members can excel in a group and, in many group and team situations, only those that excel are routinely rewarded. For example, in sports and competitive academic contests such as spelling bees, only those that come in first, second, or third are lauded, in sales only the top sales representatives receive the coveted reward trip. Because most individuals in such groups are not among the few top performers, many people may have a stronger history of being punished or criticized for their performance rather than being rewarded for it, particularly when relative rankings are known and distributed to all of the group members. This history is likely to generalize to other settings, with the avoidance of low or comparatively lower rankings and anticipated aversive consequences controlling performance.
With a large enough group of people who perform differently, feedback about the individual performance of each worker may essentially set up multiple comparisons or sub-goals for each individual (with the exception of the top-ranked performer). Each successively higher rank could serve as a sub-goal, evoking behavior that progresses the individual towards that sub-goal, with progression to the top serving as a generalized reinforcer. If previous social contingencies, criticism and other forms of punishment have made low rankings aversive and/or praise and reinforcement have made high rankings reinforcing, then, similar to other forms of evaluation, the visual discrepancy between an individual’s ranking and the higher rankings of others could function as a reflexive motivating operation (Michael, 1982, 2007), making a decrease in the discrepancy reinforcing and evoking behaviors that decrease the discrepancy. This analysis is similar to Bandura’s (1978) social learning analysis of goals in which the discrepancy between an individual’s performance and a goal serves as a motivator for increased performance. It is also similar to an analysis based on relational frame theory (O’Hora & Maglieri, 2006; Tammemagi, O’Hora, & Maglieri, 2013). From that framework, goals evoke self-statements describing the on-going relation between a person’s current performance and a goal. As the discrepancy decreases, the self-statements related to the decrease serve as derived reinforcement for behaviors that lead to goal attainment.

Malott’s (1993) analysis of rule-governed behavior suggests that the discrepancy is likely to evoke a self-rule, such as “If I don’t get to work right now, I will look bad to both my peers and supervisor”, and then the self-statement acts as a motivating operation (learned aversive condition), setting up an escape contingency in which work behaviors immediately attenuate the aversiveness a little. Eliminating the discrepancy or moving up to at least a mid-ranking could allow the person to completely escape the self-generated aversive condition or at least reduce it
to the point where it no longer evokes incremental increases in work (i.e., “I am not the best, but am doing pretty well, and well enough that my peers and supervisor won’t criticize me too much, if at all.”).

Regardless of the behavioral mechanism, research indicates that individuals are more likely to compare themselves to those who perform similarly and increase their performance when it is only slightly below a peer’s (Hake, Vukelich, & Kaplan, 1973; Vukelich & Hake, 1974; Wood, 1989). This may be because individuals perceive that the performance increase is achievable, which is deemed necessary for goals to influence behavior (Locke & Latham, 2013). When a low or middle performer matches the performance level of the person above, the match could serve as a reinforcer (Daniels & Bailey, 2014). In addition, the performance levels of others that are further above (and are now only slightly above current performance) could evoke successive performance increases. This performance pattern would be especially likely if additional rewards, such as monetary incentives, were contingent upon the incremental increases in performance. For high performers, being at the top or close to the top could serve as a reinforcer, with the loss or potential loss of one of the top spots functioning as a direct or verbally-mediated negative reinforcer, sustaining high levels of performance. Alternatively, for very low performers, it is also possible that their relative ranking could serve to discourage or punish their efforts, decreasing performance.

To summarize, the graphic display of the individual performance of all performers may affect performance by adding motivating operations and behavioral contingencies related to the performer’s relative ranking in the group. Thus, this type of feedback might enhance performance when used along with monetary incentives, not simply because the feedback is
correlated with the incentives (as is the case with objective feedback), but because of the additional motivating operations and behavioral contingencies.

As indicated earlier, despite the conceptual analyses about why feedback might enhance incented performance, the results of three studies specifically designed to examine this question have been inconclusive (Bucklin et al., 2003; Johnson et al., 2008; Smoot & Duncan, 1997). Smoot and Duncan (1997, Experiment 2) paid participants a per-piece incentive for constructing parts made from pop beads. During the feedback condition, participants self-recorded each part they completed on a recording sheet provided by the experimenters. During the subsequent condition, participants did not record part completion. Performance actually increased when the self-recorded feedback was removed. The most plausible explanation for this unusual result is that removal of the self-recorded feedback procedure increased the amount of time available for making the parts. This is particularly likely given that the sessions were only 15 minutes and parts could be assembled quickly.

Bucklin et al. (2003) attempted to determine whether feedback enhanced the effects of monetary incentives using an ABAC within-subject design with seven participants. In the A phases, participants were paid individual incentives but were not given feedback. In phase B, participants were paid individual incentives but were also given individual feedback at the end of each session. In phase C, participants were paid hourly and, as in Phase B, received individual feedback at the end of each session. Participants performed a computerized work simulation task that presented four different work tasks simultaneously in different quadrants on the screen: an arithmetic task, a memory task, a visual monitoring task, and an auditory monitoring task (Elsmore, 1994). Participants earned points for correct responses. Performance increased for six out of seven participants when they were switched from phase A to phase B. However,
performance did not reverse when feedback was removed. Bucklin et al. speculated, per Balcazar et al.’s analysis (1985-1986), that feedback may have evoked higher levels of performance that were then maintained by the incentives. They concluded that the effects of feedback may not be reversible and thus recommended that this research question be examined using an experimental design that did not require a reversal phase.

In keeping with above recommendation, Johnson et al. (2008) used a 2 x 2 between-group design to examine the effects of incentives with and without feedback. There were four conditions: hourly pay without feedback, hourly pay with feedback, incentive pay without feedback and incentive pay with feedback. Participants performed a computerized data entry task that simulated the job of a bank proof operator. The dependent variable was the number of correctly completed checks. Participants in the feedback groups received within-session computerized feedback. Participants were not paid until the study was over so that the incentive pay could not function as feedback in the incentive pay without feedback condition. Performance was significantly higher for participants who were paid incentives than for those paid hourly; however, performance was not affected by feedback. That is, feedback did not increase performance under either hourly or incentive pay. Johnson et al. speculated that the reason feedback did not affect performance was due to the fact that the feedback was objective; that is, it lacked any type of evaluative component.

To examine this possibility, Johnson (2013), in a study described earlier, directly compared the effects of objective and evaluative feedback when participants were not paid. Both objective and evaluative feedback improved performance, but the combination of the two improved performance significantly more than either alone. Johnson suggested that objective feedback may have increased performance in his study but not in Johnson et al.’s study (2008)
because it was delivered by the experimenters rather than by the computer. In essence, when humans deliver feedback, it is not free from evaluation because the face-to-face delivery of feedback is likely to have been correlated with evaluation when individuals have received such feedback in the past. Because of this history, the effects generalize to the current situation, even when explicit evaluation is absent. As pointed out by Johnson, these effects might not extend to computer-delivered feedback.

Although the conceptual analyses presented earlier suggest that objective feedback would be expected to increase performance when individuals are paid monetary incentives, the results of Johnson et al. (2008) suggested that may not be the case. Rather, they suggested that even when feedback is correlated with functional, differential consequences, some degree of evaluation may also be required. The results of Johnson (2013) suggested that the face-to-face delivery of feedback, without accompanying explicit evaluation, increases performance, perhaps due to the historical correlation of feedback with evaluation. In the current study, the experimenter gave both types of graphic feedback displays (those depicting individual performance and those depicting the individual performance of each member of the group) to the participants. Thus, it was expected, given the results of Johnson (2013), that both would enhance incented performance because both added behavioral contingencies related to evaluation. However, because graphic display of the individual performance of each group member provides additional motivating operations and behavioral contingencies related to the ranking of performers (i.e., sub-goals, implicit peer social consequences, etc.), it was expected that this type of feedback would increase performance more than display of individual performance.

This study extended previous studies in a number of ways. First, it extended VanStelle (2012) by examining the effects of the two types of graphic displays when individuals were paid
monetary incentives. Although it was expected that display of the individual performance would not enhance incented performance as much as display of the individual performance of each group member, it was also anticipated that the differences might not be as great as those seen in VanStelle (2012). Rather, it was believed that the incentives might mitigate the differences. That is, if the experimenter-delivered display of individual performance does increase performance, the initial gains in performance might be maintained or even increase due to the additional amounts of money earned. Performance may maximize or at least increase, eliminating or reducing differences that would otherwise occur in the absence of incentives.

The above finding would be particularly compelling because of the potential detrimental effects that displays of the individual performance of each group member may have. Camden, Price, and Ludwig (2011) stated that this type of feedback has several advantages; specifically, that it holds employees publicly accountable, allows employees to compare their performance with that of their peers, and may introduce competition with their peers. Alternatively, as suggested earlier, the public accountability and peer comparison may result in the aversive control of performance due to historical contingencies that are likely to have emphasized peer and supervisory criticism for poor performance rather than social approval and praise for good performance (Guerin, 1993, 1994). Further, low rankings or large discrepancies between the performance of individuals and their peers could serve to directly or indirectly punish performance and elicit negative emotional reactions. Finally, although competitiveness is not always problematic, such displays could generate detrimental, rather than positive, forms of competition (Buskist & Morgan, 1988; Prue & Fairbank, 1981) and, once again, be a source of aversiveness for employees regardless of whether they are high or low performers. For example, Steigleder, Weiss, Cramer, and Feinberg (1978) found that both high and low performers
terminated competition when they were given the opportunity to do so. The authors concluded that the results of their study “revealed a striking point-to-point correspondence between the effects of a reinforcer in escape conditioning and the effects of competition cessation in competitive performance” (p. 1291). Over the years, concern for the potential aversiveness and punishing effects of the public display of individual performance has led several individuals to develop “rules of thumb” for the delivery of feedback and praise, such as “Individual feedback should be given privately; group feedback is most often posted publicly” (Daniels & Bailey, 2014, p. 165); “Praise publicly—punish privately” (Prue & Fairbank, 1981, p. 4). Regardless of outcome, it was hoped that the results of the current study would assist organizations to make informed decisions about which type of feedback to use, based on data regarding the relative effectiveness of each.

In addition to extending VanStelle (2012), this study also extended Johnson et al. (2008) by examining the effects of a different type of individual feedback on incented performance: graphic individual feedback. In Johnson et al. (2008), the computerized objective feedback participants received consisted only of the participant’s performance in the preceding session. Graphic feedback permits performers to assess their performance over time and, perhaps because of this, has generally been shown to be more effective than other types of feedback (Balcazar et al., 1985-1986; Daniels & Bailey, 2014; Prue & Fairbank, 1981; Wilk & Redmon, 1998). Thus, graphic individual feedback may affect performance quite differently than written individual feedback when linked to incentives.

To conclude, the purpose of the current study was to extend both VanStelle (2012) and Johnson et al. (2008) to determine whether the graphic display of individual performance and the graphic display of the individual performance of each group member would enhance
performance when individuals are paid monetary incentives. It should be noted that although there are many different types of social comparison feedback, for the purposes of this study, the term “social comparison feedback” will be used in subsequent sections to refer to the graphic display of the individual performance of each group member.
METHOD

Participants

Eighty college students, recruited from undergraduate classes at Western Michigan University, completed the study. Before recruitment, approval for the study was obtained from the University’s Human Subjects Institutional Review Board. The approval letter is provided in Appendix A. Only individuals who signed a consent form were included in the study (see Appendices B and C for the consent forms).

Participants were recruited using an in-class recruitment script (see Appendix D) and recruitment flyers (see Appendix E). There were six requirements to qualify for the study. First, participants had to express interest in the available off-task activities by indicating on a questionnaire that they engaged in them for at least a combined amount of five hours a month. The available off-task activities were computer games accessible on desktop computers (Angry Birds, Jewel Quest, Text Twist, Solitaire, Bejeweled 2, and Mahjong), and access to the Internet (social media, email, web browsing) and smart phones as long as any device in use was muted in order to prevent disruptions to other participants. The off-task activities were designed to simulate off-task activities in the work place. Without such activities, participants might have spent the entire session working on the experimental task simply because there was nothing else to do, which could have negated the effects of the independent variables. Second, recruits that had participated in other studies using the same medical data entry program or, third, taken PSY 3440, Organizational Psychology, were excluded from the study because knowledge of performance management or experience with the task might have affected how they responded.
Fourth, participants were excluded if they currently held or had held any sort of data entry job. Past studies have found that participants with data entry experience are significantly better at performing this task than naive performers, and introduce extreme variability into the dataset. Requirements for the first four criteria were assessed using a questionnaire (see Appendix F). Fifth, participants had to pass a quiz to demonstrate their understanding of the monetary incentive system that was used. A pass score of 100% was required. Potential participants were given two chances to pass a quiz, two versions of which can be found in Appendix G. Finally, participants had to be able to attend one 45-minute session each week for six weeks during the available timeslots.

A total of 81 participants met the study criteria. One participant dropped out of the study due to scheduling difficulties. Seventy-five percent were female (n=60) and 25% were men (n=20). The average age of participants was 19.4 years. Participants reported spending an average of 92 hours per month in the off-task activities, which is considerably more than the five-hour minimum that was necessary to be part of the study. The only difference in group size was due to the participant who dropped out; there were 27 participants in the no feedback and social comparison feedback groups, and 26 in the individual feedback group.

Participants were paid monetary incentives based on their performance and were paid, in cash, after debriefing. Debriefing was done after the study was over. The participant who dropped out was paid the amount earned at the point of withdrawal.

**Setting**

The experimental setting consisted of three rooms (2532, 2510, 2512) in Wood Hall, Western Michigan University. Two of the rooms, 2510 and 2512, were small rooms that were used for greeting participants, delivering feedback, and scheduling the next session. The main
experimental room, 2532, was across the hall and had three cubicle workstations, sectioned off with dividers. Each workstation contained an adjustable chair, computer, keyboard, mouse, and gel palm rest.

**Experimental Task and Alternative Activities**

The experimental task was a computerized data entry task designed to simulate the job of a medical data entry clerk. The computer presented medical records that displayed a patient’s name, ID number, date of birth, current age, gender, and medical test results. Also displayed were two boxes, one for male and one for female, indicating the range of test results that would be “within range” or normal. Participants first entered the patient’s ID number into a blank “Patient ID” box. They then determined whether the patient’s medical results were in or out of range and clicked the “within range” or “out of range” button. When participants clicked the “Submit” button, a new medical record was presented. A screenshot of the task can be found in Appendix H.

As indicated earlier, the alternative tasks were meant to simulate the types of off-task activities that are available in the work place. A recent survey of 1,034 employees reported that workers frequently engage in non-work activities using company computers or personal mobile devices (Carey & Trap, 2014). Specifically, 68% indicated that they checked personal e-mail daily, 52% indicated that they texted daily, 23% indicated that they played games daily, and 21% indicated that they posted to social media daily. These data support the ecological validity of the off-task activities in the current study.

**Dependent Variables**

The primary dependent variable was the number of correctly entered medical records per session. This variable could be affected by three factors, which were measured as secondary
dependent variables: (1) time on task, measured by the average amount of time the participant spent performing the task per session, (2) accuracy, measured by the average percentage of records completed correctly per session, and (3) rate, measured by the average number of records completed per minute per session when the participant was on task. Time off task was defined as any pause in responding longer than 30 seconds. Time on task was calculated by subtracting the cumulative number of seconds off task from the 45-minute session time. The computer program automatically collected all dependent variables. After each session, the experimenter saved the data on a password protected flash drive. This was done to prevent any loss of data due to computer malfunction.

After the last experimental session, participants were asked to complete a questionnaire about their satisfaction, stress, and performance with respect to the specific condition to which they belonged. The questionnaires can be found in Appendix I. The no feedback group and the individual feedback group completed the first questionnaire. The social comparison feedback group completed the second questionnaire.

**Independent Variable**

The independent variable was the type of graphic feedback and there were three conditions: (a) no graphic feedback, (b) graphic individual feedback, and (c) graphic social comparison feedback displaying the individual performance and ranking of each group member. To isolate the effects of the graphic displays, no vocal evaluative feedback was provided in any condition. Also, no within-session feedback was provided in any condition.

Participants in all groups were paid monetary incentives based on the number of records completed correctly. The incentive amount was determined so that participants would earn approximately $7.00 per session for average performance. Average performance was ascertained
from 18 participants who performed the same task, were paid individual monetary incentives, and completed five 45-minute experimental sessions (Sundberg, 2015). The average was 335 correctly completed medical records. In the current study, each correctly completed record was worth two cents. Using the average of 335 multiplied by $0.02, the anticipated pay per session was $6.70.

As indicated earlier, participants were paid in cash at the end of the study. Otherwise, the amount of the incentive pay could have served as feedback during the study, adding a confound to the no-graphic-feedback control condition.

**No feedback (NF).** Participants in this condition did not receive any feedback concerning their performance until they had completed all six sessions and were paid during the debriefing session. The pre-session instructional script can be found in Appendix J.

**Graphic individual feedback (IF).** Before each session, except the first, participants in this condition were shown a line graph that displayed the number of medical records they correctly completed in their previous sessions. An example individual feedback graph can be found in Appendix K. The pre-session feedback script can be found in Appendix L.

**Graphic social comparison feedback (SCF).** Before each session, except the first, participants in this condition received a line graph that displayed the number of medical records that they correctly completed in their previous sessions along with the number of medical records correctly completed by each individual in their group, and their ranking within the group. An example of the social comparison feedback graph can be found in Appendix M. In an attempt to emulate the typical social contingencies associated with social comparison feedback, the performance data were identified by the participants’ real names. The pre-session feedback script can be found in Appendix N.
**Experimental Design**

The experimental design was a randomized between group with repeated measures design. As indicated earlier, the NF, IF, and SCF groups had 27, 26, and 27 participants, respectively. Each participant completed six 45-minute sessions.

**Statistical Analysis**

The number of correctly completed records was analyzed using the Abelson-Tukey test for ordered treatments with a covariate (Huitema, 2011). Data from the first session was used as the covariate to control for data entry skills. Prior to running the ANCOVA, the regression slopes were tested to ensure homogeneity. It was hypothesized that performance would be ordered from highest to lowest as follows: (a) SCF group, (b) IF group, and (c) NF group.

The relationships between the secondary dependent variables (time on task, accuracy, and data entry rate) and average number of correctly completed medical records were calculated using Pearson’s product moment correlations. Differences on the four questionnaire items that were common to all three groups were analyzed using ANOVAs. Participants in the SCF group were asked one additional question: the extent to which they were uncomfortable having others in their group see their performance. The mean and standard deviation for this item was calculated.

In order to measure the extent to which participants were able to self-administer feedback on their performance during the study, participants in all conditions were also asked to recall how many medical records they completed in their last session and on average per session. These answers were compared to their actual last session and average performance using Pearson’s product moment correlations. It was hypothesized that the correlations for participants in the IF
and SCF groups would be high and significant, and that the correlations for the participants in the NF group would be low and non-significant.

**Experimental Procedures**

**Random assignment.** After recruiting participants, they were randomly assigned to one of the three groups. Randomization into groups was done using a random number generator with numbers between one and three. Randomization was done before potential participants arrived to the introductory session. This was necessary as there were different informed consent forms depending on the group to which participants were assigned. The same consent form was given to participants in the NF and IF groups but a different one was given to the participants in the SCF group. The notable difference between the forms was that participants in the SCF group were told that their data would be shown to other group members.

**Introductory session.** The first meeting with potential participants was held to obtain informed consent, assess if they met the requirements, and train them on the task and alternative activities (i.e., computer games and how to access the Internet browser). The training script can be found in Appendix O.

**Experimental sessions.** Before each session, participants met with the experimenter in either room 2510 or 2512 Wood Hall. Because none of the participants received feedback during the first session, the script for the first session was the same for all participants. The first session script can be found in Appendix P. The scripts for the subsequent sessions, presented earlier, can be found in Appendices J, L, and N, respectively, for the NF group, the IF group, and the SCF group. After the scripted instructions and feedback if relevant, participants were escorted to a workstation in room 2532, Wood Hall. The participants started the session once they were ready.
The computerized work task program automatically stopped after 45 minutes. After the session, participants confirmed their next session.

**Debriefing session.** After completing their final session, participants scheduled a debriefing session. These sessions were 15 minutes long and conducted the week after the study was over. Debriefing sessions were held in the main experimental room, Wood Hall 2532. Participants completed the stress/satisfaction questionnaire relevant to their group after which the experimenter explained the purpose of the study. The experimenter told participants how they had done in their last session, answered any questions they had, and paid them. Debriefing scripts can be found in Appendix Q. Participants were then given a receipt and paid in cash. The receipt can be found in Appendix R. Lastly, the experimenter thanked participants for their participation in the study.
RESULTS

Primary Analysis

Table 1 displays the means and standard deviations for correctly completed records for the covariate session and the experimental sessions, along with the adjusted means for the experimental sessions.

Table 1

<table>
<thead>
<tr>
<th>Condition</th>
<th>Experimental Sessions</th>
<th>Covariate Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean</td>
</tr>
<tr>
<td>No Feedback</td>
<td>27</td>
<td>271.78</td>
</tr>
<tr>
<td>Individual Feedback</td>
<td>26</td>
<td>257.35</td>
</tr>
<tr>
<td>Social Comparison Feedback</td>
<td>27</td>
<td>229.37</td>
</tr>
<tr>
<td>Overall</td>
<td>80</td>
<td>252.83</td>
</tr>
</tbody>
</table>

Before conducting the primary analysis, the Abelson-Tukey monotone test for ordered treatments with a covariate (Huitema, 2011), the regression slopes were tested to ensure homogeneity. The regression slopes were determined to be homogeneous, $F(2, 74) = .67, p = .516$, and the assumptions of the ANCOVA and Abelson-Tukey tests were met. The results from the analysis of homogeneity can be found in Table 2 on the following page.

The Abelson-Tukey monotone test with a covariate (Huitema, 2011) revealed a significant monotonic relationship, $t = 6.9, p < 0.001$. The null hypothesis was rejected and a monotonic increasing relationship was confirmed in the hypothesized order in which the SCF
group was the highest performing group, the IF group the second, and the NF group the third. A measure of association, a form of effect size, was calculated (Huitema, 2011). A measure of association measures the proportion of variation on the dependent variable that is accounted for by the independent variable. The size of the overall effect was 0.36. This is a sizable effect as 0.15 and above are considered a large effect.

Table 2

*Source Table for Homogeneity of Slopes*

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heterogeneity of slopes</td>
<td>1752</td>
<td>2</td>
<td>876</td>
<td>0.67</td>
<td>0.516</td>
</tr>
<tr>
<td>Residuals individual</td>
<td>97045</td>
<td>74</td>
<td>1311</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residuals within</td>
<td>98797</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

With the hypothesized increasing order of the groups confirmed, a second analysis of the data was conducted to identify whether there were significant differences between each pair of conditions. To do this, an ANCOVA, followed by Fisher-Hayter tests were conducted. Although the Abelson-Tukey monotone test with a covariate has more statistical power (Huitema, 2011), these tests are more widely known and thus were also conducted. Table 3 displays the results from the ANCOVA. The obtained results, $F(2, 78) = 19.20, p < 0.001$, confirmed that the adjusted mean difference for the three group contrast was not zero.

Table 3

*ANCOVA Source Table for Correctly Completed Records*

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted treatment</td>
<td>49920</td>
<td>2</td>
<td>24960</td>
<td>19.20</td>
<td>0.001</td>
</tr>
<tr>
<td>Within residual</td>
<td>98797</td>
<td>76</td>
<td>1300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total residual</td>
<td>148717</td>
<td>78</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Fisher-Hayter tests revealed significant differences between all the pairwise comparisons at the .05 level. For the NF and IF groups, $q = 4.274, p < 0.01$; for the IF and SCF groups, $q = 5.203, p < 0.01$; and for the NF and SCF groups, $q = 3.26, p < 0.05$. An adjusted standardized effect size was calculated for each pairwise comparison as well. Standardized effect sizes are generally categorized as small (.20), medium (.50), or large (.80). The effect sizes between NF and IF, NF and SCF, and IF and SCF were 1.10, 1.73, and 0.63, respectively.

Table 4 and Figure 1 display the adjusted means by session. Over the five sessions, the NF group increased performance by 6.6%, the IF group increased performance by 21.2%, and the SCF group increased performance by 23.7%. There is no overlap between the data points for the three groups. Data for the two feedback groups show clear upward trends, with differences in performance between the NF group and the feedback groups increasing from session to session.

**Secondary Analyses**

The primary dependent variable, correctly entered medical records, could have been affected by three factors, which were measured as secondary dependent variables. The means and standard deviations for the secondary dependent variables can be found in Table 5.

**Table 4**

*Adjusted Means for Correctly Completed Records by Session*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
<th>Session 5</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Feedback</td>
<td>265.81</td>
<td>273.12</td>
<td>278.21</td>
<td>276.78</td>
<td>283.29</td>
<td>275.44</td>
</tr>
<tr>
<td>Individual Feedback</td>
<td>282.16</td>
<td>305.19</td>
<td>323.31</td>
<td>322.91</td>
<td>342.04</td>
<td>315.12</td>
</tr>
<tr>
<td>Social Comparison Feedback</td>
<td>300.26</td>
<td>318.99</td>
<td>343.78</td>
<td>354.82</td>
<td>371.34</td>
<td>337.84</td>
</tr>
<tr>
<td>Overall</td>
<td>282.74</td>
<td>299.10</td>
<td>315.10</td>
<td>318.17</td>
<td>332.22</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1. Adjusted mean number of correctly completed records for the five experimental sessions.

Table 5

Means and Standard Deviations for Accuracy, Rate, and Time on Task

<table>
<thead>
<tr>
<th>Condition</th>
<th>Accuracy</th>
<th>Rate</th>
<th>Time on Task</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>No feedback</td>
<td>96.91%</td>
<td>4.29%</td>
<td>6.93</td>
</tr>
<tr>
<td>Individual feedback</td>
<td>97.42%</td>
<td>3.10%</td>
<td>7.42</td>
</tr>
<tr>
<td>Social Comparison Feedback</td>
<td>95.45%</td>
<td>8.78%</td>
<td>7.33</td>
</tr>
</tbody>
</table>

The relationships between the primary dependent variable and the secondary dependent variables were examined, and the Pearson’s product moment correlations are shown in Table 6.

There was a weak significant relationship between time on task and rate. None of the other correlations was significant.

Table 6

Correlations between the Primary and Secondary Dependent Variables

<table>
<thead>
<tr>
<th>Correctly Completed Patient Records</th>
<th>Time on task</th>
<th>Rate</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time on task</td>
<td>.036</td>
<td>.157</td>
<td>-.057</td>
</tr>
<tr>
<td>Rate</td>
<td>.376*</td>
<td>.120</td>
<td>.045</td>
</tr>
</tbody>
</table>

*p < 0.001
Questionnaire Analysis

All participants answered a survey containing the same six questions. The SCF questionnaire had an extra question that asked participants to indicate whether they felt uncomfortable having other participants see their performance. The scale for each question was a Likert scale, where 1 = strongly disagree and 5 = strongly agree. The mean rating for the extra question for the SCF group, “I was uncomfortable having other people in my group see my performance”, was 1.6, which indicates that participants were not concerned that others saw how well they were performing.

Four of the six survey questions related to stress, motivation, and satisfaction. Table 7 displays averages and standard deviations for these questions by group. ANOVAs were conducted to ascertain whether differences existed between the group means, and the results of these analyses can be found in Tables 8, 9, 10, and 11.

Table 7
Means and Standard Deviations for Stress, Motivation, and Satisfaction Questions

<table>
<thead>
<tr>
<th>Condition</th>
<th>“I was stressed or anxious when performing the task”</th>
<th>“I did my best every session”</th>
<th>“I tried to improve my performance from session to session”</th>
<th>“I was satisfied with the incentive pay system”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>No Feedback</td>
<td>1.52</td>
<td>.75</td>
<td>3.81</td>
<td>1.08</td>
</tr>
<tr>
<td>Individual Feedback</td>
<td>1.81</td>
<td>.80</td>
<td>3.88</td>
<td>.82</td>
</tr>
<tr>
<td>Social Comparison Feedback</td>
<td>1.85</td>
<td>.95</td>
<td>4.11</td>
<td>.89</td>
</tr>
<tr>
<td>Overall</td>
<td>1.73</td>
<td>.84</td>
<td>3.94</td>
<td>.89</td>
</tr>
</tbody>
</table>
Table 8

ANOVA Source Table for “I was Stressed or Anxious When Performing the Task”

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback Group</td>
<td>1.763</td>
<td>2</td>
<td>.882</td>
<td>1.253</td>
<td>.291</td>
</tr>
<tr>
<td>Error</td>
<td>54.187</td>
<td>77</td>
<td>.704</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55.950</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 9

ANOVA Source Table for “I Did My Best Every Session”

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback Group</td>
<td>1.293</td>
<td>2</td>
<td>.646</td>
<td>.811</td>
<td>.448</td>
</tr>
<tr>
<td>Error</td>
<td>61.395</td>
<td>77</td>
<td>.797</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62.687</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10

ANOVA Source Table for “I Tried to Improve My Performance from Session to Session”

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback Group</td>
<td>12.241</td>
<td>2</td>
<td>6.120</td>
<td>8.840</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>53.309</td>
<td>77</td>
<td>.692</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>65.550</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 11

ANOVA Source Table for “I was Satisfied with the Incentive Pay System”

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback Group</td>
<td>2.333</td>
<td>2</td>
<td>1.167</td>
<td>2.087</td>
<td>.131</td>
</tr>
<tr>
<td>Error</td>
<td>43.054</td>
<td>77</td>
<td>.559</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>45.387</td>
<td>79</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The ANOVA revealed a significant difference between the groups on the question “I tried to improve my performance from session to session”. The Tukey pairwise comparison test
confirmed that the NF group had significantly lower scores on this question compared to each of the two feedback groups at the .05 level.

The last two questions on the questionnaire asked participants to estimate their last session performance and their average performance (number of correctly completed records) during the study. Table 12 displays the means and standard deviations for participants’ actual and estimated performances.

Table 12

<table>
<thead>
<tr>
<th>Means and Standard Deviations for Actual and Estimated Performances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>No Feedback</td>
</tr>
<tr>
<td>Individual Feedback</td>
</tr>
<tr>
<td>Social Comparison Feedback</td>
</tr>
</tbody>
</table>

Table 13 displays the correlations between actual and estimated performances for each group. There were low non-significant correlations between actual and estimated performances for the NF group and high significant correlations for the IF group. Two outliers were detected in the SCF group’s estimated average data and one outlier in the SCF group’s estimated last session data. With the outliers included, the correlation between the actual and estimated average performance was low and non-significant, \( r = -.009 \), and the correlation between the actual and last session performance was moderate and non-significant, \( r = .454 \). When the outliers were removed, there were high significant correlations between the actual and estimated performances for the SCF group, as displayed in Table 13.
Table 13

*Pearson’s Product Moment Correlations Between Actual and Estimated Performances*

<table>
<thead>
<tr>
<th>Condition</th>
<th>Estimated Performance</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Last Session</td>
<td>Average</td>
<td></td>
</tr>
<tr>
<td>No Feedback</td>
<td>.198</td>
<td>.094</td>
<td></td>
</tr>
<tr>
<td>Individual Feedback</td>
<td>.927*</td>
<td>.916*</td>
<td></td>
</tr>
<tr>
<td>Social Comparison Feedback</td>
<td>.936*</td>
<td>.895*</td>
<td></td>
</tr>
</tbody>
</table>

*p < 0.001
DISCUSSION

Primary Analyses

The primary statistical analysis revealed that there were significant differences in the average number of correctly completed records between the groups in the predicted order. The SCF group performed the best, followed by the IF group, and then the NF group. The additional pairwise comparisons confirmed significant differences between each pair of groups. The results are practically, as well as statistically, significant because of the size of the performance differences. The IF group performed an average of 14% better than the NF group and the SCF group performed an average of 23% better than the NF group.

The results of this study are primarily important because they show that feedback can enhance the effectiveness of individual monetary incentives. Although conceptual analyses suggest that feedback should increase incented performance (Alvero et al., 2001; Balcazar et al., 1985-1986; Bucklin et al., 2003; Duncan & Bruwelheide, 1985-86; Fairbank & Prue, 1982; Johnson et al., 2008; Smoot & Duncan, 1997), previous studies have not convincingly demonstrated a value-added effect (Bucklin et al., 2003; Johnson et al., 2008; Smoot & Duncan, 1997). This is the first study in the OBM literature to do that. The results have important practical implications because individual monetary incentive systems are quite prevalent in business and industry. For example, in 2010, WorldatWork surveyed over 1,300 companies and found that over 50% had individual incentive plans, exclusive of commission pay plans for sales representatives. In 2015, Aon Hewitt surveyed over 1,200 companies and reported that over the past decade, organizations have dramatically increased the percentage of their payroll budgets
used to supplement hourly and salary pay with individual incentives and rewards. As indicated earlier, in the current study, individual graphic feedback increased incented performance by 14% and social comparison graphic feedback increased incented performance by 23%. These increases indicate that graphic feedback should be included as a component of monetary incentive systems to augment their effectiveness and further, that the benefits of this type of feedback are likely to outweigh the costs of implementation.

The results of this study differ from those reported by Johnson et al. (2008). In that well-controlled laboratory study, feedback did not enhance the effects of either hourly or incentive pay. Two methodological differences, relating to how feedback was presented to participants, may account for the differences. First, in the current study, feedback was delivered face-to-face by the experimenter whereas in Johnson et al., feedback was delivered by the computer. As mentioned in the Introduction, the face-to-face delivery of feedback may inherently include an evaluative component because it is likely that, for most people, face-to-face feedback has historically been correlated with praise and/or criticism, increasing its impact (Johnson, 2013). Second, graphic feedback was used in the current study instead of written feedback, which was used in Johnson et al. The written feedback contained information about the performance of participants only in their preceding session. The graphic feedback used in the current study displayed the session-to-session performance of participants. Any improvements were, thus, readily apparent and may have served as a form of conditioned reinforcement. Few studies in OBM have compared the effectiveness of graphic feedback with other forms of feedback, which is surprising given how popular it has been over the years (Alvero et al., 2001; Balcazar et al., 1985-1986). Regardless, there is evidence that graphic feedback is more effective than written feedback (Austin, Weatherly, & Gravina, 2005; Wilk & Redmon, 1998). While the results of this
study support the effectiveness of both face-to-face and graphic feedback, future research is needed to determine the extent to which either or both contribute to the enhancing effects of feedback when individuals are paid monetary incentives.

VanStelle (2012) found that both graphic IF and SCF increased performance when individuals were paid hourly and, further, that SCF increased performance significantly more than IF. The results of this study are, thus, consistent with those findings and extend them to performance under incentive pay. The data from the two studies indicate that the effects of these two types of graphic feedback are fairly robust under both hourly and incentive pay conditions. As predicted, however, it appears as though the incentives attenuated the performance differences between the IF and SCF groups. In VanStelle, the SCF group performed 18% better than the IF group, whereas in this study, the SCF group performed only 7% better. Due to the potential detrimental effects of public displays of individual performance, this decrease in the difference between the two feedback groups is a compelling result. Companies may decide to forego a 5% - 7% performance increase in favor of a feedback system that employees may prefer, whereas they may not be willing to forego an 18% - 20% increase. That said, these differences were derived from an across-study comparison based on only two studies. A direct comparison of the relative effects of both types of feedback under hourly and incentive pay conditions is recommended.

**Secondary Analyses**

The correlations between the primary dependent variable and the secondary dependent variables were weak and non-significant. These results are unusual when compared to the results of other studies in which this task was used (Sundberg, 2015; VanStelle, 2012). Sundberg and VanStelle found high significant correlations between rate and correctly completed records, both
.96, and moderate significant correlations between time on task and correctly completed records, .67, .64, respectively. The reason why results differ in this study is most likely due to the fact that all participants received incentives. In Sundberg, some participants were paid incentives while others were paid hourly pay, depending on the experimental condition. In VanStelle, all participants were paid hourly. The contrasting results of the current study imply that the incentives, independent of the feedback condition, caused participants to spend their time working on the task at a high or relatively high rate. In the current study, overall, participants spent an average of 43.78 out of 45 minutes performing the task each session, with an average difference of only 1.14 minutes between the SCF group participants who spent the most time performing the task and the NF group participants who spent the least. Rate of performance differed by only .49 records among the three groups.

The conclusion that the incentives caused participants to spend most of their time working is supported by the fact that both Johnson et al. (2008) and Matthews and Dickinson (2000) found that participants who were paid incentives spent significantly more time performing an experimental task than participants who were paid hourly. A concrete conclusion about the effects of incentives on rate is not possible based on a similar analysis, however, because Johnson et al. did not find a significant difference in the rate of performance between participants who were paid incentives and those who were paid hourly, and Matthews and Dickinson did not record rate. Regardless, the fact that participants who are paid incentives spend more time working is not surprising, given that their pay is dependent on performance.

**Questionnaire Analysis**

Participants reported that they were not stressed or anxious when working on the task (mean = 1.73/5.0), that they were highly satisfied with the incentive pay system (mean =
4.41/5.0), and that they did their best every session (mean = 3.94/5.00). There were no differences across groups with respect to these ratings. It is interesting that the average rating for the NF group (3.78/5.0) for “I tried to improve my performance from session to session” was significantly lower than the average ratings for the two feedback groups (4.58 and 4.63 for the IF and SCF groups, respectively). One possible interpretation for this difference is that without feedback, participants could not compare their current performance to their preceding performance, and thus did not have the performance information they needed to adjust or alter performance in order to improve it. The across-session data, displayed in Figure 1, support the validity of the differences in the ratings among the groups. While performance increased over the five sessions by 21.1% and 23.7% for the IF and SCF groups, respectively, performance increased by only 6.6% for the NF group.

Participants in the SCF group indicated that they were not uncomfortable that others saw their performance (mean = 1.6/5.0). These data are consistent with VanStelle’s (2012) data. The mean rating for her SCF participants for the same question was 1.78/5.0. Analyses presented earlier suggest that the public display of individual performance is likely to be aversive (Guerin, 1993, 1994; Steigleder et al., 1978); however, this was not the case in these two studies. The results from these studies may be limited because the consequences for performance differed from those that would be expected in a work setting. First, participants did not typically know or interact with each other, which eliminates the possibility of social consequences from peers for performance. Second, experimenters did not criticize performers if their performance was low. In the current study, participants were neither praised for good performance nor criticized for low performance. Rather, praise and criticism were purposely withheld in order to isolate the effects of the graphic feedback. In VanStelle’s study, participants were praised when their performance
was average or above, or when their performance improved but, as in the current study, were never criticized for their performance. In an actual work setting, supervisors would be likely to criticize workers whose performance was consistently below their peers and such criticism would be likely to increase the aversiveness of SCF. In addition, workers, regardless of how well they perform, might find SCF aversive if rewards were competitive; that is, if only relatively highly-ranked performers were given pay raises, choice job assignments, opportunities for advancement, etc. Thus, research is needed to determine whether this type of feedback is aversive when implemented in actual work settings where consequences differ.

In order to determine whether participants in the NF group would be able to self-generate feedback, participants were asked to estimate their average performance across all six sessions and their performance during their last session. A few studies that have examined the effects of feedback have not found any differences between the feedback condition and the no feedback condition. This has led some authors to speculate whether participants in the no feedback condition were able to self-generate feedback. If participants in the no feedback condition are able to self-generate feedback, then that condition is no longer a no feedback condition, which could account for the failure to find any differences between the feedback condition and the nominal no feedback condition (e.g., Bechtel, McGee, Huitema, & Dickinson, 2015). However, as expected, the correlations between estimated and actual performances were low and non-significant for the NF group and, in contrast, high and significant for both the IF and SCF groups. These data show that the participants in the NF group were not able to self-generate feedback about their performance and, further, that the feedback manipulation was successful.
Other Analyses

Participants in all three groups increased their performance across the five sessions. The adjusted mean performance for the NF group increased from 266 correctly completed records in the first session to 283 records in the last session. This 17-record difference can be attributed to learning effects; that is, to participants becoming better at performing the task. The adjusted mean performances of the IF and SCF groups increased by 60 and 71 records, respectively, from the first to the last session. It should be noted that part of the improvement in performance for the feedback groups was also due to learning effects, however, the feedback and type of feedback significantly affected performance independent of these learning effects. Performance was not stable by the end of the study. The performance of the NF group appears to have been leveling, however, the performance of the two feedback groups was still increasing. Thus, the ultimate differences in performance due to the graphic IF and SCF are unknown. Unfortunately, due to time and cost constraints, the study had to be terminated before performance stabilized.

Not all participants increased their performance during the study. The performance of ten participants was at least 10 records lower in their last session than in their first. The distribution of those participants among the groups was unequal: Eight were in the NF group and two were in the SCF group. Three of the eight NF group participants decreased their performance by 51, 61, and 81 records, which is considerable. The other NF participants decreased their performance by 12 to 31 records. The two SCF participants decreased their performance by 22 and 33 records. Thus, even though participants were receiving incentives that were dependent on their performance, the feedback appears to have attenuated performance decreases.
**Strengths**

This study was the first to compare the effects of two types of graphic feedback on incented performance. Because the study was conducted in the laboratory, it was possible to isolate the effects of the graphic feedback content, individual feedback versus social comparison feedback, from other forms of feedback and interventions. In particular, great care was taken to withhold any type of evaluative feedback. Another strength of the study is that the actual names of the participants were used on the SCF graphs, which may have increased the saliency of the SCF. VanStelle (2012), who authored the only other study that has compared the effects of graphic individual and social comparison feedback, used fake names. Also, her SCF participants indicated that the SCF graphs were hard to react to because of the “clutter” and “general confusion”. In the current study, in an effort to increase the clarity of the SCF graphs, each individual’s data path was emphasized by increasing the width of the line on the graph he or she received and the individual rankings were typed on the graph.

**Limitations**

While the laboratory setting is responsible for the greatest strength of the study, experimental control, it is also responsible for its main limitations. As indicated earlier, the participants were undergraduate students who, generally speaking, did not know each other and did not interact with each other during the study. Participants in the SCF group did not find the feedback aversive; in fact, they were very comfortable with having their performance data shown to others. That might not be the case in a work setting in which workers interact with each other on a daily basis. Also, the rewards for performance, the monetary incentives, were not competitive, even though performance was ranked. If rewards are limited and distributed on the basis of rankings, it may make the public display of individual performance more aversive and
evoke unproductive forms of competition (Abernathy, 1996; Johnson & Dickinson, 2010).

Finally, although the withholding of praise and criticism increased the experimental control of the study by isolating the effects of the graphic feedback content, managers would be likely to consequate performance based on the rankings, which again, could make SCF more aversive, particularly for poorer performers. Ultimately, as discussed above, the acceptance of public displays of performance is likely to depend on the reinforcement and punishment systems in the organization.

**Future Research**

As mentioned earlier, future research should explore why the results of this study differ from those found by Johnson et al. (2008). Studies should directly compare the effects of graphic versus written feedback when individuals are paid hourly and when they are paid incentives. Second, studies should also directly compare the effects of computer-delivered and face-to-face delivery of feedback when individuals are paid hourly and when they are paid incentives. Further, because work is becoming more and more automated, it is very important to have a good understanding of the variables that make computer-delivered feedback and other forms of digitally-delivered feedback effective. Thus, studies that examine such variables are also warranted.

The performance of participants in the two feedback groups had not stabilized by the end of the study; rather, it was still increasing. The ultimate effects of the two types of feedback on incented performance, thus, are not known. Studies should examine the effects of these two feedback procedures when performance is stable to determine whether their differential effects continue or dissipate over time.
Assuming that the effects of SCF are as robust as found in VanStelle (2012) and the current study, future research could also examine ways to reduce or eliminate the differential effects of SCF and IF. Avoiding the possible problems with SCF while retaining the performance benefits should be the target. A logical extension of the current study would be to provide some type of evaluative feedback or metric that would inform participants who receive graphic IF feedback how well they are performing. Thus, performance could be praised or criticized, which would better reflect likely managerial consequences in the workplace, but decrease experimental rigor. Even if praise and criticism were added to the graphic feedback, however, participants who received SCF would still be provided with more information about the quality of their performance than participants who received IF. A possible solution to this would be to add performance sub-goals to the IF graphs. As discussed in the Introduction, SCF may increase performance by setting up a series of small, attainable goals and indicating the upper limits of performance. Therefore, instead of displaying peer performance, a series of sub-goals could be displayed on the IF graphs. This would retain the advantages of SCF without revealing the individual performance and identity of workers. To the author’s knowledge, no study has compared SCF with a series of sub-goals.

Finally, this study should be replicated in actual business settings. Particular attention should be paid to employee reactions to SCF. Although results may be influenced by unknown extraneous variables (e.g., the extent to which rewards are tied to performance and the extent to which rewards are competitive), repeated replications would yield valuable insight with respect to the relative performance effects of graphic IF and SCF and their acceptance by employees.
Summary

The results of this study contribute to the monetary incentive literature by showing that both graphic IF and SCF increased incented performance. The increases were both statistically and practically significant. This is the first demonstration in the OBM literature that feedback can enhance performance when individuals are paid monetary incentives. The results have important practical implications; specifically, organizations would benefit from adding graphic feedback to monetary incentive systems. However, while the performance differences between those who received IF and those who received SCF were statistically significant, they were not as large as those found previously by VanStelle (2012), who examined the effects of these two types of feedback when individuals were paid hourly. The results, thus, will also assist organizations to make an informed decision about which type of graphic feedback to implement, given the potential aversiveness of SCF.

Several research questions arose from the study. It is hoped that future researchers will pursue these questions, providing additional guidance to organizations regarding the combined use of feedback and monetary incentives.
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Appendix A

HSIRB Approval Letter
Date: December 10, 2015

To: Alyce Dickinson, Principal Investigator
    Yngvi Einarsson, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 15-12-24

This letter will serve as confirmation that your research project titled “The Effects of Individual and Social Comparison Graphic Feedback on Incented Performance” has been **approved** under the **expedited** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may **only** be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you **must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study.”**). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

**Reapproval of the project is required if it extends beyond the termination date stated below.**

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

**Approval Termination: December 9, 2016**
Appendix B

Informed Consent Form: No Feedback Group and Graphic Individual Feedback Group
Western Michigan University
Department of Psychology

Principal Investigator: Alyce M. Dickinson, Ph.D.
Student Investigator: Yngvi F. Einarsson, B.A.
Title of Study: Performance on a Medical Transcription Data Entry Task When Participants Receive Performance Pay

You have been asked to participate in a research project titled “Performance on a Medical Transcription Data Entry Task When Participants Receive Performance Pay.” This project will serve as Yngvi Einarsson’s thesis project under the supervision of Alyce Dickinson, Ph.D. This informed consent document will explain the purpose of this research project and will cover information related to the project, including expected time commitments, research procedures to be used in the study, and any risks or benefits associated with participating in this research project.

What are we trying to find out in this study?
The purpose of this study is to examine productivity levels on a medical data entry task across time when performers are given performance pay.

Who can participate in this study?
Six inclusionary criteria will be used. First, you must engage in the available off-task activities for at least 5 hours a month. Second, you must not have participated in performance management research projects using the medical data entry task. Third, you must not have taken, or currently be enrolled in PSY 3440. Fourth, you will be excluded if you currently have or have had a data processing job. Fifth, you need to understand the monetary incentive system used in the study and must pass the incentive system quiz. Lastly, you must be available for one 45-minute session per week for six weeks during the Spring 2016 semester.

Where will the study take place?
The study will be conducted in room 2532, Wood Hall.

What is the time commitment for participating in this study?
You must be available for one 45-minute session per week for 6 weeks during the Spring 2016 semester for a total time commitment of approximately 6 hours.

What will you be asked to do if you choose to participate in this study?
You will be asked to perform a computer-based medical transcription data entry task, a task designed to simulate the job of a medical data entry clerk. The computer program will provide you with data corresponding to patients. You will first type the patient’s ID number into a box labeled “PATIENT ID,” and then, based on the information provided by the program, indicate whether the medical data for that patient is inside or outside the normal range by clicking on the appropriate button. After you click the “Submit” button, information about another patient will be presented. Also, after your last session, you will be asked to answer questions about your experience during the study. Lastly, you will be asked not to talk to anyone about the features of this study.
What information is being measured during this study?
The computer will automatically take measures of your performance on the medical transcription data entry task. Also, at the end of the study you will be asked to indicate your satisfaction with the procedures and how much stress you felt performing the task.

What are the risks of participating in this study and how will these risks be minimized?
The nature of this computer-based task is one that requires little physical effort, and should not expose you to risks greater than those you experience in your everyday activities. During sessions you may become tired or experience minor physical discomfort or stress. To minimize these risks, you may take breaks whenever you like. During these breaks you may play one of several computer games on the workstation computer, browse the Internet, play with your smartphone or just relax.

What are the benefits of participating in this study?
Data from your participation may benefit the general scientific community by providing information on performance pay and productivity. You may also learn about research through participation in this study. This study will add to our understanding of how working conditions affect performance, satisfaction, and stress. The findings from analogue studies such as this can be applied in workplace settings.

Are there any costs associated with participating in this study?
Besides the time commitment of approximately 6 total hours, there are no costs associated with participating in this study.

Is there any compensation for participating in this study?
For each of the six experimental sessions, you will be compensated. You will receive 2 cents for each correctly entered medical record. While the amount of pay per session will vary depending on performance, you will earn approximately $7 for average performance per session. You will be paid in cash during the debriefing session, after your last experimental session. If you decide to withdraw from this study, you will be paid for your performance up until the point of withdrawal.

Who will have access to the information collected during the study?
The principal investigator, the student investigator, and the research assistants will have access to the information collected during this study. When you begin the study, you will be assigned a code number so that your individual progress can be tracked while your identity is held strictly confidential. When the data from the study are presented or published, your data will be combined with the data from others, and only group data will be presented. You will not be identified.

What if you want to stop participating in this study?
You can choose to stop participating in this study at any time, for any reason, without penalty. The investigator can also decide to stop your participation in the study without your consent. If you should have any questions before or during the study, you can contact the primary investigator, Dr. Alyce Dickinson at (269) 387-4473, or the student investigator at (269) 779-4297. You may also contact the Chair, Human Subjects Institutional Review Board at (269) 387-
8293 or the Vice President for Research at (269) 387-8298 if questions arise throughout the course of this study.

_This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year._

_Your signature below indicates that you read the above information and agree to participate in the study._

__________________________________________
Please Print Your Name

__________________________________________  ______________________
Participant Signature  Date

Please keep the attached copy of this form for your records.
Appendix C

Informed Consent Form: Social Comparison Feedback Group
Western Michigan University
Department of Psychology

Principal Investigator: Alyce M. Dickinson, Ph.D.
Student Investigator: Yngvi F. Einarsson, B.A.
Title of Study: Performance on a Medical Transcription Data Entry Task When Participants Receive Performance Pay

You have been asked to participate in a research project titled “Performance on a Medical Transcription Data Entry Task When Participants Receive Performance Pay.” This project will serve as Yngvi Einarsson’s thesis project under the supervision of Alyce Dickinson, Ph.D.

This informed consent document will explain the purpose of this research project and will cover information related to the project, including expected time commitments, research procedures to be used in the study, and any risks or benefits associated with participating in this research project.

What are we trying to find out in this study?
The purpose of this study is to examine productivity levels on a medical data entry task across time when performers are given performance pay.

Who can participate in this study?
Six inclusionary criteria will be used. First, you must engage in the available off-task activities for at least 5 hours a month. Second, you must not have participated in performance management research projects using the medical data entry task. Third, you must not have taken, or currently be enrolled in PSY 3440. Fourth, you will be excluded if you currently have or have had a data processing job. Fifth, you need to understand the monetary incentive system used in the study and must pass the incentive system quiz. Lastly, you must be available for one 45-minute session per week for six weeks during the Spring 2016 semester.

Where will the study take place?
The study will be conducted in room 2532, Wood Hall.

What is the time commitment for participating in this study?
You must be available for one 45-minute session per week for 6 weeks during the Spring 2016 semester for a total time commitment of approximately 6 hours.

What will you be asked to do if you choose to participate in this study?
You will be asked to perform a computer-based medical transcription data entry task, a task designed to simulate the job of a medical data entry clerk. The computer program will provide you with data corresponding to patients. You will first type the patient’s ID number into a box labeled “PATIENT ID,” and then, based on the information provided by the program, indicate whether the medical data for that patient is inside or outside the normal range by clicking on the appropriate button. After you click the “Submit” button, information about another patient will be presented. Also, after your last session, you will be asked to answer questions about your experience during the study. Lastly, you will be asked not to talk to anyone about the features of this study.
What information is being measured during this study?
The computer will automatically take measures of your performance on the medical transcription data entry task. Also, at the end of the study you will be asked to indicate your satisfaction with the procedures and how much stress you felt performing the task.

What are the risks of participating in this study and how will these risks be minimized?
The nature of this computer-based task is one that requires little physical effort, and should not expose you to risks greater than those you experience in your everyday activities. During sessions you may become tired or experience minor physical discomfort or stress. To minimize these risks, you may take breaks whenever you like. During these breaks you may play one of several computer games on the workstation computer, browse the Internet, play with your smartphone or just relax.

Additionally, your identity will be revealed to other participants. You will be assigned to a work group, and your name will be displayed on feedback graphs for your group along with the names of all other group members. This means that group members will be able to compare their performance with the performance of others.

What are the benefits of participating in this study?
Data from your participation may benefit the general scientific community by providing information on performance pay and productivity. You may also learn about research through participation in this study. This study will add to our understanding of how working conditions affect performance, satisfaction, and stress. The findings from analogue studies such as this can be applied in workplace settings.

Are there any costs associated with participating in this study?
Besides the time commitment of approximately 6 total hours, there are no costs associated with participating in this study.

Is there any compensation for participating in this study?
For each of the six experimental sessions, you will be compensated. You will receive 2 cents for each correctly entered medical record. While the amount of pay per session will vary depending on performance, you will earn approximately $7 for average performance per session. You will be paid in cash during the debriefing session, after your last experimental session. If you decide to withdraw from this study, you will be paid for your performance up until the point of withdrawal.

Who will have access to the information collected during the study?
The principal investigator, the student investigator, and the research assistants will have access to the information collected during this study. When you begin the study, you will be assigned a code number so that your individual progress can be tracked while your identity is held strictly confidential. When the data from the study are presented or published, your data will be combined with the data from others, and only group data will be presented. You will not be identified.
As described above, however, there is an exception to your confidentiality. Your first name and the number of medical records you correctly complete will be displayed on a feedback graph and shown to other members of your assigned group during the study (as described above in the Risks section).

**What if you want to stop participating in this study?**

You can choose to stop participating in this study at any time, for any reason, without penalty. The investigator can also decide to stop your participation in the study without your consent. If you should have any questions before or during the study, you can contact the primary investigator, Dr. Alyce Dickinson at (269) 387-4473, or the student investigator at (269) 779-4297. You may also contact the Chair, Human Subjects Institutional Review Board at (269) 387-8293 or the Vice President for Research at (269) 387-8298 if questions arise throughout the course of this study.

*This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.*

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

____________________________________
Please Print Your Name

____________________________________
Participant Signature Date

Please keep the attached copy of this form for your records.
Appendix D

Participant Recruitment Script
Participant Recruitment Script

To be read aloud by the student investigator at undergraduate classes:

“Hi, my name is Yngvi Einarsson. I am a graduate student here in the Psychology Department and I am getting ready to start my master’s thesis. I am visiting your class today to recruit participants for my study. In my study I’m looking at performance on a data entry task when individuals are paid incentives.

The task is meant to simulate the task of a medical data entry clerk. Because your pay will depend upon your performance, it will vary but you will earn approximately $7 for average performance per session for 6 sessions for a total of approximately $40 for average performance. You may also be able to earn extra credit in some of your classes, depending upon whether your instructor makes that available. Sessions will be in Wood Hall.

To be a participant, you must be available for one 45 minute session per week for 6 weeks during the Spring 2016 semester. Additionally, you cannot have previously participated in other performance management studies using the same medical data entry task or taken PSY 3440, Organizational Psychology. Participants must also use social media, email, browse the internet or play certain games for at least 5 hours combined in a month. Further, you can’t have or have had a data processing job and you must also pass a monetary incentive system quiz to make sure that you understand how you will be paid in the study.

Your participation is completely voluntary and you may withdraw at any time. If you do withdraw, you will be paid the money you have earned up to that point. Your willingness to participate in the study or your withdrawal from the study will not affect your grade in any course and your identity will remain confidential.

If you are interested in learning more about my study, please list your contact information on the individual participant recruitment slips, which I will collect in a few minutes. You can also contact me at yngvi.f.einarsson@wmich.edu or (269) 779-4297 (will write these on the board). Please remember that you must be available for 6 weeks during the Spring 2016 semester. I will contact you within the week to talk more about your potential participation.

Thank you for your time.”
Appendix E

Participant Recruitment Flyer
Research Participants Needed!!!

Are you interested in earning money and participating in research over the semester?

I'm looking for individuals to participate in a study designed to examine productivity levels on a medical data entry task when performers are paid performance based pay. While the amount of pay will vary depending on performance, participants will earn approximately $7 per session for average performance for six sessions, for a total of approximately $40.

To be eligible for participation in this study:

- You must be available for one, 45 minute session (in Wood Hall) per week for 6 weeks during the Spring 2016 semester.
- You must use social media, email, the Internet or play certain games for at least 5 hours a month.
- You cannot have previously participated in other performance management studies using the same medical data entry task here at Western Michigan University or taken PSY 3440, Organizational Psychology.
- You must not have had or currently have a data processing job.

If you are interested in learning more about this study, please contact Yngvi Einarsson at Yngvi.f.Einarsson@wmich.edu or (269) 997-4297. Be sure to provide your name, e-mail address or telephone number, and the times you can be reached.

Please remember that you must be available for 6 weeks during the Spring 2016 semester.

All information is confidential!

For more information contact Yngvi Einarsson
E-mail: Yngvi.F.Einarsson@wmich.edu or Phone: (269) 779-4297
Thank you!
Appendix F

Study Inclusion Questionnaire
Participant #_____

1. **Sex:**
   - Male
   - Female

2. **Age:**
   ______

3. Have you ever participated in a study using a medical data entry task at Western Michigan University (a screenshot of the task is available if you are not sure)?
   - Yes: _____
   - No: _____

4. Have you taken, or are currently taking, PSY 3440, Organizational Psychology?
   - Yes: _____
   - No: _____

5. Do you currently or have you held a position that involved data entry?
   - Yes: _____
   - No: _____

6. Think about how many hours per month, on average, you engage in the following activities. When the activity does not specifically specify the device used, then think about the total time using all devices.
   - Use social media
   - Email
   - Browse the internet
   - Play games on your smartphone
   - Play games online through a web browser
   - Play Solitaire
   - Play Angry Birds
   - Play Bejeweled

   **On average monthly hours:** _____
Appendix G

Pay System Quiz
Incentive Pay System Quiz #1

Participants are allowed to use a calculator or calculator app on their cellphone during the quiz.

PAY SYSTEM:

Individuals are paid 2 cents for every medical data record correctly processed during the session.
Answer the following questions based on the pay system.

1. James correctly processed 200 medical records during a session. How much money did James earn for that session?

2. Michelle processed 367 medical records during a session. 333 were correct. How much money did Michelle earn for that session?

3. Steve correctly processed 522 medical records during a session. How much money did Steve earn for that session?
**Incentive Pay System Quiz #2**

Participants are allowed to use a calculator or calculator app on their cellphone during the quiz.

**PAY SYSTEM:**

Individuals are paid 2 cents for every medical data record correctly processed during the session.

Answer the following questions based on the pay system.

1. Dale correctly processed 534 medical records during a session. How much money did Dale earn for that session?

2. Miles processed 425 medical records during a session. 377 were correct. How much money did Miles earn for that session?

3. Jessica correctly processed 284 medical records during a session. How much money did Jessica earn for that session?
Appendix H

Screenshot of Apparatus
Appendix I

Participant Questionnaires
Exit Survey

We would like to begin by thanking you for your participation in this study. Please answer the following questions about your experience.

1. How many records do you think you correctly completed in your last session? _________

2. How many records do you think you correctly completed in an average session? _________

**Evaluation Scale:**

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Using the evaluation scale, please circle the number which reflects your opinion.*

3. I was stressed or anxious when performing the task 1-- 2-- 3-- 4-- 5

4. I did my best every session 1-- 2-- 3-- 4-- 5

5. I tried to improve my performance from session to session 1-- 2-- 3-- 4-- 5

6. I was satisfied with the incentive pay system 1-- 2-- 3-- 4-- 5
Exit Survey

We would like to begin by thanking you for your participation in this study. Please answer the following questions about your experience.

1. How many records do you think you correctly completed in your last session? _________

2. How many records do you think you correctly completed in an average session? _________

Evaluation Scale:

Strongly Disagree 1------2-------3-------4------5  Strongly Agree

Using the evaluation scale, please circle the number which reflects your opinion.

3. I was stressed or anxious when performing the task 1------ 2------ 3------ 4------ 5

4. I did my best every session 1------ 2------ 3------ 4------ 5

5. I tried to improve my performance from session to session 1------ 2------ 3------ 4------ 5

6. I was satisfied with the incentive pay system 1------ 2------ 3------ 4------ 5

7. I was uncomfortable having other people in my group see my performance 1------ 2------ 3------ 4------ 5
Appendix J

Instructional Script: No Feedback Group
**Beginning of Session Instructions:**

*When the participant arrives in either 2510 or 2512 Wood Hall, the research assistant will greet the participant and close the door (to ensure privacy).*

*The research assistant will read aloud:*

**“Remember that before you go to the experimental room, make sure that any devices you do bring with you to the experimental room are completely silent in order not to disturb other participants in the study.”**

*“You will be working on the medical transcription task again today. I want to remind you that you will be paid 2 cents for every correct medical record in the session and paid at the end of the study. If you feel tired and need a break, you may take a break and will not be penalized for taking the break. You can relax, play any of the available computer games, browse the Internet or use your smartphone as long as you are not interrupting or disturbing other participants.**

*Please work at your own pace for the next 45 minutes. It is also important that you stay at your workstation and do not talk to any of the other people present in the lab room. If you have any questions, I will be on the other side of the room. You can stand up and let me know when your session is over.”*

*The research assistant will take the participant to his or her workstation in the laboratory room (2532 Wood Hall) and prompt him or her to begin their work session.*

*The research assistant observes the participant start their session.*

**End of Session:**

*The research assistant waits until the participant’s 45 minute session is over; the research assistant will then take the participant back to either 2510 or 2512 Wood Hall and remind the participant when his or her next session is.*
Appendix K

Sample of Individual Feedback Graph
Appendix L

Instructional Script: Graphic Individual Feedback Group
**Beginning of Session Instructions:**

**Before the participant arrives, the research assistant will take out the graph of previous performance for the participant. When the participant arrives in either 2510 or 2512 Wood Hall, the research assistant will greet the participant and close the door (to ensure privacy).**

**The research assistant will then read aloud:**

“Remember that before you go to the experimental room, make sure that any devices you do bring with you to the experimental room are completely silent in order not to disturb other participants in the study.”

“You will be working on the medical transcription task again today. I want to remind you that you will be paid 2 cents for every correct medical record in the session and paid at the end of the study. If you feel tired and need a break, you may take a break and will not be penalized for taking the break. You can relax, play any of the available computer games, browse the Internet or use your smartphone as long as you are not interrupting or disturbing other participants.”

**The research assistant will read aloud:**

“Here is a graph of your performance for each session so far. This graph will get updated with your information after every session that you complete.”

**The research assistant will give the participant a moment to look at the graph, and will then answer any questions the participant may have about it.**

**The research assistant will read aloud:**

*Please work at your own pace for the next 45 minutes. It is also important that you stay at your workstation and do not talk to any of the other people present in the lab room. If you have any questions, I will be on the other side of the room. You can stand up and let me know when your session is over.”*
**The research assistant will take the participant to his or her workstation in the laboratory room (2532 Wood Hall) and prompt him or her to begin their work session.**

**The research assistant observes the participant start their session.**

**End of Session:**

**The research assistant waits until the participant’s 45 minute session is over; the research assistant will then take the participant back to either 2510 or 2512 Wood Hall and remind the participant when his or her next session is.**
Appendix M

Sample of Social Comparison Feedback Graph
Appendix N

Instructional Script: Graphic Social Comparison Feedback Group
Beginning of Session Instructions:

**Before the participant arrives, the research assistant will take out the graph of previous performance for the participant. When the participant arrives in either 2510 or 2512 Wood Hall, the research assistant will greet the participant and close the door (to ensure privacy).**

**The research assistant will read aloud:

“Remember that before you go to the experimental room, make sure that any devices you do bring with you to the experimental room are completely silent in order not to disturb other participants in the study.”

“You will be working on the medical transcription task again today. I want to remind you that you will be paid 2 cents for every correct medical record in the session and paid at the end of the study. If you feel tired and need a break, you may take a break and will not be penalized for taking the break. You can relax, play any of the available computer games, browse the Internet or use your smartphone as long as you are not interrupting or disturbing other participants.

**The research assistant will read aloud:

“Here is a graph of your performance for each session so far. This graph will get updated with your information after every session that you complete. Your data path is represented here (**RA should point to the participants data). You will also notice that there are other lines of data represented on the graph, there are 15 total people in your group and the other data lines represent their performance.”

**The research assistant will be permitted to answer any questions that the participant has about where they fall in the data and can confirm or deny any of the participants assertions related to the graph (i.e., so I am much lower/higher than participant 2,3,4 right?)

**The research assistant will give the participant a moment to look at the graph, and will then answer any questions the participant may have about it.

**The research assistant will read aloud:
Please work at your own pace for the next 45 minutes. It is also important that you stay at your workstation and do not talk to any of the other people present in the lab room. If you have any questions, I will be on the other side of the room. You can stand up and let me know when your session is over.”

**The research assistant will take the participant to his or her workstation in the laboratory room (2532 Wood Hall) and prompt him or her to begin their work session.

**The research assistant observes the participant start their session.

**End of Session:**

**The research assistant waits until the participant’s 45 minute session is over; the research assistant will then take the participant back to either 2510 or 2512 Wood Hall and remind the participant when his or her next session is.
Appendix O

Training Script
TRAINING SESSION (ALL GROUPS)

After the informed consent form is signed and participants are accepted into the study, the participant will practice the task for 10 minutes. Take the participant into the lab, and explain the task to him/her. Point out the various parts of the task as you are explaining them:

“If you have a cell phone, please silence it now and before all sessions. Before you begin the study, we’d like you to get comfortable with the task, which is designed to simulate the job of a medical data entry clerk. The computer program will provide you with data corresponding to patients. You should first look for the “Patient ID number” and type it into the correct location (the blank “PATIENT ID” box). Then, look at whether the patient is male or female and, based on the ranges provided for the respective gender, determine whether the patient’s data are “within range” or “outside of range” by clicking the appropriate button. When you are satisfied with your response, click the “submit” button to close the current patient’s record and generate the next record. Let’s try one.”

Have the participant complete a record. Ask if there are any questions about the task. If so, answer the questions.

“Each computer has access to the Internet, as well as 6 computer games available for play at any time: Solitaire, Bejeweled, Mahjong, Text Twist, Jewel Quest, and Angry Birds. You are welcome to play these games, surf the Internet, play with your smart phone, or just take a break and relax. You may minimize the data entry task but under no circumstances should you close the program. Closing the program may result in no payment for the session, with an option to come in again to repeat the session. Additionally, all devices must be muted while in session so you do not disturb the other research participants.

Today, we’d like you to practice the task for 10 minutes. I will come back after 10 minutes to turn off the task and schedule your sessions. “

Return after 10 minutes. Record these data on the participant’s spreadsheet. Schedule subsequent session with the participant in the room used for greeting.
Appendix P

First Session Script for All Participants
First Session:

Introductory sessions will begin in 2510 or 2512 Wood Hall:

The student investigator or the research assistant will read aloud the paragraphs below at the beginning of the initial session for each participant:

“For all future sessions, we will meet in this room or the room next door. Remember that before you go to the experimental room, make sure that any devices you do bring with you to the experimental room are completely silent in order not to disturb other participants in the study.”

“You will be working on the medical transcription task today. Once you put in your participant number and press ok, your session has started. The computer program will automatically stop once 45 minutes have passed and let you know when your session is over. It is important that you never close the computer program during any of your sessions. In order for the session to count, the computer program must have the full 45 minutes accounted for. However, this does not mean you need to work for the entire 45 minutes. I want to remind you that you will be paid 2 cents for every correct medical record in the session and paid at the end of the study. If you feel tired and need a break, you may take a break and will not be penalized for taking the break. You can relax, play any of the available computer games, browse the Internet or use your smartphone as long as you are not interrupting or disturbing other participants.”

“There is a job aid for the task located next to the computer just in case you have forgotten how to complete the task.”

**The research assistant will take the participant to his or her workstation in the laboratory room (2532 Wood Hall), open the program on the computer, and prompt him or her to begin their work session.

**The research assistant observes the participant start their session.

End of Introductory Session:
The research assistant waits until the participant’s 45 minute session is over; the research assistant will then take the participant back to either 2510 or 2512 Wood Hall and remind the participant when his or her next session is.
Appendix Q

Debriefing Scripts
No Feedback - Debriefing Session Script:

**This script will be read aloud by the student investigator or a research assistant to each participant following the completion of the study.**

Thank you for your participation in this study. As one last task, I would like to ask you to fill out this short survey about your experiences as a participant in the study. Is that something you are willing to do?"

**The research assistant will give the participant the survey.**

"Thank you for completing the survey!"

"Thank you again for your participation in the study. The reason for this session is so that I can provide a brief explanation of the purpose of the study that you have just completed. Feel free to ask any questions you have.

The purpose of the current study was to evaluate the effects of graphic feedback on performance during performance pay. You were in a condition in which you didn’t receive any feedback. There were (25-26) other people in your group who also received no information about their performance.

There were also two other conditions, one in which participants received a graph of their own performance and another in which participants received a graph of their individual performance and the individual performances of other group members (show the sample SCF – individual performance for each individual graph).

We will be comparing the performance of individuals in these three groups.”

**The research assistant will have a time sheet available that will be provided by the student investigator.**

“I will now pay you for your participation. You completed six sessions during the study. Here’s the number of medical records you correctly completed in each session along with the total number (show and give them the receipt). Each correctly completed record was worth 2 cents, thus you earned a total of X (experimenter pays the participant).

Do you have any questions or concerns about this study or your participation at this time?

Thank you for your participation in this study and please do not discuss this study with anyone else because we are still in the process of debriefing other participants.
Individual Graphic Feedback - Debriefing Session Script:

**This script will be read aloud by the student investigator or a research assistant to each participant following the completion of the study.**

*Thank you for your participation in this study. As one last task, I would like to ask you to fill out this short survey about your experiences as a participant in the study. Is that something you are willing to do?**

**The research assistant will give the participant the survey.**

*“Thank you for completing the survey!”*

*“Thank you again for your participation in the study. The reason for this session is so that I can provide a brief explanation of the purpose of the study that you have just completed. Feel free to ask any questions you have.**

*The purpose of the current study was to evaluate the effects of graphic feedback on performance during performance pay. You were in a condition in which you received graphic feedback about your performance. There were (25-26) other people in your group who also received graphic feedback about their performance.**

*There were also two other conditions, one in which participants received no feedback at all on their performance and another where participants received a graph of their individual performance and the individual performances of other group members (show the sample SCF – individual performance for each individual graph).**

*We will be comparing the performance of individuals in these three groups.”*

**The research assistant will have a time sheet available that will be provided by the student investigator.**

*I will now pay you for your participation. You completed six sessions during the study. Here’s the number of medical records you correctly completed in each session along with the total number (show and give them the receipt). Each correctly completed record was worth 2 cents, thus you earned a total of X (experimenter pays the participant).**

*Do you have any questions or concerns about this study or your participation at this time?**

*Thank you for your participation in this study and please do not discuss this study with anyone else because we are still in the process of debriefing other participants.*
**Graphic Social Comparison Feedback - Debriefing Session Script:**

**This script will be read aloud by the student investigator or a research assistant to each participant following the completion of the study.**

Thank you for your participation in this study. As one last task, I would like to ask you to fill out this short survey about your experiences as a participant in the study. Is that something you are willing to do?"

**The research assistant will give the participant the survey.**

"Thank you for completing the survey!"

"Thank you again for your participation in the study. The reason for this session is so that I can provide a brief explanation of the purpose of the study that you have just completed. Feel free to ask any questions you have.

The purpose of the current study was to evaluate the effects of graphic feedback on performance during performance pay. You were in a condition in which you received social comparison graphic feedback about your performance. There were (25-26) other people in your group who also received social comparison graphic feedback about their performance.

There were also two other conditions, one in which participants received no feedback at all on their performance and another where participants received a graph of only their individual performance.

We will be comparing the performance of individuals in these three groups.”

**The research assistant will have a time sheet available that will be provided by the student investigator.**

“I will now pay you for your participation. You completed six sessions during the study. Here’s the number of medical records you correctly completed in each session along with the total number (show and give them the receipt). Each correctly completed record was worth 2 cents, thus you earned a total of X (experimenter pays the participant).

Do you have any questions or concerns about this study or your participation at this time?

Thank you for your participation in this study and please do not discuss this study with anyone else because we are still in the process of debriefing other participants.
Appendix R

Receipt for Compensation
Compensation for Study Participation:

Date: __________

Participant number: _______________________

Number of correct medical records:

1st session: _______
2nd session: _______
3rd session: _______
4th session: _______
5th session: _______
6th session: _______

Total: __________ * 0.02

= ____________