Feedback intervention theory: An examination of the differential effects of expertise on performance

Blakely Lauren Smith

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FEEDBACK INTERVENTION THEORY: AN EXAMINATION OF THE DIFFERENTIAL EFFECTS OF EXPERTISE ON PERFORMANCE

A Thesis
Presented to the Faculty of California State University, San Bernardino

In Partial Fulfillment of the Requirements for the Degree Master of Science in Psychology: Industrial/Organizational

by Blakely Lauren Smith
March 2013
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ABSTRACT

The effects of feedback on performance have produced inconsistent results over the years. This can be attributed to a lack of feedback intervention theory which takes into account the amalgamation of factors which can interact to effect performance as a function of feedback. One such factor is the attention that can be directed to various levels of the perceptual hierarchy when the feedback intervention cue is task or self relevant. Furthermore, in the presence of information that is relevant to the self, individual expertise may moderate the actions taken directly following feedback. The current study examined level of expertise as a moderator of the effects of feedback intervention cue on performance on a sample of 193 female undergraduate students from a mid-sized public university in the southwestern United States. A significant interaction was found between feedback intervention cue and expertise indicating that self and task relevant feedback intervention cues were beneficial depending on level of expertise.
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CHAPTER ONE
INTRODUCTION

A central principle of performance management is the idea of continuous and dynamic feedback as a means to continuously exceed standards (Aguinis, 2000). However, it is not entirely clear how feedback affects performance. Early research declared that feedback had a universally positive effect on performance (Ammons, 1956) yet, more recent research has suggested that this is not the case (Kluger & Denisi, 1996; Waldersee & Luthans, 1994). One possibility is that level of experience will interact with the effects of feedback on performance.

To date, the feedback literature has primarily focused on positive (i.e., indications of success) versus negative (i.e., indications of failure) effects of feedback on performance. Much of the hypotheses surrounding these studies were attributed to the behavioristic Law of Effect (Kluger & Denisi, 1996). The law of effect (Thorndike, 1913) stated that the effects of feedback were a function of reinforcement and punishment where the only variable which affected performance was whether or not the feedback elicited was positive or negative. The assumption of this position yielded many
inconsistencies in the feedback literature, however because the effects of feedback on performance proved to be more complex (Kluger & Denisi, 1996; Waldersee & Luthans, 1994). Kluger and Denisi (1996) contended that the results of feedback on performance were variable in that they did not consistently improve performance. Given these inconsistencies, the need for a feedback intervention theory became apparent (Kluger & Denisi, 1996; Waldersee & Luthans, 1994).

Feedback, as defined by Kluger and Denisi (1996), is an action taken by an external agent to provide information regarding one’s performance. Others have broadly defined feedback as knowledge of performance or results which could extend to, a typist’s knowledge of their typing technique to a typist's knowledge of how many words they type per minute (Ammons, 1956). This distinction is important to the current study because it defines the scope of feedback in regards to performance. A feedback intervention (FI) only refers to feedback that is elicited from an outside source. Naturalistic feedback processes (i.e., feedback that is elicited simply from the result of an action) are separate, and outside of the focus of present research.
In a meta-analysis of Feedback Interventions (FI) on performance, Kluger and Denisi (1996) found that FIs were detrimental to performance in one-third of the studies they examined. Their solution to these inconsistencies was to propose a Feedback intervention theory (FIT) in which they tested with a moderator analysis. Feedback intervention theory consists of three arguments: a) behavior is regulated by the comparison of feedback to a standard, b) attention is a limited resource and only those feedback-standard gaps that receive attention play a role in regulating behavior, c) and feedback intervention cues necessarily change the allocation of attention (Kluger & Denisi, 1998).

Kluger and Denisi (1996) introduced FIT theory as an amalgamation of several theories (e.g., goal-setting theory, control theory), which would account for the effects of feedback on performance. Feedback type (i.e., positive or negative) alone should not be the only variable considered to affect performance. Their assertions were that effects of feedback on performance were a function of where attention is directed in the hierarchy of goals (i.e., the perceptual hierarchy) as well as the familiarity of the task. The key findings of their meta-analysis were that FI cues which direct
attention to the self diminish the effects of FI on performance. Conversely, they found that FI which direct attention to the task enhance the effects of FI on performance.

Kluger and Denisi (1998) stated that knowing where attention is allocated (i.e., to the task or to the self) is valuable in predicting the effects of FI on performance. FI cues are messages embedded within feedback interventions that direct attention either to the level of the self (e.g., opportunities for enhancement) or to the level of the task (e.g., the components of the task). Feedback intervention cues determine where attention will be allocated.

One factor that moderates the allocation of attention is the degree to which the task being performed is familiar. Furthermore, as familiarity is gained the task begins to be performed automatically (Klein, Calderwood, & Macgregor, 1989). An automatic or highly proceduralized process is one that is run on a "permanent set of associative connections" (Shiffrin & Schneider, 1977, p. 2) and directs attention consistently to a stimulus target. A controlled process is run on a "temporary sequence of associative connections" and directs attention to varying targets (Schneider & Chien, 2003, p. 527). In
short, an highly proceduralized process is one that requires few cognitive resources.

Experts on a particular task possess a familiarity and thus use highly proceduralized processing (Klein et al., 1989). Unlike experts, novices do not possess task oriented familiarity and therefore do not perform tasks via highly proceduralized processes. Instead, novices operate tasks via controlled processes (Ford & Kraiger, 1995).

Furthermore, an individual who is performing a highly proceduralized task is able to engage in other activities that require attention (e.g., self-relevant information) (Shiffrin & Schnieder, 1977). Moreover, self-relevant information requires controlled processing (Rameson, Satpute, & Lieberman, 2010).

Feedback interventions have the ability to alter locus of attention, and different loci of attention require distinct processes, therefore one should expect fundamental differences in the way similar feedback is processed when the task is run by highly proceduralized vs. controlled processes. Specifically, there will be differences between experts and novices on the same task. The purpose of the current research was to test the differential effects of feedback type (i.e., self-relevant
vs. task-relevant) on individuals with different levels of expertise type (expert vs. novice).

Moderators of Feedback

A moderator of FI effects on performance is the attention that is directed to the self when feedback is given. One possible explanation for decreased performance directly following self relevant feedback is the decreased attention an individual gives to a task when feedback is self-relevant rather than task relevant. This occurrence would result in a shift of attention from the task at hand. This is because attention is shifted up the hierarchy to the cognitive processes associated with the self rather than remaining focused on the task (Kluger & Denisi, 1996). Understanding how the activation of the self during feedback interventions affects attention will add to the theoretical understanding of how cognitive control schemas and feedback interventions interact to affect performance.

Many moderators have been identified and are discussed in the feedback literature. Kluger and Denisi (1996) considered four moderators of the effects of feedback on performance which were derived from their propositions of FIT: feedback intervention (FI) cues, task
characteristics, situational variables, and personality variables. FI cues are messages imbedded within feedback which determine which action regulation will receive the most attention. Task characteristics are defined by the complexity and familiarity of the task. They moderate the effects of feedback on performance because they determine the cognitive resources and effort which are necessary in order to improve performance. Situational variables (e.g. context) provide information about externally provided goals and can moderate whether feedback is task on self relevant. Personality traits which can act as moderators of individuals' reaction to feedback are self-esteem, locus of control, trait working memory, and altruism (Kluger & Denisi, 1996). The focus of the current study was the role of task characteristics and FI cues. Each is delineated below.

The term task characteristic refers to the novelty or familiarity of the task. Feedback interventions on novel tasks result in performance decrements (Waldersee & Luthans, 1994). In contrast, FI on familiar tasks do not disrupt performance (Waldersee & Luthans, 1994). Kluger and Denisi (1998) stated that one of the obstacles to understanding feedback's effect on performance is the differing effects FI have, as a function of task
differences. The present research addressed this question by examining performance on different types of tasks (i.e., novel or familiar); where task type was determined by an individual’s level of task expertise (i.e., whether they are an expert or novice.)

Feedback Intervention Cues

Before considering the differences in experts and novices, the types of feedback and their potential to allocate attention should be specified. Attention can be shifted in the perceptual hierarchy of goals as a function of FI cues. Three types of feedback processes were identified by Kluger and Denisi (1996) as being tied to the hierarchy: task motivation, task learning, and meta-task. Feedback interventions which direct attention to task motivation processes simply alert an individual to the discrepancy between performance and a standard. If feedback indicates that performance exceeds standards then two actions are possible: reduction in effort or an increase in effort. Effort is increased if an improvement in performance represents the opportunity to attain self goals. It is decreased if there is no benefit to an improvement in performance. Conversely, if feedback indicates that the performance is below the standard then
effort will be increased. If an increase in performance does not eliminate the discrepancy then attention is shifted in the hierarchy. From this point, if an individual believes they can improve performance, then their attention will shift to learning strategies to better perform the task. However, if an individual does not believe they can successfully improve performance, then their attention will be shifted to the self. Every FI activates task motivation processes. What is variable is whether it is the self or the task which receives attention in the hierarchy. There are differences in the benefits for shifting attention to the task versus self for novel versus familiar tasks. These are discussed below.

Task learning processes are initiated when performance is below the standard (i.e. negative feedback sign) and the discrepancy can only be rectified by a change in behavior as opposed to an increase in effort. In general, as individuals begin working harder at a task they develop hypotheses about actions that improve performance. These hypotheses become highly proceduralized scripts that are represented in the lower levels of the perceptual hierarchy which are supervised and regulated by the higher level loops. Task learning processes can also
be activated directly by a feedback intervention that focuses on the components of the task (e.g., you are not using your thumb when you type). The activation of task learning processes does not ensure an improvement in performance if the task is already familiar as they may interfere with the execution of highly proceduralized processes. If FI interfere with highly proceduralized scripts then performance decrements will be the result (Kluger & Denisi, 1996). Conversely, on a novel task, task learning processes would improve performance.

Meta-task processes are initiated by feedback interventions that direct attention to the self. Doing so redirects attention to the higher levels of the hierarchy (i.e., to higher level goals) away from the task, which in turn will deplete cognitive resources for the task. Attention to the self is only problematic on a novel task. This is because the cognitive resources that were being used for the task would now be used to process information about the self. Self relevant feedback does not affect performance on a familiar task because the cognitive resources being used for the task are unaffected by the processing of self relevant information.
Expert verses Novice

An avenue that has been left unexplored in regard to FI is the distinction between the effects they have on performance depending on whether or not they are processed by the experientially or rationally based cognitive systems (Kluger & Denisi, 1998). Human cognition is governed by two systems: a rational system and an experiential system (Sloman, 1996). The rational system requires more cognitive resources (i.e., controlled processes) because it is evaluative and rule based. The experiential system is based on previously formed associations and thus is not sensitive to resource depletion. Experts operate tasks through the experiential system which does not require the careful manipulation of symbols in order to encode information. Novices operate tasks through the rational system, which requires the controlled manipulation of symbols in order to encode information. In short, experts operate on a system that processes information automatically and novices operate on a system that is controlled (Kanfer & Ackerman, 1989).

This distinction is important because it suggests that in response to a FI, an expert will use highly proceduralized processing which increases the attentional capacity for other tasks (Shiffrin & Schneider, 1977).
Conversely, an individual performing a novel task (i.e., a novice) will have restricted attentional capacity because the task is being operated by controlled processes. The processing that occurs as a function of the familiarity of the task is postulated to affect how attention will be used for performance once it is allocated in the hierarchy (Vallacher & Wegner, 1987). Specifically, if automatic or highly proceduralized processes are being used for the task then the action is identified at the level of the self. Conversely, if controlled processes are being used then the action is identified at the level of the task.

Experts' knowledge is proceduralized and principled by what knowledge is most useful given a particular context. Proceduralized knowledge is a set of conditioned *if-then* rules that are applied to situations and that can be accessed from long-term memory without having to be attended to consciously (Glaser, 1984). This, coupled with the notion that an automatic or highly proceduralized task will be located at higher levels of meaning in the hierarchy suggests that experts and novices will cognitively process and act upon feedback interventions differently. More specifically, it suggests that experts will be able to process information pertaining to higher
levels of the hierarchy (i.e., self-relevant feedback) why maintaining the same level of performance on the task.

In summary, the current research posited an integration of assumptions. The first being that feedback interventions, which are common in the workplace, are often given considerable attention by those receiving them because they have implications for the self (Kluger & Denisi, 1996). Furthermore, FI cues will ultimately direct attention either to the self or to the task. Finally, the allocation of attention and ultimately performance is dependent upon the familiarity of the task.

Discussed below, are theories relevant to FIT. The theoretical effects of FI on performance are contingent upon the assumption that individuals are motivated to reduce discrepancies which are made apparent via FI. This regulation of discrepancies occurs in a closed cybernetic system which will dictate the regulatory loops that are activated following feedback. Specifically, attention is allocated to loci (i.e., to the task or to the self) in the perceptual hierarchy depending on the FI cue elicited. Finally, the results of feedback on performance is a function of the interaction of FI cue and the familiarity of the task.
Cybernetic Theory

One of the building blocks of FIT is the regulation of discrepancies in relation to a referent standard (Kluger & Denisi, 1996). According to control theory (Klein et al., 1989) a referent standard is the desired state which is monitored by the comparator. The comparator then sends information about the comparison of the current and desired states to the output function which takes action to reduce the discrepancy. Furthermore, the discrepancy results in affect and ultimately in action (Carver & Sheirer, 1981). The notion is one of a simple feedback loop.

Kluger and Denisi (1996) assume a cybernetic model of feedback in which the term goal is used to indicate a reference signal (Powers, 1973). A reference signal is the representation of a desired state as opposed to a current state. In a cybernetic unit, the reference signal drives an organism to reduce discrepancies by testing or evaluating a comparison to a standard. The difference in the cybernetic model compared to the Test-Operate-Test-Exit model is that testing the standard is a continuous process which requires automatic processing as opposed to controlled processing (Austin & Vancouver, 1996).
The simple feedback loop is the basic unit of a cybernetic system. However, it was represented originally in the goal setting literature as the TOTE system. The TOTE system was proposed in the 1960s as an alternative explanation of self-regulation to the behaviorist stimulus-response bond (Austin & Vancouver, 1996). The assumptions surrounding the stimulus-response bond are that behavior occurs in an open loop system meaning that the effect (i.e., the behavior or response) is contingent upon the cause (i.e., the stimulus). Actions in response to a discrepancy are not contingent upon the current state of a system. This is consistent with Ammon’s (1956) notion that all FI improve performance. For example, a sprinkler system may be set to go off at a certain time every day and it does so without testing the moisture that is currently present in the soil. Furthermore, even if it rains the sprinkler system will water the ground (Benjamin, 1991). Open loop systems do not take into account the current status of a system. This can be likened to the behaviorist position that response occurs as the result of some stimulus but not vice versa. This is counter to a closed loop system where current behavior, in a sense, is its own cause. Phenomena in a closed loop system occur enduringly over time such that the
environment changes and the cause and effect relationship lose its sequential identity (Powers, 1973). This is relevant to feedback intervention theory because it explains why the effects of feedback interventions on performance are not dichotomous: one must consider the current state of a system (i.e., an individual) at the time the feedback is given. Powers (1973) posited that the idea of stimuli emitting responses was far too simple to explain human behavior much like Kluger and Denisi (1996) posited that knowledge of results (i.e., positive or negative) is far too simple to account for feedback’s effect on performance. These two concepts are paralleled in that behavior (i.e., performance) is contingent on the input (i.e., FI cue) as well as the current state of the system (e.g., expertise, task type, hierarchy, attention).

In a cybernetic model, when positive or corrective feedback is elicited it disrupts routine behaviors (Waldersee & Luthans, 1994). Routine behaviors in the workplace become proceduralized meaning that said behaviors do not require controlled processes for operation. The incorporating of positive or corrective feedback (i.e., comparison to the standard) requires controlled processes because incorporation requires a disruption in the cybernetic process in order to engage in the process of
comparison to performance. According to Waldersee and Luthans (1994), in the workplace, habitual (i.e., familiar) behaviors do not require the cybernetic process of comparison to a standard in order to maintain performance because they are thoroughly learned.

Furthermore, in a study conducted by Waldersee and Luthans (1994) on the effects of positive and corrective feedback on customer service performance, results showed that positive feedback improved performance significantly less than did corrective feedback. In their study, 111 employees from 11 different fast food restaurants were given either corrective or positive feedback regarding performance via performance appraisal slips that addressed job behaviors (e.g., since your last evaluation, we have noticed that the following behaviors have been performed in an especially excellent manner). The findings suggest that on routine (i.e., automatic) tasks, regulation occurs through habit control rather than the controlled monitoring of performance in relation to the regulatory loops. This supports Kluger and Denisi's (1996) postulation that regulatory loops are organized in a hierarchy. Exemplifying that positive feedback did not improve routine performance refutes the behavioristic notion that positive feedback simply acts as reinforcement.
for performance. The empirical finding that corrective feedback improves performance supports the notion that improvements in performance are motivated by discrepancy reduction within the regulatory loops. Therefore further examination of the regulatory loops within the perceptual hierarchy in relationship to the effects of feedback on performance is needed.

Cognitive Components of the Perceptual Hierarchy

The theoretical notion of a hierarchy has been validated by action identification theory (Kluger & Denisi, 1996). Action identification theory states that individuals have varying ways of identifying what they are doing depending on the action’s identity structure. The identity structure is organized hierarchically according to the level of meaning it is assigned. Specifically, actions which are located in a low level of the hierarchy express the details of the action (i.e., the components of the task). Conversely, actions that are located at a high level of the hierarchy express the general purpose of the task (i.e., the relevance to the self) (Vallacher & Wegner, 1987).

The action taken following a FI will be dependent upon where the task is located in the hierarchy. The
location of the task in the hierarchy is a function of its level of action identification, which refers to the extent to which an action (i.e., the receipt of feedback) is identified by the recipient as task or self relevant (Vallacher & Wegner, 1987). As an action or task becomes progressively familiar it becomes easier for individuals to highlight its potential meanings (e.g., reading words means a higher degree of education). That is to say that individuals for whom a task is highly proceduralized (i.e., experts) will identify their actions at higher levels of the hierarchy (e.g., self enhancement). Conversely, novices will identify a given task at the lower levels in the hierarchy (i.e., the mechanistic underpinnings of the task).

Kluger and Denisi (1996) discuss the hierarchy in terms of negative feedback loops where negative feedback loops at the top of the hierarchy possess the goals of the self and lower level loops possess the goals of physical action (Austin & Vancouver, 1996). The higher level loops regulate the lower level loops. In the instance of a graduate student, the higher level loop of "obtaining a degree" would activate the lower level loop of "reading words". Furthermore, according to action identification theory (Vallacher & Wegner, 1987), various levels of
meaning in regards to the self are activated at different levels of the hierarchy so that "reading words" at the lower level is interpreted as "investing in my future" at the higher level. The familiarity of the task will determine the level of action identity within the hierarchy which will subsequently determine the type of processing (i.e., automatic or controlled) used to carry out the task following feedback. The nature of these processes and their determinants are discussed below.

Automatic and Controlled Processing

Lieberman (2007) talked about two types of social cognitive processes that are governed by separate groupings of brain structures. The x system is composed of the more basic functions that govern automatic responses in social cognition, the reflexive responses. The c system is composed of those structures that govern more controlled responses in social cognition, the reflective responses. These systems are differentially activated to elicit processes and responses in social cognition. Previously, it was thought that these systems operated completely independently and separately of one another (Chaiken & Trope, 1999). However, it was suggested by Lieberman that this idea is not entirely true:
specifically, he states, "the X and C systems are not conceived as hermetically sealed Fodorian modules. Both systems work to process socioemotional information, and often work hand in hand to achieve socioemotional goals" (Lieberman, 2007, p. 293). Furthermore, social cognitive processes should be thought of as continuum of automaticity and control rather than as an all or none phenomena similar to Kluger and Denisi's contention that locus of attention on a given task is not an all or none phenomenon.

While there is evidence for the independence of the systems, the C system exerts control over the X system in that it overrides X system responses if the automatic response is contextually inappropriate (Lieberman, 2007). Applied to the concept of the hierarchy, the C system would regulate where attention (i.e., resources) would be allocated in the hierarchy. Kluger and Denisi (1996) described attention in the hierarchy similarly by describing it as a probabilistic process where the locus of attention can be present simultaneously at different levels of the hierarchy. However, while possible, this would not result in optimal levels of performance. For instance, it would not be beneficial for a FI to direct attention to the self in a novice performer. Doing so
would direct the locus of attention to self and task simultaneously, thus reducing cognitive resources available for the task.

The prefrontal cortex (PFC) is the hub of working memory, controlled processing, and logic. It is a part of the C system and it is responsible for holding goals in short-term memory. For instance, the PFC is responsible for the response inhibition of the automatic word response in the Stroop task (Kane & Engle, 2002). Furthermore, it is the part of the C system that overrides contextually inappropriate automatic responses in the X system. However, the PFC does not act alone in detecting conflict in the form of inappropriate responses. The anterior cingulated cortex (ACC) is responsible for notifying the PFC that it needs to regulate responses when expectations are not met (MacDonald, Cohen, Stenger, & Carter, 2000). Therefore, the ACC plays a role in regulating where attention goes in the hierarchy when feedback is given. This is because the ACC is the structure responsible for regulating responses so that they are in line with current standards. Specifically, if a novice is given self-relevant feedback on a task, then the controlled processes which are being used to operate the task will then be used to process information at higher levels of the hierarchy.
which will result in performance decrement. In the case of an expert, self relevant information will still activate controlled processes in order to process information at higher levels of the hierarchy. However, performance decrements will not occur because the information about the task, which is located at lower levels of the hierarchy, is well learned and does not require the activation of controlled processes. For the current study, it was postulated that experts are running the task via highly proceduralized processes rather than automatic processes. The distinction is critical because a truly automatic process cannot be improved nor can it be interrupted (Kane & Engle, 2000) and thus the current study sought to examine the interaction of feedback and the spectrum of automaticity.

**Rationale for the Present Study**

Kluger and Denisi's (1996) interpretation of the feedback literature raises questions about the effects of feedback on performance. Their suggestion that the effects of feedback are more than just a function of positive or negative reinforcement has guided the current research question by bringing to light the possibility that feedback intervention cues can direct attention to.
different levels of the perceptual hierarchy which can subsequently effect the way in which the feedback is processed. Their assertion that FI cues can direct attention to different levels of the hierarchy has implications for the ways in which feedback can or should be presented in order to improve performance.

Furthermore, Kluger and Denisi's (1996) contention that once a task is highly proceduralized it is given a higher level of meaning in the hierarchy has implications for the differential effects of feedback on performance for expert versus novices. Specifically, it implies that the meaning assigned to feedback given on a highly proceduralized task will be at higher levels of the hierarchy (i.e., at the level of the self). Moreover, Kluger and Denisi (1996) found that FI cues which directed attention to the meta-task processes resulted in performance decrements. However, this was not considered in terms of expert versus novice differences.

The idea of the perceptual hierarchy coupled with the Lieberman's concept of the X and C systems has implications for the ways in which FI cues will be processed depending on whether or not the task is run by controlled or automatic processes. It is expected that the effects of type of FI cue on performance will be moderated
by whether the individual receiving the feedback is an expert or a novice. Specifically, it is expected that task relevant information will interrupt automatic scripts in experts, resulting in performance decrements where task relevant information will result in performance improvements in novices. Furthermore, was expected that FI cues which direct attention to meta-task processes will interrupt the controlled processing of the novice which will interfere with the task and result in greater performance than for an expert. Meta-task processing is not expected to interfere with expert performance because the task is being run by highly proceduralized processes which are not needed in order to process self relevant information.

H1: There would be an interaction between type of feedback and level of expertise. Experts in the task relevant condition would be outperformed by experts in the self-relevant condition and novices in the task relevant condition. Novices in the self-relevant condition would be out performed by novices in the task relevant condition and experts in the self-relevant condition. The predicted interaction is depicted in Figure 1 which displays performance levels of participants who received self relevant feedback interventions and participants who
received task relevant feedback interventions. Performance levels are expressed as differences between performance pre and post feedback; positive values indicate an improvement in performance, and negative values indicate performance decrement.

Figure 1. Predicted Interaction of Feedback and Expertise
CHAPTER TWO

METHOD

Participants

The sample consisted of 193 female undergraduate psychology students at California State University, San Bernardino. A review of the descriptive statistics indicated that the average age of participants was 23. Participant race was composed of 17.7% Africa American, 6.8% Asian American, 49.5% Hispanic, 1.4% Middle Eastern and 14% Caucasian. The average GPA of participants was 3.05. In order to examine the composition of the groups, the file was split by expertise.

The average age of experts was 21.35 compared to the novice average age of 24.29. Novice race was composed of 17% African Americans, 57% Hispanics, 7% Asian Americans, 1% Native Americans, and 12% Caucasian. Expert race was composed of 16% African Americans, 44% Hispanics, 4% Asian Americans, 1% Native Americans, and 14% Caucasian. The average GPA of experts was 3.1 and the average GPA of novices was 3.05. The novice group was composed of 35% seniors, 32% juniors, 14% sophomores, and 7% freshmen. The expert group was composed of 25% seniors, 25% juniors, 21% sophomores, and 16% freshmen (see Table 1).
Procedure

Participants were recruited via SONA which is a service used by the Psychology Department to manage the student participant pool. Access to the subject pool is limited faculty and principal investigators with an IRB. Participants were told that they were participating in a study which looks at skill in first person shooter (FPS) games and achievement orientation.

Before beginning the experiment, participants were read the following protocol:

"You are here to participate in a study about video games and achievement orientation; before you begin I am going to have you fill out a consent form and a demographics sheet. All of our data are analyzed at the group level therefore your information will be confidential.

The term achievement orientation refers to an individual’s desire to achieve. As you may know, individuals who play video games have a strong need to perform to the best of their abilities and this indicates a strong need for growth and achievement in other aspects of life, like education. Furthermore, individuals with high achievement orientation tend to be faster learners."
You will be playing the video game Unreal Tournament. You will be allowed one practice round then you will play an actual round. Then you will be allowed one more round to reach your highest level of performance. Good Luck!"

Following the protocol, participants were asked to complete a demographics sheet which included questions about their experience with FPS games. Then they were asked to perform a five minute practice game at the average level of skill of Unreal Tournament.

After skill had been assessed, participants were asked to complete another five-minute match after which they were given feedback that was either task or self relevant, unless they were in the control condition which received no feedback. Following feedback, they completed another five-minute match in order to assess the effects of feedback on performance.

Design

The study was conducted using a 2 (skill: expert vs. novice) X 3 (feedback type: self, task, or no feedback) between subjects design. Experts and novices were assigned to one of three groups of feedback type: task relevant, self-relevant, or no feedback. Expert and novice status
was determined based on the proficiency level of participants at the video game Unreal Tournament. This was determined by a practice session which occurred immediately before participation in the experiment. Participants were asked to play a five minute practice game at the average level of skill. Proficiency level was based on the number of kills completed by the end of the game. The cutoff was based on the average number of kills of players in the top quartile on the official Unreal Tournament site (Unreal Tournament, 2004)

Materials

For the present study Unreal Tournament, a FPS game was used in order to assess the effects of feedback on performance. The objective of the game is to complete a map and get the highest number of kills in comparison to other players. Performance was assessed on the First Person Shooter game Unreal Tournament.

First person shooter games center game play around weapon based combat from the first person perspective. The player experiences the game from the perspective of a protagonist. The goal of the game is to kill as many opponents as possible. The environment is presented as 3-D
graphics in which players must maneuver through in order to kill opponents.

The game was played by all participants on a Dell personal computer using a standard keyboard. Operations for the game were controlled via keyboard and mouse. Participants were playing a five minute game on the map Osiris (see Figure 2). The server was configured so that players receive the same map and weaponry each time they played.

Previous ethnographic works have suggested that, in modern culture, video games provide a social identity for individuals who play them frequently. Furthermore it has been shown that expertise develops over long periods of game play. Specifically, Reeves, Brown, and Laurier (2009) studied player expertise on the 2004 version of the FPS game, Counterstrike. Their work illustrated that over the course of hours of play; players develop dexterity in maneuvering through terrain and demonstrate automaticity of tactics (Reeves et al., 2009). This is important to note for the current study because it demonstrates that automaticity can be attained on a video game task and thus has indications for the effects of feedback on performance per the postulations of previous literature regarding the
perceptual hierarchy (Kanfer & Ackerman, 1989; Chaiken & Trope, 1999).

Task

The game was set up as a death match between two players where the goal is to find the opponent by maneuvering through the map so that they can locate and kill their opponent. In this particular type of match, once a player dies they can be resurrected and continue to play until the match ends. Performance was indicated by number of times the participant kills their opponent. Matches were five minutes long in a map sequence on the single player version of Unreal Tournament.

Feedback Manipulation

Feedback interventions were given via verbal feedback. Two types of feedback processes were elicited as follows: Self-relevant feedback was given in the form of a percentile ranking that is based on performance relative to other players listed on a global website. The use of normative feedback is based on Kluger and Denisi’s (1996) postulation that normative feedback increases ego involvement and thus reduces attention to the task. The percentiles presented were based on efficiency ratings which are calculated on a kills per hour ratio by the
UT2004 global stats tracking server. Participants were told that "compared to players of the same age and same level of skill, you are in the XX percentile." Task relevant information was given as an instruction for the participants to aim at the target's head in order to kill more accurately. Participants in the task relevant feedback condition were told "You will improve your performance by using the cross hairs to aim the opponent's at the head and by using the lateral arrows to duck behind structures."

Feedback Orientation Scale

The Feedback Orientation Scale was administered in order to assess participants' propensity for receiving feedback (Linderbaum, 2006). While there are no specific hypotheses regarding the current study and feedback orientation, the scale were used to inform the results of the current study in terms of participants' inclination to receive feedback. The justification for administering this scale is that feedback interventions in general will not affect performance if the individuals are not inclined to consider feedback. The Feedback Orientation Scale is a multidimensional scale which assesses an individual's overall receptivity to receiving feedback (London &
Smither, 2002). The measure includes four dimensions: utility, accountability, self-awareness, and feedback self-efficacy. The overall observed reliability of the scale was .91.
CHAPTER THREE

RESULTS

The pilot study consisted of 10 participants: five of whom met the criteria for expert and five who met the criteria for novice. The results of pilot testing revealed that the video game task was run by highly proceduralized processes for experts. This is because all five experts were able to successfully recall the visuo-spatial task after playing Unreal Tournament while none of the novices were able to correctly recall the spatial task after playing Unreal Tournament. Therefore the task was deemed to be highly proceduralized for experts and ultimately appropriate for the current study.

Data Screening

Prior to testing study hypotheses, data were screened for violations of normality, missing data, and outliers, within each group. To accomplish this, the file was split into expert and novice groups. Missing data were evaluated using frequencies, and univariate outliers were evaluated by transforming raw scores on the DV to z-scores and comparing the z-scores to a criterion of ±3.29, p < .001 (Tabachnik & Fidell, 2007). No missing data were detected and there were no univariate outliers. Normality was
evaluated using histograms and the skewness statistic. The skewness statistic was divided by the standard error of skewness and the resulting coefficient was compared to the critical value of \( \pm 3.29, \ p < .001 \). No variables exceeded the critical value therefore the data was deemed normal (Tabachnik & Fidell, 2007).

The assumption of homogeneity of variance were checked by conducting an ANOVA with the difference scores from pre and post as the DV and feedback performance by expertise level and feedback condition as the IVs. Homogeneity of variance was evaluated using Levene’s test for equality of variances. Levene’s test was non-significant, \( f(5, 198) = 1.085, \ p = .370 \), therefore the assumption was met (Tabachnik & Fidell, 2007).

**Preliminary Analysis**

Prior to proceeding with the proposed analysis, an analysis was conducted to determine the homogeneity of the expert and novice groups. The file was split by expert and novice, and differences at time one were compared for self, task, and no-feedback conditions within expertise. There were no significant differences in the feedback conditions for novices at time one, \( f(2, 103) = 2.46, \ p = .09 \). At time one novices had the highest level of performance for self relevant feedback (\( \mu = 27.7 \)) followed
by task relevant feedback ($\mu = 24.6$), followed by no feedback ($\mu = 24.4$). Nor were there significant differences for experts at time one, $f(2, 283) = .151$, $p = .95$. At time one, experts had the highest level of performance for no feedback ($\mu = 42$) followed by self relevant feedback ($m = 41.59$), followed by task relevant feedback ($\mu = 41.18$) Due to the fact the ANOVAs were non-significant, it was determined that differences among self, task, and no-feedback conditions could be attributed to the treatment rather than a pre-existing difference among experts and novices.

Primary Analysis

As expected, there was a significant difference in the mean scores (i.e., number of kills) from time one to time two for all participants, $t (183) = -7.81$, $p = .000$. On average, scores increased by 4.37 from time one to time two. The main effect of feedback was not significant $f(2, 178) = .996$, $p = .282$, $\eta = .009$. However, there was a statistically significant main effect of expertise $f(1, 178) = 11.06$, $p = .002$, $\eta = .071$. As expected, novices had a larger average increase in performance from time one to time two ($\mu = 6.18$) than experts ($\mu = 1.92$) (see Table 2).
In order to assess the hypothesized interaction between feedback type and expertise on the difference in performance scores pre and post feedback, a 2 X 3 between groups analysis of variance was conducted. There was a statistically significant interaction between expertise and feedback type, $f(2, 178) = 3.89, p = .012, \eta = .047$ (see Figure 4). There was a significant mean difference in the difference scores of number of kills from time one to time two as a result of expertise depending on feedback type, $t(182) = 3.31, p = .001$ Novices in the task relevant condition had greater average performance increment ($x = 7.16$) than experts in the task relevant condition ($\mu = -.5$) while novices in the self-relevant condition also had greater average performance increment ($\mu = 5.21$) than experts in the self-relevant conditions ($\mu = 4.34$) (see Table 3). In summary, the hypothesis was supported in so far as there was a significant interaction. In order to further explicate the interaction, the results of experts and novices were examined separately by splitting the file and conducting one-way ANOVAs (i.e., simple comparisons) to compare the effect of feedback type on performance depending on expertise. There was not a significant difference in performance scores of novices for the different feedback types $f (2, 98) = .502, p = .602$. There
was however a significant difference in performance depending on feedback for experts $t(2, 98) = 4.49, p = .014, \eta = .34$. Specifically, experts had a mean decrease of .86 after receiving task relevant feedback, a mean increase of 4.26 after receiving self-relevant feedback, and an increase of 3.9 after receiving no feedback (see Table 4).

For the purposes of exploring the comparative effects for the FI cues on expert performance, $t$-tests were conducted. Experts had a significantly greater improvement following self-relevant feedback than following task-relevant feedback, $t(61) = -2.73, p = .008$. Experts also had a significant decrease in performance following task relevant feedback when compared to the no feedback condition, $t(52) = -2.21 p = .032$. Experts did not have a significant improvement following self-relevant feedback when compared to the no feedback condition, $t(.52) = .189, p = .851$.

In order to further explicate the comparison of experts in the task and no feedback conditions, the differences between the raw scores (i.e., times one and two) for experts in the task and no feedback conditions were also examined. No significant difference was found between experts in the task a no feedback conditions at
time one, \( t \ (50) = - .47, p = .562 \). However, a significant
effect was found for experts in the task and no feedback
conditions at time two, \( t \ (47) = -2.50, p = .016 \). Experts
had a higher average number of kills following task
relevant feedback (\( \mu = 43.35 \)) than task relevant feedback
(\( \mu = 37.82 \)).

A 2 by 2 between groups analysis of covariance was
conducted to assess the effect of feedback orientation on
performance. After adjusting for feedback orientation,
there was not a significant interaction \( f(2, 173) = 2.894, \)
\( p = .817 \). There were also no significant main effects of
feedback, \( f \ (2, 173) = 855, p = .427 \) or for expertise \( f \)
(2, 173) = .415, \( p = .219 \). In summary, no significant
relationship was found between the feedback orientation
scale, expertise, feedback, and performance.

In summary, although the interaction between feedback
and performance was significant, further testing of
anticipated relationships reveals mixed results. The
hypotheses that experts in the task-relevant condition
would have lower scores than by experts in the self-
relevant conditions and novices in the task relevant
condition was supported. However, not all of the specific
hypotheses regarding expert and novice performance were
supported. The hypothesis that novices in the
self-relevant condition would be outperformed by experts in the self-relevant condition was not supported.
Primary Findings

Kluger and Denisi (1996) posited that the effects of feedback on performance were more than a function of the valence of feedback intervention cues. The current study supports this position in that self or task relevant feedback, referred to in the literature as task familiarity and FI cue type respectively, moderated the effects of feedback on performance depending on the task characteristics (i.e., expertise). This is because task and self-relevant feedback had significant effects on performance depending on the expertise level of participants. Specifically, task relevant feedback was more effective for novices and self-relevant feedback was more beneficial for experts.

Several moderators of FI effects on performance have been noted in previous literature: task characteristics, FI cues, situational variables, and personality variables (Kluger & Denisi, 1996). The current study sought to add to this by examining the effects of feedback interventions by focusing on the effects of task characteristics (i.e., performer expertise) and the location of FI cues in the
perceptual hierarchy (i.e., self and task relevant feedback). The implications of the results in relation to previous theory are delineated below.

It is important to note that the results were consistent with the hypothesis and previous theory in some instances, however inconsistent in others. Primarily, the difference scores for both experts and novices are in alignment with the previous findings that performance improves on a visual task as a function of practice effects (Peterson, Mier, Fiez, & Raichle, 1998). This is because both groups, with the exception of experts in the task relevant condition, had improved performance at time two. The following discussion will explore the extent to which the results found are a function of improvement which can be attributed to the feedback solicited or to practice effects.

Before discussing the effects of feedback, it is important to note that there are three assumptions regarding FIT and the expertise literature which needed to be met in order to draw conclusions about how FI cue type affects performance. First, according to Kluger and Denisi (1998), every FI activates task motivation processes. In other words, performance will improve as a function of self-regulation from time one to two regardless of
feedback. Therefore, it was expected that performance would improve on a task from time one to time two in the non-feedback condition due to task motivational processes which is an assumption made by FIT (Kluger & Denisi, 1996). Results yielded the expected practice effect since performance on the task did indeed improve from time one to time two for both groups. The second assumption is that experts will perform at a significantly higher level than novices at time one because experts, by definition have a higher level of skill than novices (Peterson et al., 1998). The study met this assumption in that experts completed the first round with a significantly higher score (i.e., higher number of kills) than novices.

Finally, another finding which is relevant to the assumptions of the nature of expertise was the significance of the difference scores pre and post feedback between experts and novices. Novices improved significantly more than experts from time one to time two. In other words, while novices were performing at a lower level than experts, they were more apt to improvement than experts (Peterson et al., 1998). In summary, the assumptions that performance improves as a function of self-regulation, that experts would perform at a higher level than novices and finally that novices would
experience greater improvements to performance the experts were all met. Meeting the aforementioned assumptions indicates that the effects of self-relevant and task relevant on novice and expert performance were due to the treatments themselves. Furthermore, these assumptions will be used as reference points intermittently throughout the discussion.

**Major Conclusions**

The current study advanced the feedback literature by examining the differential effects of feedback on experts and novices. Results of previous studies (Ryan, 1982; Mikulincer, 1989) indicate that self-relevant feedback activates meta-task processes and ultimately results in decrements because attention for the task is attenuated as it is redirected to the self. The current study refined this position by measuring the performance of experts (i.e., individuals who were not using controlled processing to run the task). The resulting effect indicates that the decrement found in previous studies was perhaps due to the lack of controlling for expertise. FI cue did not have an effect on performance in and of itself which indicates that the more important factor is level of expertise. What are more interesting are the results of
experts and novices when isolated which provide evidence for the concept of the perceptual hierarchy in regard to the effects of feedback on performance (Carver & Scheirer, 1981; Kluger & Denisi, 1996, 1998). This is because feedback moderated performance depending on where attention was allocated in the hierarchy and evidence for this was found in the varying effects of FI cues on the performance of experts versus novices.

Effects of Feedback on Expert Performance

When examining experts only, FI cue had an effect on performance. Expert performance increased in the no feedback and self-relevant conditions, and performance decreased following task-relevant feedback. Experts had a significantly greater increase in performance in the self-relevant condition than experts in task relevant feedback. However, self-relevant feedback did not benefit experts beyond the benefits of a practice effect (i.e., the no feedback condition). What can be extrapolated from this in terms of the perceptual hierarchy is that for experts, task relevant feedback is indeed located at lower levels of the hierarchy which requires controlled processing and ultimately interrupts the highly proceduralized script used for the task (Lieberman, 2006).
Furthermore, the improvement that experts had following self-relevant feedback was unexpected given that experts run tasks on highly proceduralized processes which cannot be improved (Kane & Engle, 2000). The improvement experts experienced following self-relevant feedback provides support for the position that once a task is highly proceduralized it is given a higher level of meaning in the hierarchy and ultimately has implications for the effects on FI cue on performance (Kluger & Denisi, 1996). As stated previously, the aforementioned finding indicates that self-relevant feedback is beneficial when the task is highly proceduralized and the redirection of attention to the self does not absorb the attention needed for the task itself.

Conversely, previous studies and theories which posited that task relevant feedback is detrimental to expert performance were supported. In the current study, task relevant feedback was followed by a decrement in expert performance. Experts demonstrated a decrease in performance following task relevant feedback when compared to the no feedback condition. Therefore, what can be deduced is that task relevant feedback is detrimental to the performance improvement of experts. It can also be deduced that feedback is not beneficial to experts beyond
practice effects because there was no significant improvement to their performance beyond the no feedback condition.

Effects of Feedback on Novice Performance
When isolated, novices had an improvement in performance in all three conditions. Novices benefited most from task relevant feedback, followed by no-feedback, then by self-relevant feedback. This finding implies that placing focus at the lower levels of the hierarchy (i.e., at the mechanical underpinnings of the task) is what is most beneficial for novices which is also in alignment with previous theory. For novices task relevant feedback resulted in a performance increment which was greater than the increments for the self-relevant and control conditions.

The key implication from the effects of FI cue on novice performance is that the task is located at the lower levels of the hierarchy (i.e., at the mechanical underpinnings of the task) because task relevant (i.e., locus of attention is placed on the mechanics of the task) feedback helped while self-relevant feedback (i.e., locus of attention is placed on the self via normative processes) did not in relation to no feedback. Ultimately,
the results imply that novices benefit most when locus of
attention is redirected to the task. It should be noted,
however, that the main effect of feedback for novices was
not significant, so the results must be considered within
the context of the interaction between expertise and
feedback. This provides support for the previous
literature in that it indicates that experts and novices
use different processes (i.e., controlled vs. automatic)
for tasks which ultimately determines the following
performance on the task (Vallacher & Wegner, 1987).

It was the position of Kluger and Denisi (1996) that
meta-task FI cues would be detrimental for novices due to
their propensity to direct attention to higher levels of
the hierarchy. The direction of attention to higher levels
of the perceptual hierarchy was posited to deplete the
cognitive resources for the task. In light of this, it was
unexpected that meta-task processes would improve the
performance of novices given that novice performance is
run by controlled processes which require greater
cognitive resource (Kluger & Denisi, 1996).

Task relevant feedback had the predicted effects on
novel and familiar tasks. Task relevant feedback improved
the performance of novices and decreased performance for
experts. This supports the notion that task-relevant
feedback promotes learning on a novel task. Furthermore, it supports the notion that task relevant feedback interrupts the highly proceduralized script of familiar tasks.

Task-Relevant Feedback

Task relevant feedback in the current study was intended to activate the task learning processes which facilitate performance when they eliminate erroneous hypotheses (Kluger & Denisi, 1998). The task relevant feedback in the current study did this by providing information on the mechanics of the task (e.g., use crosshairs to improve accuracy). The hypothesis for task relevant feedback was that it would result in greater performance improvements for novices than experts. This hypothesis was supported by the results and also revealed an additional finding.

Task relevant feedback was a beneficial FI cue for novices only. Experts actually had a performance decrement after receiving task relevant feedback. The decrement which occurred after task relevant feedback for experts was significantly different from the no feedback condition which indicates that task relevant feedback is detrimental to expert performance improvement.
Further, novices benefited the most from task relevant feedback which has implications for the cognitive components of the hierarchy which is discussed below.

Self- Relevant Feedback

Self-relevant feedback in the current study was intended to activate the meta task processes by providing normative feedback which is posited to be located at a higher level (i.e., the level of the self) within the perceptual hierarchy. Meta-task processes were found to attenuate the effects of feedback on performance improvement in previous studies (Kanfer & Ackerman, 1989), and analyses (Kluger & Denisi, 1996). Based on this, the hypothesis was that self-relevant feedback would be detrimental for novices and would be less detrimental than task relevant feedback for experts.

The hypothesis for self-relevant feedback was supported in both cases. Novices had greater improvement following task relevant feedback than self-relevant feedback. Experts had greater improvements as a result of self-relevant feedback than task relevant feedback.

Cognitive Components of the Perceptual Hierarchy

Action identification theory (Vallacher & Wegner, 1987), a critical aspect of feedback intervention theory,
states that individuals have varying ways of identifying what they are doing depending on the action’s identity structure. The identity structure plays a key role in determining how the task will be identified within the hierarchy. In other words, the task’s identity structures is an indicator for the type of processing used for the task and ultimately provides support for Kluger and Denisi’s (1996, 1998) notion of the hierarchy.

The identity structure for the task was prompted by the protocol given to each participant for the study which alluded to the correlation between achievement orientation and video game skill. In other words, participants most likely identified the task as a form of achievement indication. This allowed the current study to indirectly test the identity structures of participants by measuring the effects of FI cue depending on where attention was allocated based on whether the participant was an expert or novice. Based on action identification theory, we would expect individuals operating the task via controlled processes (i.e., novices) to focus at lower levels (i.e., the task) and conversely we would expect individuals operating via highly proceduralized processes to focus at higher levels (i.e., the self). The effects of the identity structure of the task are indicated by resulting
performance following feedback. This is because the feedback administered either directed participants’ attention to the level of the self or to the task within the perceptual hierarchy. Evidence of the nature of the hierarchy’s role is indicated by the varying effects that task and self-relevant feedback had on experts and novices. Based on the interaction found between feedback and expertise, it is apparent that where attention is allocated in the hierarchy is indeed a determinant of the resulting action. Specifically, experts do not benefit from directing attention to the lower levels of the hierarchy and novices do not benefit from directing attention to the higher levels of the hierarchy.

Stated within the context of dual processing theory, a possible explanation for this effect in regard to experts was that the task was being run on a highly proceduralized script which was disrupted by the task relevant feedback. A disruption would have occurred because task relevant feedback is located at lower levels of hierarchy, which in the case of an expert is already well known (Lieberman, 2000). Conversely, the explanation for the effects found for novices is that the self-relevant feedback reduced the resources for the controlled processing being used for the task.
The above explanation is based on the coupling of Lieberman's X and C systems and action identification theory. In order to test action identification theory, the task and self-relevant feedback conditions were set up to activate information at the level of the self or the task. Per previous theory, the action taken following a FI will be dependent upon where the task is located in the hierarchy (Waldersee & Luthans, 1994). Based on the current study's results, it can be deduced that for experts, the action (i.e., the video game) was identified at the level of the self because task relevant feedback did not improve their performance. This is not surprising given that theorists state that as an action or task becomes progressively familiar it becomes easier for individuals to highlight its potential meanings (e.g., performing well on the video game task indicates the ability to learn quickly) (Vallacher & Wegner, 1987). Conversely, the action was located at the lower levels for novices given that task relevant feedback was beneficial for performance. The resulting benefit of task relevant feedback for novices is an indication that controlled processing is being used and hence is located at the level of the task.
Implications for Performance Management and Training

Feedback is a central piece of performance management as it is the mechanism by which employees know their progress relative to established standards. Feedback furthers performance management and improvement by building confidence, developing competence, enhancing involvement (Aguinis, 2009). However, as shown in the current as well as previous studies is that the mere presence of feedback does not ensure the improvement of performance (Kluger & DeNisi, 1996). This happens primarily when the information shared is not useful, is inaccurate, or is not delivered well. According to Aguinus (2009), feedback can be detrimental if it focuses on the employee as a whole (i.e., the self) rather than employee behaviors (i.e. the task).

The results of the current study have implications for performance management as they provide further evidence of how experts and novices operate following feedback as well as performance following self vs. task relevant feedback. As routine behaviors in the work place become proceduralized they become highly automatic (Waldersee & Luthans, 1994) and ultimately located at higher levels of the hierarchy (Kluger & Denisi, 1998).
What can be extrapolated from the results of the study are the types of feedback cues that are most effective for employees depending on their level of experience with their job.

For instance, an individual who is new to their job will get the most benefit out of task relevant feedback. This is because incorporating of positive or corrective feedback (i.e., comparison to the standard) requires controlled processes because incorporation requires a disruption in the cybernetic process in order to engage in the process of comparison to performance (Powers, 1973). For example, a novice typist would gain the most benefit from feedback regarding hand positioning rather than feedback about number of words per minute. While, on the contrary, an expert typist could benefit from knowledge of number of words per minute and could even possibly benefit from normative feedback. This is a possibility because, according to Waldersee and Luthans (1994), in the workplace, habitual (i.e., familiar) behaviors do not require the cybernetic process of comparison to a standard in order to maintain performance because they are thoroughly learned. However, it should be noted that the effects of feedback on performance in the current study were partially the results of practice effects. Therefore
the implications of the results are applicable to tasks which have practice effects. This distinction is important because the task was examined over time and therefore it is uncertain how feedback effects tasks that are only performed once and do not have the benefit of a practice effect.

The current study also has implications for the field of training. The difference among novices and experts in terms of learning strategies has been a focus of the training for a decade (Goldstein & Ford, 2002). This focus has resulted in different models of the need assessment process depending on levels of mental models or, said another way, expertise. The implication here is that experts would not benefit from refresher training or training which focuses on the mechanics of a task which is already known. As stated previously expert performance does not, based on the current study, improve following feedback and is best when left to naturalistic feedback processes.

Limitations

A fundamental limitation to the study is the fact that an all-female sample was used. This was the case because male’s scores were significantly different than
female scores at the onset of the study, which would have skewed the results. Therefore, it was decided to use an all-female sample because the population of California State’s Psychology Department is predominantly female. In other words, an all-female sample was used in order to have a homogeneous sample. Therefore, the study has limitations on what can be learned about the effects of feedback and expertise on performance for males.

There are several limitations to the current study with respect to testing feedback intervention theory’s ability to fully explain the effects of feedback on performance. The assumption of action identification theory is that once automated, the task is identified as related to the self. Although the study was able to test the effects of feedback on performance, it did not fully explore action identification theory because there was no verification that the task was identified at the level of the self (i.e., the participants learning ability) for individuals in the self-relevant condition. Similarly, action identification is a limitation for participants in the task relevant condition as well. FIT makes the assumption that all feedback has implications for the self and as such all feedback receives attention. The implications of this assumption for the current study is
that the feedback given following the first round of the video game would be attended to by participants even if they did not have vested interests in video games. The ambiguity of the identification of the action is an important topic because without knowledge of how the action was identified, it is difficult to associate the identity structure with the type of processing being used. Knowledge of the association between action identification and processing is vital to understanding what type of feedback is most beneficial to experts and novices.

A further limitation to the study's ability to explicate the results in terms of FIT is its ability to fully explore the complexity of the perceptual hierarchy. Attention is shifted within the hierarchy depending on the object of the feedback-standard gap (Kluger & Denisi, 1996; Waldensee & Luthans, 1994). What is unknown is whether or not the internal standard an individual is using is singular or multiple given that attention is not an all or none phenomena and can be directed in multiple places. This complexity places a limitation on the ability to know performance following task or self-relevant feedback is due solely to the shifting of attention within the hierarchy.
Another limitation to the design of the study was the inability to fully integrate the dual processing theory. Previous studies have used fMRIs to study the neural substrates associated with the spectrum of automatic and controlled processing. Without utilizing this type of technology it is impossible to know the brain structures utilized to perform the task following feedback. Knowledge of the neural substrates for the task would facilitate conclusions about the type of processing being used by associating the neural correlates of the X and C systems (Lieberman, 2006). For instance, a recent fMRI study (Ozyurk, Rietze & Thiel, 2012) found that the neural correlate of self-regulation (Lieberman, 2006), the dACC, is instrumental in processing outcome information (i.e., correct response versus incorrect response) and further that the dACC is insensitive to the valence of feedback. The ultimate implication of this for FIT is that self-regulation occurs following feedback that indicates outcome information. These findings highlight the current study’s limitations for two reasons: it demonstrates how fMRIs can contribute to the feedback literature, and also brings to light a new variable to the literature (i.e., outcome information). Based on the results of Ozyurk et al.’s (2012) study, providing individuals with knowledge
of the outcome is a determinant of the performance which will follow. This was not explicitly communicated to the participants in the current study which possibly limited the effort to self-regulate in response to a standard.

The ultimate goal of the study was to provide implications for feedback in the workplace. However, a sample of convenience was used; therefore participant engagement is a possible limitation to the study. Given that there may have been a lack of participant engagement, it is unlikely that the attention given to a video game task was analogous to the attention given to tasks at work. This may have had an impact on the current research due to a lack of engagement and identification of the task. For instance, a participant may have reached expert status and yet the task, because it was for student experiment, was not fully identified at the apex of the level of self due to a lack of the task being perceived as important as a job task.

In light of the limitation of participant engagement, there is a lack of the generalizability of the study to the workplace setting. The concern of generalizability is an extension of the limitation to test action identification theory because it is unknown if the task was identified at the same level of a job task.
Conversely, the performance following feedback is generalizable in so far as it, like all FI cues has the ability to command attention. Therefore, the consequences following the various FI cues are generalizable.

Conclusions

Kluger and Denisi (1996) hypothesized that the feedback literature was in need of the integration of several theories. The results of study have shown that this is indeed the case by verifying the relevance of action identification theory and the dual processing literature within the context of the differential effects of feedback on performance. In short, this study was the first to confirm the importance of two previously hypothesized moderators of the effects of feedback on performance: familiarity (i.e., expertise) with the task and FI cue type (i.e., task or self). Its contribution is that expertise and ultimately the spectrum of automaticity is a deciding factor in regard to the benefits of feedback on performance.

The applied implications indicate that in the proper situation, FI cues can substantially improve performance such as in the case of the effects of task relevant feedback on novice performance. While FI cues that are not
properly applied can have no effect at all on performance such as in the case of task relevant feedback on expert performance. What is clear is the need to further examine the utility of feedback interventions within the context of dual processing and action identification theory in order to truly understand how to apply feedback in the workplace.
Table 1. Demographics

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<td>4.8</td>
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Table 2. Mean Difference Scores for Experts and Novices by Feedback Type

<table>
<thead>
<tr>
<th>Level of Expertise</th>
<th>Feedback Type</th>
<th>Mean difference score</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
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</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Novice</td>
<td>Task</td>
<td>7.16</td>
<td>1.28</td>
<td>4.50 - 9.81</td>
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<tr>
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<td>1.21</td>
<td>2.73 - 7.69</td>
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<td>1.21</td>
<td>3.50 - 8.40</td>
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<tr>
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<td>1.34</td>
<td>-3.54 - 1.81</td>
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<tr>
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<td>Self</td>
<td>4.26</td>
<td>1.24</td>
<td>1.79 - 6.73</td>
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<tr>
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<td>3.90</td>
<td>1.62</td>
<td>0.67 - 7.12</td>
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</table>

Table 3. Means for Experts and Novices by Feedback Type at Time One and Time Two

<table>
<thead>
<tr>
<th>Expertise</th>
<th>Feedback Type</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
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<td>10.00</td>
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<tr>
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<td>54.00</td>
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<td>24.1333</td>
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<td>Post_fb_kills</td>
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<td>9.00</td>
<td>50.00</td>
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<td>Expert</td>
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<td>55.00</td>
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<td>55.00</td>
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<td>Self</td>
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<td>26.00</td>
<td>56.00</td>
<td>39.2647</td>
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<td>Post_fb_kills</td>
<td>20</td>
<td>33.00</td>
<td>60.00</td>
<td>43.3500</td>
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</tbody>
</table>
### Table 4. Mean Difference Scores for Experts and Novices Overall

<table>
<thead>
<tr>
<th>Level of Expertise</th>
<th>Mean Difference Score</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novice</td>
<td>6.183</td>
<td>1.010</td>
<td>4.184 - 8.182</td>
</tr>
<tr>
<td>Expert</td>
<td>1.921</td>
<td>.876</td>
<td>.188 - 3.654</td>
</tr>
</tbody>
</table>

### Table 5. Mean difference scores by task type for experts

<table>
<thead>
<tr>
<th>Feedback Type</th>
<th>Mean difference score</th>
<th>Std. Error</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>task</td>
<td>-.862</td>
<td>1.346</td>
<td>-3.541 - 1.817</td>
</tr>
<tr>
<td>self</td>
<td>4.265</td>
<td>1.243</td>
<td>1.791 - 6.739</td>
</tr>
<tr>
<td>none</td>
<td>3.900</td>
<td>1.621</td>
<td>.674 - 7.126</td>
</tr>
</tbody>
</table>
APPENDIX B

FIGURES
Figure 2. Screen shot of Osiris Map
*Arrows and numbers indicate the sequence participants were asked to recall.

Figure 3. Diagram of Spatial Pointing Task
Figure 4. Interaction of Expertise and Feedback Type
APPENDIX C

INFORMED CONSENT
Informed Consent

You are invited to participate in a study intended to examine skill in first person shooter games and achievement orientation. This research is being directed by Blakely Smith under the direction of Dr. Mark Agars. The study has been approved by the Department of Psychology Institutional Review Board Sub-Committee of the California State University, San Bernardino, and a copy of the official Psychology IRB stamp of approval should appear on this consent form.

There are no foreseeable risks associated with this study beyond those of everyday life, or any direct benefits for you as an individual. Should you agree to participate, you will play a first person shooter game for a total of fifteen minutes, as well as complete a 20 item survey. Your total participation time will be approximately 20 minutes. At the discretion of your instructor, you will receive 3 units of research credit for your participation.

Your participation is voluntary, and you may end your involvement without penalty at any time. Results from this study will be reported in group format only so your individual responses will not be revealed. Your name will not be associated with the data collected during this study; thus your responses will be completely anonymous. Results from this study will be available after December 1, 2010 from Blakely Smith (blake579@gmail.com).

By placing an X in the space below, I acknowledge that I have been informed of, and that I understand, the nature and purpose of this study, and I freely consent to participate. I also acknowledge that I am at least 18 years of age.

Participant’s X _______

Date: ____________

CALIFORNIA STATE UNIVERSITY, SAN BERNARDINO
PSYCHOLOGY INSTITUTIONAL REVIEW BOARD SUB-COMMITTEE
APPROVED 06/07/11 VOID AFTER 06/07/11
IRB# H-10SP-18 CHAIR
APPENDIX D

FEEDBACK ORIENTATION SCALE
Feedback Orientation Scale

Please indicate the degree to which you agree with each statement.

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

1. Feedback contributes to my success at work. _____
2. To develop my skills at work, I rely on feedback. _____
3. Feedback is critical for improving performance. _____
4. Feedback from supervisors can help me advance in a company. _____
5. I find that feedback is critical for reaching my goals. _____
6. It is my responsibility to apply feedback to improve my performance. _____
7. I hold myself accountable to respond to feedback appropriately. _____
8. I don’t feel a sense of closure until I respond to feedback. _____
9. If my supervisor gives me feedback, it is my responsibility to respond to it. _____
10. I feel obligated to make changes based on feedback. _____
11. I try to be aware of what other people think of me. _____
12. Using feedback, I am more aware of what people think of me. _____
13. Feedback helps me manage the impression I make on others. _____
14. Feedback lets me know how I am perceived by others. _____
15. I rely on feedback to help me make a good impression. _____
16. I feel self-assured when dealing with feedback. _____
17. Compared to others, I am more competent at handling feedback. _____
18. I believe that I have the ability to deal with feedback effectively. _____
19. I feel confident when responding to both positive and negative feedback. _____
20. I know that I can handle the feedback that I receive. _____

APPENDIX E

DEBRIEFING STATEMENT
Debriefing Statement

Thank you for participation in my study today. The purpose of the study is to assess the effects of feedback on performance in experts vs. novices. Feedback has the ability to direct attention either to the self (e.g., opportunities for self enhancement) or to the components of the task at hand. Where the attention is directed had benefits and costs depending on whether one is an expert or novice at a given task. The theoretical implications of this study can be applied to the work setting. This is because feedback within organizations is ongoing and necessary in order to improve performance. The study in which you have just participated is intended to contribute to a deeper understanding of how feedback affects performance depending on level of expertise. Again, all data will be analyzed at the group level; therefore your performance and responses will be confidential. If you are interested in obtaining a copy of the final report of this study or have any questions regarding this research, contact the primary investigator, Blakely Smith, at magars@csusb.edu, or 909-537-7500.
APPENDIX F

INSTITUTIONAL REVIEW BOARD
Human Subjects Review Board
Department of Psychology
California State University,
San Bernardino

PI: Smith, Blakely and Agars, Mark
From: John Clapper
Project Title: Feedback Intervention Theory: An examination of the effects of expertise on performance
Project ID: H-10SP-18
Date: Tuesday, June 08, 2010

Disposition: Administrative Review

Your IRB proposal is approved. This approval is valid until .

Good luck with your research!

John P. Clapper, Chair
Psych IRB Sub-Committee
REFERENCES


