SOCIAL FACILITATION: SALIENCE AND MEDIATED, ANTICIPATORY, AND RESIDUAL PRESENCE

By

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Abstract of the Dissertation

Social Facilitation: Salience and Mediated, Anticipatory, and Residual Presence
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Social facilitation is the oldest experimental concept in social psychology. Throughout decades of social facilitation research, social presence has typically been viewed as a dichotomous variable which affects individuals while performing a task. However, this dissertation attempts to investigate whether social presence may be viewed as continuous variable, differing on the salience of presence. In addition, it seeks to determine whether changes in performance can be elicited by prior social presence (residual presence) and the expectation of future social presence (anticipatory presence). Study 1 compared the effects of 6 different levels of presence (absence, artificial presence, passive presence, implied presence, embodied presence, and active presence) on simple and complex task performance. It provides evidence that the various levels of social presence did have a differential impact on participants. From the questionnaire responses, social presence was able to be classified into three distinct categories: low (absence, artificial and passive presence), intermediate (implied presence), and high salience (embodied and active presence). Study 1 also provides some support for the expectation that presence results in simple task facilitation. However, instead of an expected linear relationship between salience of presence and simple task enhancement, a quadratic inverted U-shaped curve was observed. Implied presence, a type of presence of intermediate salience, produced the strongest effects. Study 2 showed that social presence can enhance simple task performance even after the stimulus has been removed.
(residual presence). Study 2 also provided some indication that anticipating a supervisor could cause social facilitation effects even before the supervisor’s arrival. Questionnaire responses showed that participants expecting the presence of a supervisor, like those exposed to residual presence, were more affected on perceived distraction, immediacy, impact, and stress compared to control participants. Implications of the present results provide the rationale for a modified conceptualization of social facilitation.
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Introduction and Background

Social Facilitation

Social facilitation refers to changes in performance that occur when individuals perform in the presence of others versus when they are alone. Although social facilitation is one of the oldest concepts in social psychology, there has been no widely-accepted parsimonious explanation that accounts for all the impacts of social presence on individual performance (Aiello & Douthitt, 2001). The boundaries of social facilitation are often ambiguous. It is often defined based on what does not occur (i.e., competition, reinforcement, cueing, and cooperation) as opposed to what does (Guerin, 1993).

According to Sanders (1981), social facilitation occurs independently of any informational or interactional influences and reflects the most elemental and minimal aspect of social psychology, that is, the effect of moving from a nonsocial to a social environment. Regardless of the fact that its underlying mechanisms continue to be elusive and its boundaries unclear, social facilitation remains relevant and consequential to managers, supervisors, and other authority figures who determine where workers achieve peak performance (Hughson & Goodman, 1986).

Social facilitation received its name because it originally referred to the boost in performance (“facilitation”) individuals received when they performed in the presence of others (“social”). Triplett (1898) observed bicycle racers rode faster in trials where they raced against other individuals versus alone. Subsequently he concluded that most of his subjects turned a fishing reel faster when they were in the presence of other reelers. Years later, Allport, coined the phenomenon “social facilitation” (Allport, 1920).
However, not all social facilitation researchers found increases in performance when others were present. Some found decreases in performance associated with the presence of others. For decades, the conflicting reports of the effects of social presence on performance remained a mystery to researchers and discouraged interest in the subject (Aiello & Douthitt, 2001). Drawing on the learning theories of Hull (1943) and Spence (1956), Zajonc proposed a new theory. He theorized that the “mere presence” of others facilitates dominant responses. He also theorized that “mere presence” impairs subordinate responses. Thus, Zajonc postulated that performance of simple or well-learned tasks (those that involve dominant responses) is enhanced by the presence of others and the performance of complex (or novel) tasks is impaired. He attributed these changes in performance to increases in “drive” resulting from presence (Zajonc, 1965).

Empiricists in general agree that the presence of others facilitates performance on simple tasks and worsens performance on complex tasks. In spite of this, based on a meta-analysis, Bond and Titus (1982) warn that complex task impairment is observed a great deal more than simple task enhancement, which is less frequently observed. Perhaps “social impairment” would be a more fitting way to describe the phenomena known as social facilitation. In addition, no single explanation for the cause of social facilitation is universally accepted. Many theories conflict with Zajonc (1965) and do not attribute the performance effects of social facilitation to drive, arousal, and/or “mere presence.” Conflicting theories include evaluation apprehension theory (Cottrell, 1972); self-awareness theory (Carver & Scheier, 1981; Duval & Wicklund, 1972); self-presentation theory (Bond, 1982), and distraction-conflict theory (Bond, 1986).

Evaluation apprehension theory, like Zajonc’s “mere presence” theory, argues
that social presence creates drive which causes changes in performance. Cottrell (1972) presents a “learned drive” account of social facilitation known as the evaluation-apprehension model where “the effects of social presence are not innate, but rather are caused by observers associating the presence of others with an evaluative context.” However, Rajecki, Ickes, Corcoran, and Lenerz (1977) find evidence that not all social facilitation effects occur due to evaluation apprehension. In Rajecki et al. (1977) the presence of a blindfolded audience, unable to evaluate the observer, produced simple task enhancement. Zajonc (1980) responds to evaluation apprehension theory by stating that even if other factors might influence reactions to others, they are not necessary for social facilitation to occur. According to Zajonc, “mere” presence is mandatory and is all that is necessary to produce social facilitation effects.

Baron (1986) proposed a new explanation for the effects of social presence and task difficulty on task performance. According to Baron, the change in performance often attributed to presence occurs due to the distraction associated with the presence. Distraction-conflict theory posits that a large amount of social presence, when distracting, can cause cognitive overload. Cognitive overload can lead to simple task enhancement by screening out nonessential stimuli because a simple task often only requires attention to a couple of central cues. However, Baron (1986) also asserted that the effect of simple task performance might be curvilinear. Simple task performance may be enhanced up to a point, beyond which cognitive overload will actually impair simple task performance and disrupt processing capacity. For example, Aiello, Chomiak, and Kolb (Unpublished Manuscript) provides evidence that the high salience evaluation subjects were over-stimulated and therefore performed worse on a simple task than lower salience no-
evaluation participants. Cognitive overload can also lead to complex task impairment by making it difficult for a performer to focus on all the necessary stimuli involved in a complex task. Baron (1986) and Moore, Baron, Ligal, and Sanders (1988) also suggest that evaluation–apprehension is itself distracting. An evaluative other may be a source of attentional conflict that distracts participants away from their task.

Unlike Zajonc, Baron (1986) argues that distracting non-social stimuli such as noise can elicit the same types of performance effects as social stimuli. Even though there is evidence of non-social stimuli (e.g., music and noise) causing performance effects, these effects are outside the scope of this dissertation (Sanders & Baron, 1975; Zucchi & Gamberini, 2007). Therefore, they will not be discussed in depth here.

Not all empirical data support the notion that distraction is the sole cause of social facilitation. According to distraction-conflict theory, there will be no social facilitation effects when there is ample time to attend to both the task and the distraction (Baron, Moore, & Sanders, 1978). In spite of this, a couple of studies where participants were not subject to time constraints observed simple task enhancement. Markus (1978) and Rittle and Bernard (1977) observed simple task enhancement even though participants had time to attend to both the audience and the task.

Many social facilitation theories (e.g. mere presence theory, evaluation apprehension theory) rely on drive or drive-like (e.g., arousal) explanations for social facilitation. Other theories eliminate the idea of drive from social facilitation. At first, distraction-conflict theory described drive-like changes leading to the performance effects of social presence (Baron et al., 1978). However, Baron (1986) later proposed that attentional mechanisms were more important and that drive might not be involved.
The validity of drive/arousal as a unidimensional construct is in doubt (Schimmack & Grob, 2000; Schimmack & Reisenzein, 2002). Construct-validity problems with arousal have been around for decades. There has been a failure to find a physiological measure(s) which captures what is often referred to as arousal or drive. It has been suggested that the construct is too broad to predict behavior or convey any meaning (Lacey, 1967; Neiss, 1990). Therefore, arousal and drive will not be discussed here in detail. Regardless, evidence for the effects of distraction and evaluation apprehension on observer’s performance is widespread (Feinberg & Aiello, 2006).

Other theories eliminate the idea of drive from social facilitation. Self-awareness theory states that social presence amplifies awareness of one’s own performance. This causes performance gains or impairment depending on the task (Carver & Scheier, 1981; Duval & Wicklund, 1972). Duval and Wicklund (1972) attribute the effects of social facilitation on individuals focusing their attention inward and trying to avoid the unpleasantness of falling short of a goal. Likewise, Bond (1982) suggests social presence causes participants to be conscious of the impression they make on audiences and coactors (known as self-presentation theory).

Guerin (1993) suggests that independent social facilitation effects exist caused by factors such as the anticipation of evaluation, self-awareness, and self-presentation. In the same vein, Aiello, Chomiak, and Kolb (Unpublished Manuscript) theorized that the impact of different social facilitation effects might be additive with that of mere presence. Guerin (1993) further suggests that self-awareness and self-presentation theories are both parts of the larger process known as the social conformity response. A few researchers
have made some effort fusing elements of evaluation apprehension and distraction-conflict theory (Feinberg & Aiello, 2006).

Although there is still no widely-accepted parsimonious explanation for social facilitation, some recent progress has been made. There has been some limited progress in finding physiological mechanisms’ involved, e.g., (Blascovich, Mendes, Hunter, & Salomon, 1999; Gendolla & Richter, 2006; Wagstaff, Wheatcroft, Cole, Brunas-Wagstaff, Blackmore, & Pilkington, 2008) as well as identifying relevant individual difference variables (Grant & Dajee, 2002; Uziel, 2007).

Social Presence

Sociologist, Erving Goffman, was an early proponent of the idea that even in non-mediated situations that the binary present versus absent conceptualization of social presence was unsatisfactory (Goffman, 1959; Goffman, 1963). Interestingly, Goffman did not refer specifically to levels of social presence, but to levels of “co-presence.” Nevertheless, human beings are social creatures. Therefore, the most widespread objective of physical presence is to increase the sense of social presence (Biocca, Burgoon, Harms, & Stoner, 2001). Short, Williams, and Christie (1976) were the first to refer to social presence in a context similar to what is referred to here. Up until that point, the effects of social presence (i.e., social facilitation and impairment) received a good amount of attention, but the actual concept of social presence did not receive nearly as much. Short et al. (1976) state that person perception differs based on the level of social presence. The ideas of Short et al. (1976), collectively known as “social presence theory,” provide a useful way to look at social presence as a continuum. However, Short et al. (1976) focus on social presence as a property of different communication media.
For example, compared to face-to-face interaction, phone calls are affected by the loss of nonverbal cues and thus are “lower” in social presence.

Due to emerging technologies such as virtual environments and advanced “social” robots, social presence research has recently grown tremendously as an area of research (Biocca, Harms, & Burgoon, 2003). The communication medium involved is not the only factor that affects the amount of social presence experienced by the perceiver of the stimuli. Relatively recent literature on presence, such as Biocca et al. (2003), Gunawardena (1995), and Lombard and Ditton (1997), have expanded the notion of social presence to not only represent the static properties of a medium, but also psychological properties such as the user’s fleeting perceptions, behaviors, and attitudes.

According to Ijsselsteijn (2002), users exposed to social stimuli can shift instantly from experiencing very little social presence to an “absolute” experience of social presence. There have been many attempts to define and operationalize social presence by communication and computer science scholars (Biocca et al., 2003). However, a new definition will be used here. Social presence will be defined as, “the experience of real, implied, or imagined other(s).” The aforementioned definition is derived from Allport's definition of social psychology (Allport, 1985).

According to social impact theory, people affect others in different ways. For example, others can stimulate activity and can cause “any of the great variety of changes in physiological states and subjective feelings, motives and emotions, cognitions and beliefs, values and behaviors” (Latané, 1981, p. 343). Social impact theory predicts greater changes e.g., embarrassment, entertainment, comfort based on higher intensities of social presence (Latané, 1981). One of the major goals of this dissertation is to
systematically rank different the types of social presence in order to unpack the effects of social presence.

**Salience**

It has been suggested that social presence, be viewed not as a dichotomous variable, but as a continuous variable differing on the salience of presence (Aiello, 1998; Feinberg & Aiello, 2006). Salience refers to the amount of input from stimuli and the resultant attention drawn from a perceiver. The input comes from all five senses (Sekular & Blake, 2002). Salience reflects the behavioral significance of perceptual information and determines what information is prioritized. Salience not only affects attention, but sensation, interpretation, and memory as well (Kaldy, Blaser, & Leslie, 2006).

Researchers, such as Sanders (1981), describe social facilitation purely as being independent of any informational or interactional influences. In spite of this, Zajonc (1980) states that presence stuck completely in a “vacuum” devoid of all other factors and processes associated with the presence of others does not exist. The capacity to deliver nonverbal cues increases the sense of sense of "being with others.” In large part, the experience of two components of psychological closeness, immediacy and intimacy, are closely tied to the expression of nonverbal involvement (Lombard & Ditton, 1997; Mesrobian, 1981). Therefore, this dissertation will classify the effects of observer nonverbal characteristics on task performance as a subset of social facilitation. However, in order to clarify boundaries, the effect of verbal communication on task performance will not be subsumed under the theory of social facilitation. Other social psychological literature explicates the interaction of individuals.

There is a great deal of evidence that salience affects social presence (and
therefore social facilitation/impairment) without verbal interaction taking place. The effect of salience on social presence is exemplified by proxemics, the study of our use of space. As two individuals come closer to one another, they perceive each other more intensely (Hall, 1966). More specifically, closeness communicates greater intimacy, but also involvement (Aiello, 1987; Burgoon, Buller, Hale, & deTurck, 1984). One investigation that looked into the meaning associated with distance found that observers judged individuals a far distance away as unresponsive (Golding, 1967). Not surprisingly, in a recent study, closer physical proximity to a supervisor (high salience) led to greater impairment in complex tasks. However, this only occurred when observers were of a different gender than participants (Aiello & Feinberg, 2004).

Observable social behaviors such as eye contact, facial expressions (e.g. smiling), gestures, and body movements also affect social presence (Ijsselsteijn, Ridder, Freedman, & Avons, 2002). The amount of gaze detected from an observer affects perceptions of their attentiveness (Kleinke, Staneski, & Berger, 1975). It also affects perceptions of their credibility and dominance. Individuals are more likely to feel that co-located individuals are credible, yet also dominant who maintain a normal or high degree of gaze (Burgoon, Buller, Hale, deTurck, 1984; Burgoon, Manusov, Mineo, & Hale, 1985). Avoidance of eye contact often leads to suspicion (Kleinke, 1986). Actors also interpret frequent smiling as expressing involvement, relaxation, and composure. Moreover, they perceive less distance between co-located individuals who lean their body in the forward direction (Burgoon et al., 1985).

Extra raw sensory input, in general, enhances the brain’s innate tendency to attend to a stimulus (Sekular & Blake, 2001). If an individual makes a great deal of noise,
wears bright clothes, has body odor, or even wears perfume he or she is perceived more intensely (Nesbitt & Steven, 1974). Fast-moving and approaching persons are more likely to be salient than stationary or receding people (Guerin & Innes, 1982).

Raw sensory input greatly affects salience; however, salience strength is not solely based on raw sensory input, but also prior knowledge and expectations. Strange and unfamiliar stimuli are more likely to invoke monitoring and avoidance (1982). A performer’s social judgment of an observer, the perception of the observer’s role, and their perception of “mutual understanding” between him or herself and the observer all affect the performer (Prothero, Parker, Furness, & Wells, 1995). Perceptions of perceived evaluators are influenced by self-attention. Self-attentive individuals are more aware of themselves and their own salient characteristics. Observers, depending on how they are perceived, can cause individuals to become more self-attentive and possibly use that knowledge to focus on impression management (Carver & Scheier, 1978). This impression management can cause performance effects. Henchy and Glass (1968) found that social facilitation effects vary depending on the perceived level of evaluation (i.e., expert or non-expert) that is available. The presence of a non-expert audience produced simple task enhancement. Nevertheless, the presence of an expert audience produced a significantly larger performance enhancement. Seta and colleagues (Seta, Wang, Crisson, & Seta, 1989) found that performance debilitation increased as additional evaluative elements were added. Feinberg and Aiello (2006) combined evaluation with distraction and produced greater social impairment than there was with just evaluation or distraction alone.

Social Presence Continuum
Short et al. (1976) developed social presence theory in order to compare communication media. However, the idea of a social presence continuum ranging from low to high salience will be extremely useful here as far as comparing the effects of different types of social presence on task performance. Not all social presence is “real” presence, i.e., not all social presence is caused by a physically present co-located human-being. For example, mediated presence consists of non-physical presence that is transmitted via media technologies, e.g. a computer. Social facilitation research has dealt traditionally only with “real” presence i.e. physical in-person presence and has paid little attention to the effects of other forms of presence (Abeele, Roe, & Pandelaere, 2007). Although generally social facilitation has referred only to studies involving physical “in person” presence, there have been social facilitation studies which have investigated other social presence stimuli. Cottrell, Wack, Sekark, and Rittle (1968) found that subjects made more errors on a complex task when watched by a “non present audience” than alone. Criddle (1971) produced impairment utilizing an “unseen audience” behind a one-way mirror. Because the awareness of social presence leads to the opportunity for heightened perceptions of distraction and evaluation, invisible forms of social presence and “real” presence have been shown to produce similar effects. In fact, Guerin and Innes (1982) go so far as to predict that invisible observers may produce greater physiological effects on performers than those who are visible.

Two examples of non-physical presence which have been shown to produce social facilitation effects include virtual presence in the form of Electronic Performance Monitoring (EPM) and avatar presence. EPM refers to the practice of using computers and/or telecommunication technology to collect information about employee
performance. EPM can provide managers with useful information on employee performance because it can continuously monitor performance and record a great deal of data (Stanton, 2000). Nonetheless, there are those critical of EPM as well. For example, Schleifer, Galinsky, and Pan (1995) reported that EPM decreased workload satisfaction and increased tension and perceived time pressure. Electronically monitored individuals often feel mediated or “virtual” presence, while an unseen observer watches them. Aiello and Svec (1993) and Aiello and Kolb (1995) provide empirical evidence that electronic performance monitoring can produce effects which mirror typical “in person” social facilitation effects. Likewise, Park and Cantrambone (2007) provide empirical evidence that the presence of avatars can also produce simple task enhancement and complex task impairment. Individuals exposed to avatars, i.e., virtual humans on a computer screen controlled by “real” human beings, experienced similar effects to those who were in the presence of an actual co-located human being. Thus, users of virtual human beings should be aware of the social nature of their avatar.

As was stated above, social presence effects vary based on many factors such as perceptions of evaluator credibility, dominance, and level of expertise. The type of presence is not the only factor in determining the salience of social presence. For example, Aiello, Chomiak, and Kolb (Unpublished Manuscript) manipulated the salience of electronic performance monitoring. Unlike low salience subjects who were told once that they were going to be monitored, high salience subjects were reminded periodically about the monitoring by a message that was displayed on their computer screens. However, the type of presence is a starting point as far as developing a presence model that will be tested in this dissertation (See Figure 1). As one moves from left to right, the
continuum reflects an increase in the salience of the social presence. The lowest salience state reflects the equivalent of a “true alone condition.” In this state, the actor performs completely alone without any social presence stimuli with the exception of "self" presence. Researchers in the past have attempted to manipulate performers’ time in front of a mirror in order to demonstrate the effects of the subjects awareness of him/herself as an object on task performance, e.g., Wicklund and Duval (1973), Innes and Young (1975), Guerin (1986). Symanski and Harkins (1987) showed that the potential for self-evaluation produced improved simple task performance as compared to no evaluation at all. However, in order to delineate clear boundaries, “self” presence will be not be included in the social presence spectrum because it is not caused by the experience of real, implied, or imagined other(s).

The lowest salience type of presence (absence characterizes the lack of presence) is “artificial” presence. Artificial presence can feel life-like. After being created by a human “being”, the artificial presence stimuli no longer are directly affected by human intelligence. Artificial presence can be caused by mannequins and videos/images of fictitious characters. Rajecki et al. (1977) provided evidence that a mannequin could produce simple task enhancement. Interestingly enough the type of mannequin had an effect as well. Participants were more affected by a mannequin with eyes than one without. Gardner and Knowles (2008) recently showed that image of a favorite television character (as opposed to just any television character) in the field of view of a performer caused simple task enhancement as well as complex task impairment.

Artificial presence also includes computer software agents (i.e., website guide, software guide, teammate or opponent in a computer game), which after being
programmed are not directly controlled by a human being. Hall and Henningsen (2008), provide evidence that a software agent can cause complex task impairment. The Microsoft Office clip agent, who resembles a paper clip with eyes attached to it, produced complex task impairment (although it failed to produce simple task enhancement). Rickenberg and Reeves (2000) provide evidence that a “dwarflike” cartoon man could produce social task impairment as well. Perhaps the aforementioned effects of software agents can be explained by the “Computers as Social Actors” (CASA) paradigm. The CASA paradigm states that individuals respond to computers as though they are people. Individuals often fail to critically assess computers and their limitations as interactive partners. These limitations include the fact that computers do not have emotions, feelings, or “selves.” Therefore, individuals interact with computers pretty much as if they are actual human beings (Nass, Steurer, & Tauber, 1994; Zanbaka, Ulinski, Goolkasian, & Hodges, 2004). Even though computers, unlike mannequins, can provide feedback, they are still not directly controlled by “real” human beings. Because artificial types of presence such as software agents are not directly controlled by human intelligence, artificial presence remains the lowest salience form of presence on the social presence spectrum. Regardless, even though determining the effectiveness of a software agent appears to be a technical question, the ‘real’ answer is social psychological in nature (Biocca et al., 2001).

One special case as far as “artificial presence” is robot presence. People behave differently when designers introduce more human-like attributes to computers, e.g., a face, speech, speech recognition, and social intelligence. Appearance of a face elicits social perceptions relating to personality and emotion (Sproull, Subramani, Kiesler,
Walker, & Waters, 1996). In addition, robots capable of human language can
demonstrate behavior which appears to be self-directed. A recent study provided
evidence that robot presence could cause complex task impairment for actors working on
a difficult arithmetic task. However, the results were only significant for males. Not
surprisingly, male participants reported that the robots were significantly more “human-
like” than female participants (Schermerhorn, Scheutz, & Crowell, 2008).

The third level on the proposed social presence model is passive presence, i.e.,
presence produced by a non-active co-located individual. The idea of passive presence
stems from Zajonc’s concept of the “mere” presence of a conspecific (1965, 1980).
Nonetheless, even Zajonc (1980) describes the idea of “mere presence” as an abstraction
since no presence can be completely devoid of any context. In spite of this, the idea of
“mere presence” remains useful. Performance effects have been observed when just
about all major factors and processes commonly associated with the physical presence of
others has been eliminated (e.g. evaluation, distracting nonverbal cues, etc.). For
example, Schmitt, Gilovich, Goore, and Joseph (1986) provide perhaps the best evidence
to date of minimal presence causing social facilitation effects. Confederates acted as peer
conspecifics, wearing headphones and blindfolds. Subjects were told that the confederate
was another subject who was being deprived of sensory stimulation for a later part of the
same experiment. Although sensory deprived, the confederates still managed to produce
simple task enhancement and complex task impairment. In fact, in Schmitt et al. (1986),
participants completed tasks before they were even aware that the experiment had started.
Even though passive presence eliminates just about all factors commonly associated with
the physical presence of others, performers exposed to a conspecific, unlike artificial
presence, are still able to visualize a “real” human being. It is for that reason that artificial presence is often called “quasi” social presence (Biocca et al., 2003).

One type of passive presence involves presence caused by a coactor. This differs from the presence of a regular audience in that the coactor is a peer working on a task at the same time as the other performer. In order for a conspecific to constitute a passive form of presence (known as “mere co-presence”), he/she must be working on a different task from the other performer. Coactors who work on the same task have the opportunity to compare their own performance to how their peer appears to be performing, altering the potential for evaluation (Sanders, Baron, Moore, 1978; Szymanski, Garczynski, & Harkins, 2000).

The fourth level of social presence is implied presence. Implied presence involves scenarios where observers are not visible (differing from passive presence), but have the ability to keep an "eye" on performers. When observers are located behind one-way mirrors or when told that they may be subject to electronic performance monitoring, participants are exposed to “implied” presence. Whether advanced technology is being utilized or simply a one-way mirror, in both situations the performer is aware of an invisible individual with the ability to watch them. A third implied presence scenario, similar to electronic performance monitoring, involves situations where participants are videotaped. However, these monitoring situations are only be considered social facilitation paradigms if an individual watches the video live and if there is no chance that the video would be watched at a later time. Social facilitation effects have been attributed in the past to EPM (Aiello & Kolb, 1995; Aiello & Svec, 1993) as well as observers behind one-way mirrors (Cohen & Davis, 1973; Criddle, 1971). Nevertheless,
the idea of classifying these scenarios into one “presence” category is a novel one.

Embodied presence is the fifth level of social presence. Similar to EPM, avatars (also known as embodied agents) can produce virtual presence. As technology improves, interest in virtual humans is growing greatly (Park & Catrambone, 2007). Immersive virtual environment technology allows individuals to interact via virtual human representations. Life-like avatars contain human-like characteristics, such as speech, gestures, and facial expression. Unlike software agents, avatars are controlled by actual live human beings who the avatar embodies, i.e., represents in a virtual bodily form. Similar to performers exposed to implied presence, those exposed to embodied presence are not able to visualize the physical presence of a human being. Similar to implied observers, embodied agents are able to monitor performance. Unlike implied observers, the presence of an embodied agent is visual and is suggestive of a “real observer.”

According to Bowman and McMahan (2007, p.2), “The goal of immersive virtual environments was to let the user experience a computer-generated world as if it were real--producing a sense of presence, or ‘being there,’ in the user’s mind.”

The highest level of presence is active presence. Unlike passive presence, active presence occurs due to audiences and coactors who are potentially evaluative and who potentially create distraction through nonverbal cues. Although there are more “active” forms of other types of presence, (e.g., more salient embodied and artificial presence), in order to clearly delineate boundaries, active presence will only consist of presence produced by “real” observers.

Although “passive presence” is capable of causing social facilitation effects, observers exposed to active presence often feel greater effects than those exposed to a
“benign” conspecific. Schmitt et al. (1986) found support for the effect of the mere presence on an audience, but also found that evaluation apprehension intensifies the mere presence effect. Aiello, Chomiak, and Kolb (Unpublished Manuscript) found that the addition of a noisy repairperson increased simple task performance significantly more than performing in the presence of nonevaluative others. Moreover, in Guerin (1983) inattentive observers, unlike attentive ones, failed to produce complex task impairment.

Most presence stimuli can be seamlessly categorized into one of the aforementioned types of social presence. However, there are scenarios that are not as clear-cut as the “more general” points on the spectrum. For example, presence produced by augmented reality, a hybrid of computer graphics and live video imagery, falls between embodied and active presence (Azuma, 1997). In addition, there are the unique situations of residual and anticipatory social presence which are also proposed to be capable of simple task enhancement and complex task impairment.

Residual Social Presence

Spence (1956, pp. 179-189) hypothesized social presence continues to affect actors completing a task a few minutes after the observer/spectator leaves the room. Henchy and Glass (1968) suggest that the fear of evaluation can last until after the observer leaves the room. In spite of this, traditional social facilitation paradigms have been primarily characterized by participants who are exposed to social presence stimuli while completing a task. Often social facilitation research describes the effect of social presence on task performance as dissipating immediately after the social “presence” disappears. A majority of the evidence of “carryover” or “residual” effects on performance is limited to studies outside of the social facilitation literature. However,
Sanders and Baron (1975) did demonstrate that a “carryover effect” elicited by previous social presence can affect performance on simple and complex tasks. Sanders and Baron (1975) compared participants’ performance in no distraction trials in two studies. Overall, participants in two studies, who had been distracted in previous trials minutes earlier, performed significantly better in simple task trials than those who were never distracted at all. In study 2 participants in “no distraction” complex task trials, who had been distracted in previous trials, performed significantly worse than those who had never been distracted. The same complex task impairment had not been observed in study 1; however, study 2 controlled for the practice effects that confounded study 1. Harkins (2006) also demonstrated that adding 30 seconds between trials can affect performance because it allows some of the residual effects of social facilitation to dissipate.

Even though the following studies are not considered social facilitation studies, they do provide evidence that residual effects from a previous stimulus or situation can often linger and even affect performance. Excitation transfer theory, as first described by Zillman (1971), posits that residual effects from a previous stimulus or situation may serve to intensify a later state. Neurological evidence for excitation transfer includes the fact that sympathetic nervous system activity does not terminate abruptly when the eliciting conditions terminate, but it slowly declines resulting in residual effects (Cantor, Zillman, & Bryant, 1975). In addition to excitation, emotions such as fear and anger also can persist beyond the eliciting situation affecting subsequent behavior as well as cognition (Lerner, Small, & Loewenstein, 2004; Meston & Frohlich, 2003).

The effects of crowding on subsequent performance have been well documented.
In Sherrod (1974) and Nicosia, Hyman, Karlin, Epstein, and Aiello (1979), participants suffered from decreased performance while working on a post-crowding frustration task. Similarly, Aiello, DeRisi, Epstein, and Karlin (1977) found that subjects exposed to close proximity crowding suffered from impairment on a subsequent creativity task.

Crowding remains relevant since the performance effects of crowding are caused by social presence and sometimes mirror those of social facilitation. However, the effects of crowding are unique and often not discussed in reviews of social facilitation. For example, an individual’s sense of control plays a larger role in the effects of crowding (Smith & Mackie, 2000). The effects of exposure to uncontrollable loud noise on subsequent tasks have been documented as well (Glass & Singer, 1972; Klein & Beith, 1985). Klein and Beith (1985) found that individuals performed better on moderate puzzle tasks following moderate unexpected noise and suffered impairment on puzzles following low or high amounts of unexpected noise. Exercise has also been shown to affect subsequent performance on a short-term memory task (Davey, 1973). Similar to the inverted U-shaped relationship observed in Klein and Beith (1985), Davey (1973) observed an inverted U-shaped relationship between exercise and subsequent performance. Interestingly enough, Klein and Beith (1985) attempt to explain their findings using two explanations often discussed in the social facilitation literature, i.e., attention/cognitive load and arousal. Nonetheless, the authors are quick to point out the problems with these two explanations: that the attention/cognitive load explanation (similar to distraction-conflict theory) is likely spurious given the data and that the arousal explanation contains a large and well-known set of problems as well.

Anticipatory Presence
Similar to residual presence, another overlooked area is the effect of anticipating social presence on task performance. According to Nitschke, Sarinopoulos, Mackiewicz, Schaefer, and Davidson (2006), anticipation is an adaptive component leading to emotional and behavioral adjustments. There is evidence that anticipation of aversive stimuli activates the same regions of the brain as responding to aversive stimuli (2006). Anticipation can become excessive and maladaptive and can lead to various forms of pathology. Nevertheless, it often is important to prepare the individual for positive or negative outcomes. Lazarus (1966) provides evidence that in many situations certain forms of physical pain do not produce stress reactions beyond those produced by the mere anticipation of such conditions. In fact, in some cases the anticipation of an event may produce a more powerful effect than the event itself (Calpin & Leahy, 2001).

Traditionally, a study investigating the anticipation of social presence would not be considered a social facilitation study. However, based on our definition of social presence, anticipatory social presence would be subsumed under the presence of the “imagined other.” Unlike a scenario where a mirror manipulation increases self-presentation, the effects of anticipating an observer occur due to an “imagined other” and not just the self.

All of the proposed explanations for social facilitation discussed earlier would predict changes in performance resulting from anticipating an observer. The effect of mere presence, proposed by Zajonc (1965), at its core is an alerting mechanism, alerting the performer of a social encounter. Cottrell (1969, 1972) states that is it the anticipation of positive and negative outcomes that is responsible for social facilitation effects. It is very likely that subjects anticipating a conspecific will use whatever information they
have available (e.g., information about the future observer, task difficulty) to cognitively appraise the conspecific’s outcome expectancies. The presence of another individual requires a great deal of processing. This may be to assess possible threat, to anticipate evaluation, to prepare to respond, or to regulate their self-image. These processes start before the eliciting presence stimuli and are capable of causing cognitive distraction even when physical distraction is not involved (Jones & Gerard, 1967). Carver and Scheier (1981) suggest when individuals are faced with a task, the presence of another causes those individuals to focus their attention inward engaging in a discrepancy-reduction-feedback loop. Moreover, individuals adjust their subsequent effort depending on expectations for success. Not surprisingly, Sanna and Shotland (1990) found that manipulating a participant’s outcome expectancy could lead to social facilitation effects. Subjects expecting to perform successfully anticipated a positive evaluation from an audience, resulting in improved performance as compared to subjects working alone.

Few studies have analyzed the effects of anticipatory social presence on performance before individuals were observed without manipulating outcome expectancy. However, Higgs and Joseph (1971) found that the warning of an impending audience (small and large) produced poorer original learning (less accuracy although more words) on a recall task of an Indian folktale. The aforementioned study provides additional evidence that “real” presence is not a necessary condition or social facilitation. Moreover, as was stated earlier, studies have shown that anticipating the potential for evaluation can cause social facilitation effects even during an “alone” condition (Harkins, 1987; Szymanski & Harkins, 1987).

*Current Studies*
It is acknowledged that there are many proposed explanations for social facilitation and that no explanation has been universally accepted. The proposed studies do not intend to investigate the mechanisms causing social facilitation. Instead, Study 1 compares the various different levels of social presence on task performance. Since there is evidence that social presence is not just a dichotomous variable, it is important to methodically classify and rank different categories of social presence in order to understand the effects of social presence.

Study 2 examines two rarely studied, but very common scenarios, and whether they are capable of producing conventional social facilitation effects. In addition to a performer being affected by experiencing a social presence during a task, they also are expected to be affected by a “carryover effect” elicited by an earlier social presence. Performers also are expected to be affected by imagining a subsequent social presence.
Study 1

Study 1 will empirically test a proposed social presence model (see Figure 1). As was postulated by Zajonc (1965), that performance of simple or well-learned tasks (those that involve dominant responses) is enhanced by the presence of others and the performance of complex (or novel) tasks is impaired. Therefore, hypotheses 1 and 2 are as follows:

Hypothesis 1: The performance on the simple task will be enhanced in conditions of social presence.

Hypothesis 2: The performance on the complex task will be impaired in conditions of social presence.

Past studies have investigated the effect of artificial presence, passive presence, implied presence, avatar presence, and active presence on simple and complex task performance. However, no study to date has compared the effects of more than three types of presence, as defined by the social presence model, using the same experimental paradigm.

The proposed social presence model consists of absence and five types of presence varying from low salience (artificial presence) to high salience (real presence). As was stated above, salience refers to the amount of perceptual input from stimuli as well as the resultant attention drawn from the perceiver. Regardless of whether evaluation, arousal, attention, self-presentation, self-awareness, or some combination of these is the underlying mechanism of social facilitation, it is expected that the less salient the form of presence, the weaker consequences it would produce. Thus, the weaker the social facilitation effects predicted.

Hypothesis 3: The stronger the salience of the social presence, the stronger the social facilitation effects, i.e., greater simple task enhancement and greater complex task
Comparing performance and other effects of different types of social presence serves as a starting point to test the proposed model. In order to develop the model and rank the intensities of different types of presence, it was essential to take into account characteristics of the salience of presence such as nonverbal cues and perceived evaluation. In addition to manipulating types of social presence, varying characteristics of salience within each type of social presence would also be expected to affect task performance. However, Study 1 will not test salience within each type of presence. In the future, it would be highly useful if a set of studies could manipulate salience characteristics within each type of presence to further “fill in the blanks” as far as the “social presence continuum.”
Method

Subjects

The current study included 188 Rutgers psychology students. One hundred and six students were female (56.4%) and 82 (43.6%) were male. Eighty nine students were Caucasian (47.3%), 14 were African-American (7.4%), 18 were Hispanic (9.6%), 63 were Asian (33.5%), and 4 were other (2.1%). Most of these students were introductory psychology students who completed the study as part of a course requirement. Fifteen were advanced psychology students who completed the study for extra credit. Fourteen students were dropped from the study. Of these nine were dropped due to experimenter error, three were dropped due to computer difficulties, and two were dropped because the participant did not understand the instructions.

Research Design

Participants in study 1 were randomly assigned to one of 6 conditions: control (alone condition), artificial presence (agent condition), passive presence, implied presence (monitoring condition), embodied presence (avatar condition), and active presence. The study followed a mixed-subjects design. Each participant completed a simple and then a complex task. Participants were exposed to the same type of presence during both tasks.

Materials and Procedures

Figure 2 outlines the procedure of studies 1 and 2. Appendix A contains a detailed account of the study script. Participants were invited into the lab room where they were logged in and filled out a consent form. Afterwards they were informed that they would be completing two tasks that would measure their perceptual speed/accuracy
(Finding A’s task) and implicit memory (anagram task). A research assistant (artificial, passive, embodied presence, and control) or supervisor (active and implied presence), informed the participants that implicit memory and perceptual speed are associated with proficiency in certain workplace tasks. Additionally, participants were told that their data would be used to evaluate undergraduates for internships and that the better they perform the more entries they will receive to win prizes such as gift certificates to area restaurants.

Simple Task

The simple task consisted of the “Finding A’s task” (Ekstrom, French, & Harmon, 1976). The task was divided into two, two-minute trials. In this task participants scanned through lists of words and put a line through any word with the letter “A”. Participants were told that the task tested for perceptual speed and accuracy. The “Finding A’s task” was chosen because it had been used successfully previously in a social facilitation experiment to produce simple task enhancement (Karlin, 1974).

Complex Task

An anagram task was used as the complex task. The anagram task consisted of participants being presented with sets of six letters on an IBM Compatible personal computer. The participants completed ten, 150 second rounds (one practice trial, nine official trials) of anagrams. During each round the participants worked on unscrambling the letters to create several 5 or 6 letter words. Similar to the game, Text Twist, five letter words were worth 250 points and six letter words were worth 460 points to reward the more difficult unscrambling of longer words (GameHouse Inc., 2010). A twist button was also available to randomly re-order the 5 or six letters of each puzzle. All participants
were told that the task tested implicit memory. The computer timed the participants in the anagram task. Participants were not able to go on to the next anagram until time expired. If a participant unscrambled all the words in a puzzle, they needed to wait for the entire 150 seconds to expire before moving on to the next puzzle.

The participants filled out questionnaire items before and after the task without anyone present (see Appendix B). The participants were told to press a button (to ring a bell) in order to notify the supervisor that they completed the post-task questionnaire. Participants were treated differently during the tasks depending on the condition to which they were randomly assigned.

Control Condition- There was no supervisor during the control condition. Instead, there was a “friendly” research assistant who gave instructions to the participant. Participants were asked about their research assistant on post-task questionnaires because there was no supervisor.

Artificial Presence Condition-Similar to the control condition, a “friendly” and “non-authoritative” research assistant, gave instructions to the participant. The research assistant told participants that he/she would be leaving the room during the tasks. However, a computer-controlled agent named Charlie would be monitoring participants (for a picture of Charlie, see Figure 3). Participants were told that Charlie was a graphical character controlled by a computer program that possesses artificial intelligence. Unlike the “dwarflike” image that produced complex task impairment in Rickenberg and Reeves (2000), Charlie is a realistic looking intelligent agent. Charlie is an animated female human being created by the programmers of the Microsoft Agent Scripting Helper (called MASH). Charlie resembles a normal human being in terms of
appearance and dress. Throughout the tasks the participants were exposed to Charlie. Charlie’s 37 animations were varied in order to make her movements less predictable. Participants were asked about their perceptions of Charlie, their supervisor on the post-task questionnaire.

Passive Presence Condition- During the passive presence condition the “friendly” research assistant informed the participant that once the trials began, the research assistant would leave the room and close the door to go to their “office” next door. In order to establish a “mere presence” a confederate remained in the room with the participant during the trials. The participants were told that due to space constraints in the Psychology Department, the confederate would be working on a questionnaire study in the same room as the participant. The confederate remained quiet and did not interact with the participant during the tasks. On the questionnaires participants were asked about the impact/perception of the peer conspecific.

Implied Presence Condition- Participants were greeted by a “stern” supervisor. However, the participants did not perform in the presence of the supervisor. Instead, participants were told that the supervisor would be monitoring the participants’ performance via a surveillance camera in the adjoining room. The surveillance camera was a mock camera (see Figure 4) designed to make noise and to move around and scan the room to appear real. The participants were told that the footage from the camera was going to be deleted immediately after the study. They also were required to sign a second consent form where they give permission to experimenters to monitor them. In addition to describing the monitoring, the form reminds the participants that video footage will be deleted after the task is over.
**Embodied Presence Condition**—Similar to control condition, a “friendly” research assistant delivered instructions to the participant. Before the tasks, the experimenter mentioned that he/she would be leaving the room during the tasks. However, participants are told that their supervisor, Mr. Tompkins, would be watching them (for a picture of Mr. Tompkins, see Figure 5). Participants were told that the avatar, a graphical representation of Mr. Tompkins, would reflect his movements and that through the avatar that participants would be connected to him. A webcam was also pointed out to participants in order to make it believable that they were being watched via an avatar. Throughout the tasks, the participants were exposed to the avatar. Participants were exposed to a “video” of an avatar as opposed to a “live avatar.” This was implemented in order to control the consistency of the avatar. The “play” and “fast forward” buttons were hidden so as not to arouse suspicion that participants were watching a video. On the questionnaires participants were asked about the impact/perception of their supervisor, Mr. Tompkins (referring to the avatar).

**Active Presence Condition**— In the active presence condition a “stern” supervisor stood nearby the participants systematically making check marks, shuffling his or her papers, and writing “I am a salient supervisor” on a clipboard twice per trial during the Finding A’s task and after each anagram. The participants did not see this phrase being written, it was used purely so the note each time would take roughly the same amount of time. In addition, the supervisor reminded participants that they are not to interact with them and that they were only there to observe, unless there was a problem. Supervisors stood and remained stationary, 1.2 meters away from participants during the task (a setup similar to Sanders, Baron, & Moore, 1978). Supervisors stood in front of and to the left
participants who were in their direct field of vision.
Results

Simple Task Session

Participants identified whether their supervisor/research assistant was present in the room with them during some of the Finding A’s task, during none of it, or during all of it. Of the control participants, 25 participants (92.6%) correctly identified that the supervisor was not next to them during the Finding A’s trials. Similarly, 26 out of 30 (86.7%) of the participants exposed to the agent believed their supervisor was not in the same room as them during the task. Ten out of 23 (43.5%) of all passive participants, incorrectly indicated that nobody was in the room during the Finding A’s task. Thirty four out of 38 (89.5%) in the monitoring condition and twenty two out of 27 (81.5%) of the individuals exposed to embodied chat correctly identified that the supervisor was outside the room throughout the task. In the active conditions, 27 out of 29 (93.1%) of the subjects correctly identified that their supervisor was in the room while they were looking for words with the letter “A.”

The average participant rated task difficulty a 3.3 on a 7-point Likert scale where 1 corresponded to not very difficult and 7 corresponded to very difficult. Perceptions of difficulty did not significantly differ among groups, $F(5, 173) = .962, p < .10$. The scores for both rounds of the Finding A’s task were summed together to increase reliability. Collapsing the data was possible because the performance from round to round did not significantly differ across time $F(1, 173) = .036, p > .10$. Words missed and words selected incorrectly were combined into total errors. The mean participant made 14.08 errors and thus selected 77.0% of words correctly. There was no significant difference in accuracy across conditions, $F(5, 173) = .502, p > .10$. There was a significant correlation
between the number of words selected correctly and the number of words attempted.

A main effect was found for gender. Females scored (M=53.8) significantly higher than males (M=48.1) on the Finding A’s task, $F(1, 173)=6.56, p<.01$. However, no interaction was found between condition and gender, $F(5, 173)=.137, p>.10$.

A one-way analysis of variance comparing participant’s overall scores produced a significant effect for type of presence, $F(5, 173)=2.339, p<.05$ (see Table 1). A Tukey HSD post hoc analysis revealed that monitoring participants (M=55.3) experienced simple task enhancement (Meancontrol=44.6). The Cohen’s D indicated a medium effect size (d=.78). Although this finding was consistent with Hypothesis 1, participants in other social presence conditions did not differ significantly from each other. Therefore, hypothesis 1 was only partially supported. A planned contrast also failed to reveal a significant linear trend where increasing the salience of the presence increased simple task performance, $t(173)=1.044, p>.10$. Thus, hypothesis 3 was not supported. However, a visual inspection of scores in Table 1 suggested that the way the type of presence predicted performance followed an inverse-U shaped relationship, i.e., a quadratic relationship. Near the apex of the curve was the performance of those exposed to passive and implied presence. The higher and lower salience conditions scored lower on the simple task. The lowest scores were attributed to the highest (active) and lowest (control) salience conditions. A polynomial trend analysis confirmed a quadratic trend (contrast estimate=-8.550, p<.05). Consistent with a quadratic trend, a curve-estimation analysis using regression showed that was a significant quadratic, but not linear, relationship between type of presence and performance (quadratic, $R^2 = .062$, $F(5,$
One-way analyses of variance were conducted on the post-task questionnaire items. Tukey HSD tests were used to determine whether there was a significant difference between the types of presence to which participants were exposed. A 6-item anagram session salience scale was constructed to measure participant’s perceptions of the salience of their research assistant/supervisor. The items included “I found the supervisor/research assistant to be distracting,” “to what extent did the supervisor/research assistant affect your performance,” “I felt like I was being judged,” “to what extent did I feel distracted,” “I would have preferred if the supervisor was quieter”, and “the supervisor impacted my performance during the anagram task.” The Cronbach’s α test indicated high inter-item reliability (Cronbach’s α = .75). There was a significant main effect of condition for perceived supervisor salience (F(5,173)=2.343, p<.05 (see Table 2). Active presence participants perceived supervisors as more salient (M=2.91) than passive presence participants (M=1.98). A significant analysis of variance elucidated that subjects differed in how much they reported that their supervisor affected their performance. A Tukey HSD test revealed that participants exposed to active presence (M=3.07) felt their supervisor affected them more than subjects who performed in the presence of only a peer conspecific (M=1.59), F (5, 173)=2.660, p<.05 (see Table 2). There was also a significant main effect on whether participants felt evaluated while working on the task, F(5, 173)=3.553, p<.01. Again Tukey HSD tests found that the one significant pairwise comparison was between active presence (M=4.97) and passive presence participants (M=2.91, see Table 2). Similarly, there was a significant effect on whether participants found their supervisor/research assistant to be
distracting, $F(5, 173)=2.491, p<.05$. Subjects exposed to active supervisory presence reported that their supervisors were more distracting ($M=2.83$) than participants whose supervisors left the room and instead worked in the presence of a peer ($M=1.41$). There was no significant difference between active presence individuals and control participants ($M=2.29$) even though control students’ research assistants also left the room during the task (see Table 2).

Participants exposed to active presence felt more stressed ($M=3.03$) than those exposed to a “benign” conspecific ($M=1.65$) or a computer agent ($M=1.77$), $F(5, 173)=2.922, p<.01$. Interestingly, the stress reported by control participants did not significantly differ from participants exposed to active presence (see Table 2). In contrast, participants exposed to an avatar reported feeling the most nervous ($M=4.11$), $F(5, 173)=2.881, p<.05$. The aforementioned participants felt significantly more nervous than participants who performed “adjacent to” a computer agent ($M=5.70$) and a peer conspecific ($M=6.00$, see Table 2).

Students in the avatar condition liked their supervisor significantly less than participants in all other conditions, $F(5, 173)=9.381, p<.01$. Participants observed by the agent liked their supervisor less ($M=2.00$) than control participants ($M=5.35$). Avatar participants ($M=3.59$), unlike those performing in the presence of an active supervisor ($M=5.21$), reported liking their supervisor significantly less the three lowest salience conditions: control ($M=5.35$), agent ($M=2.00$), and passive ($M=1.59$), $F(5, 173)=9.381, p<.01$ (see Table 2). When asked if their supervisor/research assistant was evaluating their performance in general, participants exposed to the computer agent believed their supervisor was evaluating their performance less ($M=2.20$) than participants exposed to
active presence ($M=4.86$), avatar presence ($M=3.00$), monitoring ($M=3.92$), and even control participants ($M=3.73$), $F(5, 173)=8.812, p<.01$ (see Table 2). Performers exposed to the artificial ($M=4.33$) and embodied presence manipulations ($M=3.56$) also believed their supervisor possessed significantly less expertise than those who were monitored by video camera ($M=3.08$), $F(5, 173)=8.248, p<.01$. However, active presence participants ($M=3.38$) did not feel their supervisor/research assistant possessed more expertise than participants in the agent ($M=4.33$) and avatar conditions ($M=4.19$, see Table 2). There was no significant differences across conditions on the item asking whether the supervisor impacted performance during the Finding A’s task, $F(5,173)=.690, p>.10$.

Complex Task Session

Participants indicated whether their supervisor/research assistant was present in the room with them during some of the anagram task, during none of it, or during all of it. Twenty five of the control participants (96.2%) correctly reported that the supervisor was not in the room during the Finding A’s tasks. Twenty nine out of 30 of the participants (96.7%) exposed to the agent believed their supervisor was not in the same room as them during the task. Only 4 out of 23 (17.4%) of passive participants incorrectly indicated that they were alone during the anagram trials. A McNemar’s Chi Square test revealed that this was significantly less than the 10 out of 23 (43.5%) who indicated they were alone during the Finding A’s task, $\chi^2(1, n=23)=4.76, p<.05$. Furthermore, of the 10 subjects who originally believed they were alone, only 3 reported that they were alone during the anagram task. Thirty out of 38 (78.9%) in the monitoring condition correctly indicated that the supervisor was outside the room. Twenty-two out of 27 (81.5%) of the
individuals exposed to embodied chat thought the supervisor was away from their room while working on the task. In the active conditions, 27 out of 29 (93.1%) of the individuals correctly identified that supervisor was in the room while they were working on the anagram trials.

There was a main effect of gender. Females scored ($M=6,086$) significantly higher than males on the anagram task ($M=5,451$), $F(5, 173)=3.97$, $p<.01$. However, no interaction was found between condition and gender, $F(5, 173)=.398$, $p>.10$. The average participant rated task difficulty 4.7 on a 7-point Likert scale where 1 corresponded to not very difficult and 7 corresponded to very difficult. There were no significant effects for perceived task difficulty across conditions, $F(5,173)=.868$, $p>.10$.

Anagram scores did not differ by condition, $F(5, 173)=1.432$, $p>.10$ (see Table 3). Therefore, hypothesis 2 was not supported. However, there were significant differences on post-task questionnaire responses. A 6-item anagram session salience scale was constructed to measure participant’s perceptions of the salience of their research assistant/supervisor. The items included “I found the supervisor/research assistant to be distracting,” “to what extent did the supervisor/research assistant affect your performance,” “I felt like I was being judged,” “to what extent did I feel distracted,” “I would have preferred if the supervisor was quieter”, and “the supervisor impacted my performance during the anagram task.” Cronbach’s alpha was .834. Control ($M=2.40$), agent ($M=2.40$) and passive presence participants ($M=2.00$) felt their supervisor was less salient than those exposed to avatar ($M=3.40$) and active presence ($M=3.40$), $F(5,173)=6.342$, $p<.01$. Participants exposed to monitoring (implied presence) did not significantly differ in their salience perceptions ($M=2.80$) from any of the other
conditions (see Table 4).

There was a significant main effect of the item, “to what extent did the supervisor/research assistant affect your performance on the anagram task?” $F(5, 173)=6.610, p<.01$. Control participants ($M=1.89$), those performing in the presence of a computer agent ($M=1.90$), and those who performed in the presence of a peer conspecific ($M=1.68$) felt less affected than those performing in the presence of an avatar ($M=3.22$) and an active supervisor ($M=3.72$). Participants monitored by video surveillance, whose means were intermediate compared to the low and high salience groups ($M=2.41$), felt significantly less affected by their supervisor than active presence participants (see Table 4). There was also a significant main effect of the item, “I found the supervisor/research assistant to be distracting,” $F(5, 173)=7.459, p<.01$. Participants assigned to the control group ($M=1.89$), participants completing anagrams in front of a computer agent ($M=1.73$) and participants completing anagrams in front of peer conspecific ($M=1.68$) felt significantly less distracted than those who were watched by an avatar ($M=3.56$) and an active supervisor ($M=3.24$). A Tukey HSD test revealed participants monitored by video camera ($M=2.46$) did not differ in perceived distraction from participants exposed to varying strengths of presence (see Table 4). Participants felt the most impacted while performing in front of an avatar, $F(5, 173)=2.668, p<.05$. They perceived performing in front of Mr. Tompkins had significantly more impact ($M=3.37$) compared to performing in front of Charlie, the agent ($M=2.00$, see Table 4). Moreover, participants in embodied ($M=3.74$) and active presence conditions ($M=3.43$) preferred that the supervisor be significantly less immediate compared to control participants ($M=2.26$), $F(5, 173)=9.804, p<.01$ (see Table 4).
On affective measures, participants reported disparate stress levels based on the type of presence to which they were exposed to, $F(5, 173)=6.07, p<.01$. Participants performing in front of an agent ($M=1.80$) and a peer conspecific ($M=1.74$) felt significantly less stressed than those performing in the presence of an avatar ($M=3.07$) and an active supervisor ($M=3.48$). Participants in the control group and those in the monitoring condition ($M=4.29$) felt significantly more stressed than those in the active presence condition yet not those performing in front of an avatar (see Table 4). There was also a significant main effect of how nervous the anagrams made participants, $F(5, 173)=3.459, p<.01$. Participants who performed in front of a peer conspecific ($M=5.70$) felt less nervous than individuals performing in the presence of a computer agent ($M=4.23$), a video camera ($M=4.29$), an avatar ($M=4.11$) and an active supervisor ($M=4.10$, see Table 4). Participants in control conditions felt more leisurely ($M=2.17$) than those performing while subjected to avatar presence ($M=3.00$), $F(5, 173)=3.044, p<.05$ (see Table 4).

Actors performing in front of avatars and computer agents liked their supervisors significantly less than participants in all other conditions, $F(5, 173)=10.378, p<.01$ (see Table 4). Actors rated the level of expertise of both the agent ($M=4.43$) and the avatar ($M=4.33$) to be worse than that of active supervisors ($M=3.25$) and those performing in the presence of a peer conspecific ($M=2.47$), $F(5, 173)=9.804, p<.01$. Participants also believed the agent possessed significantly less expertise than their supervisor who monitored them via video camera ($M=3.34$, see Table 4). Participants performing in front of avatars would have preferred if their supervisor was significantly quieter ($M=3.41$) than participants randomly selected to control ($M=1.74$) and passive presence.
conditions ($M = 1.74$) $F (5, 173) = 4.418, p < .01$ (see Table 4). This is in spite of the fact that no noise was made during the anagram trials.

There was a significant main effect for how distracted participants felt while working on the anagram task, $F (5, 173) = 2.390, p < .05$. However, there were no significant pairwise comparisons. There also was a significant effect for how much subjects felt evaluated while working on the anagrams, $F (5, 173) = 2.428, p < .05$. Again, Tukey HSD comparisons revealed no significant pairwise effects.
Discussion

As predicted, the type of presence had a significant effect on simple task performance. In particular, monitored students performed significantly better on the simple task than participants in the control condition. Although participants were told they would be monitored via camera and not told they would be monitored electronically, the result of the manipulation was similar to that of electronic performance monitoring. Similar to Aiello and Kolb (1995), participants experienced simple task enhancement after being told they would be monitored in real-time. This occurred even without the visible presence of an observer. The paradigm was also similar to what was observed in one-way mirror studies which involved participants performing in front of a one-way mirror, where they were being observed by an invisible presence (Cohen & Davis, 1973; Criddle, 1977).

Participants performing in the presence of Charlie, the human-like agent, did not experience simple task enhancement. Social facilitation effects have been produced by agents in the past (Hall & Henningsen, 2008; Rickenberg & Reeves, 2000), though these effects have been limited to complex task impairment. In addition, a couple of studies, (Hoyt, Blascovich & Swinth, 2003; Read, 2003) show examples of agents failing to produce complex task impairment. In general, complex task impairment has been observed a great deal more often in the literature than the more elusive simple task enhancement. The results of a meta-analysis showed that complex task impairment is seven times more likely than simple task enhancement (Bond and Titus, 1983). While the mean of the agent condition was not high enough to produce a significant Tukey
honestly significant difference, agents performed markedly higher than control participants on the simple task.

Surprisingly the presence of a peer did not produce simple task enhancement. This contrasts with the results of many classic social facilitation studies (e.g., Guerin, 1986; Henchy & Glass, 1968; Markus, 1978; Rajecki, et al., 1977; Schmitt et al., 1986), which reveal social facilitation effects caused by a passive conspecific (i.e., non-distracting, unable to evaluate). The results of a Tukey HSD test did not show that these individuals scored significantly higher than control participants. Even though the post-hoc test did not reveal a significant pairwise comparison, passive presence participants scored higher on the Finding A’s task than participants in any of the other conditions. In addition, scores among passive presence participants were considerably higher than among control participants and also slightly higher among monitoring participants. It is interesting that the means were similar for participants exposed to passive and implied presence. Unlike the peer conspecific, the implied presence consisted of an evaluative audience. However, the evaluative audience was invisible and therefore the observer’s presence could not be perceived and could only be imagined.

It should be noted that roughly forty three percent of passive presence participants incorrectly indicated that nobody was in the room during the simple task. Significantly less passive presence participants erroneously believed that they were alone during the complex task. Of the 10 who originally believed they were alone, 70% of them correctly reported being in the presence of another individual during the anagram task. It is possible that subjects were, at first, confused, because they were told that the conspecific was not part of the study. The Finding A’s task was a great deal shorter than the anagram
task. Possibly this was not long enough for some of the participants to remember performing in the presence of the conspecific. The fact that many passive presence participants did not notice the conspecific enough to report his/her presence may have created an artifact in the data. However, passive presence participants who incorrectly reported that nobody was in the room with them did not differ from other participants as far as simple task performance.

The presence of an avatar also did not produce simple task enhancement on the Finding A’s task. This contrasted with Park and Cantrambone (2007) who found that an avatar produced simple task enhancement during a maze task, as well as an anagram task. However, the mean for avatar presence was in the expected direction as compared to the control mean. Even more surprisingly, participants in the active presence condition did not experience social task enhancement. Hypothesis 3 proposed that due to social impact theory, the strongest manipulation should cause the strongest impact (Latané, 1981). The active presence manipulation not only did not produce simple task enhancement, active presence participants actually scored lower than any other participants with the exception of control participants.

One possible explanation for why simple task enhancement was not observed in embodied and active presence conditions is that the manipulations were too weak. Seta et al. (1989) proposed that increasing additional evaluative elements produced increased social facilitation effects. Those monitored by video camera experienced simple task enhancement, while those exposed to an active supervisor or avatar did not. This supports Guerin and Innes (1982) who predicted that invisible observers may produce greater physiological effects on performers than those who are visible. Guerin
and Innes (1982) attributed these phenomena to the uncertainty involved when an individual is observed by an invisible observer. Interestingly, monitored participants also perceived that their supervisor was the most expert, which could have caused supervisors monitoring them by camera to be taken more seriously. However, this explanation does not seem to be congruent with the self-reported data.

A more likely explanation is that the avatar and active presence manipulations were too powerful to produce simple task enhancement. Aiello, Chomiak and Kolb (Unpublished Manuscript) and Sanders and Baron (1975) suggest the effect of social presence on simple tasks might be represented by an inverted U-shaped curve. According to distraction-conflict theory, stimuli producing too much distraction interfere with the processing of a simple task, leading to cognitive overload. Supervisors in active presence conditions, who made checkmarks, notes, and shuffled papers throughout the Finding A’s task were perceived as the most salient experimenters during the Finding A’s session (based on the results of a 6-item salience scale). Active presence participants also reported that they were most evaluated and the most stressed.

A performer’s judgment of how much they like an observer can have an effect on task performance (Prothero et al., 1995). The avatar, along with the agent, was perceived as possessing the least expertise. Embodied supervisors were disliked more than control, passive, monitoring, and active supervisors/research assistants. The agent, Charlie, was also disliked more than research assistants in the control condition. Possibly more realistic and likable agents and avatars might have been perceived as possessing more expertise. This may have also led performers to feel more intimate with the agents and avatars on their computer screen.
In the avatar condition, participants were told that through the avatar they would be connected to their supervisor, Mr. Tompkins. The research assistant then pointed to a webcam, implying that Mr. Tompkins was able to visually monitor participants during the task. The addition of a distracting avatar, as well as the threat of real-time monitoring may have produced too much distraction/evaluation to produce simple task enhancement. Geen (1981) cautions that the inverted U-shaped curve explanation is not easily falsifiable. When simple task effects have not been found, it is often empirically unclear if the data refute the explanation entirely, if there was not enough attention, or if there was too much attention. Regardless, consistent with the “too much distraction/evaluation” explanation, participants performing in the presence of an avatar reported feeling more nervous than participants in any other condition and significantly more nervous than those exposed to artificial and passive presence. Moreover, two analyses confirmed that the relationship between salience of presence and simple task performance was quadratic.

Participants viewed observers to be least salient, evaluative, and distracting in the passive presence condition as opposed to the alone condition. Only one item asking participants to identify how leisurely they were feeling provided any evidence that control participants were less affected by their supervisor than their counterparts in artificial and passive presence conditions. This is surprising since roughly 93% of all control participants reported that no observer was in the room during the entirety of the Finding A’s task. Perhaps even though control participants were not exposed to a presence stimuli during the Finding A’s task, the role of the observer was ambiguous and participants still perceived they were being evaluated. Zajonc (1980) suggests that
uncertainty is responsible for social facilitation effects. Similar to passive presence participants, but in contrast to control participants, participants exposed to artificial presence reported that they were significantly less stressed than active participants. However, Burke (1987) warns that sometimes self-report measures related to stress need to be viewed with caution since individuals are not always consciously aware of stress levels. Perceived stress is often unrelated to physiological measures. Regardless of the perceived attitudes of participants, on a behavioral measure, task performance, the means for the control condition were markedly lower than the means of other participants.

The social presence manipulation did not have a significant effect on scores on the anagram task. Therefore, the data failed to provide support for Hypothesis 2. The anagram task used was perceived by participants to be neither difficult nor easy on a 7-point scale (M=4.7). This was surprising since pilot subjects perceived the same task to be difficult (mean of approximately 6.0). Perhaps individual differences increased the variance and contributed to this difference in perceived task difficulty. The task was too easy to yield complex task impairment and most likely did not consist of solely non-dominant responses. Although, the Finding A’s task was only viewed as slightly more simple than a moderately difficult task (M=3.3), the Finding A’s task is an automatic task requiring little cognitive capacity which has produced simple task enhancement in the past (Karlin, 1974). According to conventional criteria, if a response is emitted more than 50% of the time (77.0%), in the present it can be inferred that the response must have been dominant (Spence, 1956). Allowing participants to use multiple words in each puzzle and to “twist” the letters possibly contributed to the task not being as difficult as intended. Participants in a recent study exposed to both an avatar and a co-located
observer displayed complex task impairment on an anagram task (Park & Cantrambone, 2007). However, the anagram task, used in the aforementioned study, did not involve multiple answers or an automatic way to twist letters.

There were no significant differences between conditions as far as complex task performance. Nevertheless, post-task questionnaires responses reflect a wide variety of differences among participants exposed to various types of presence. The 6-item salience scale, asking about participant’s feelings about being evaluated, distracted, and impacted by an observer, produced a high reliability score. This indicated that the items reflected very closely related attitudes about supervisor salience. Participants exposed to the 3 types of presence expected to be the lowest in salience (control, artificial, and passive) perceived their supervisors to the least salient. Participants exposed to the 2 types of presence expected to be highest in salience (embodied and active) perceived their supervisors to be the most salient. Participants assigned to the monitoring condition did not significantly differ in perceived salience compared to participants in the other conditions. However, the mean for monitoring participants’ was intermediate to the means of the low and high salience conditions. This provided support for the expectation that implied presence, where observers can evaluate, but are not visible, has an effect weaker than that of active and embodied presence. In active and embodied presence conditions, observers had the potential to be distracted either by the physical presence of a person observing them, or by an image representing a person evaluating them. Questionnaire data also provide support for the fact that implied presence produced a stronger effect than artificial and passive presence. Similarly, participants exposed to different type of social presence felt differentially affected by their supervisor/research
assistant. The participants in the proposed “low” salience presence conditions reported being the least affected (control, artificial, and passive presence) and those in the “high” salience presence conditions (embodied and active) reported being the most affected. The invisible observers in the monitoring condition were perceived as having a weaker effect than the active observers. This provided more support for the proposed social presence spectrum, in spite of the fact that the performance data did not support hypothesis 3. Active observers, unlike avatars, were seen as having an effect significantly greater than monitoring participants. Monitored participant’s perceptions did not significantly differ from the “low salience” conditions.

Self report data show that during the anagram session, participants’ perceptions were most affected by active and embodied presence. Individuals randomly selected to the two “high” salience conditions, preferred their supervisor to be less immediate compared to control participants. They also felt significantly more stressed and more nervous than those exposed to artificial and passive presence. On some items, active presence appeared to have a greater effect than avatar presence. Participants exposed to active (but not embodied) presence felt significantly less leisurely than those in control conditions. Monitored participants experienced less stress than participants exposed to active presence, but not significantly less than embodied presence. In contrast, on a few items, participants seemed to be more affected by embodied presence than by active presence. In the avatar condition, unlike the active presence condition, participants wanted the supervisor to be quieter compared to control and passive presence conditions. This occurred even though the avatar made absolutely no noise during the anagrams task. Participants also felt the avatar (and not the active supervisors) produced more impact
than the agent. Again, avatars and agents were not liked as well as the other supervisors/research assistants. In addition, their level of expertise was viewed as lower than in the other conditions. The anagram task also differed from the Finding A’s task because the anagram task shared the computer screen with the agent, as well as the avatar. It is possible that this caused more distraction than a similar presence did during the non computerized, Finding A’s task.

Study 1 provides some preliminary evidence for the proposed social presence continuum. Perhaps the means for embodied and active presence conditions would have been higher, had the manipulations not been too distracting. Most of the post-simple task questionnaire data only provided evidence that active presence was viewed as stronger than artificial and passive presence. It provided little evidence (other than one item about nervousness) that embodied presence was strong and that implied presence had an intermediate effect on participants. It is possible that participants were more consciously aware of the effects of social presence during a longer, more difficult anagram task. In spite of the fact that there were no significant performance effects on the so-called “complex task,” participants did provide evidence that the experience of no presence, artificial, and passive presence were the weakest, that embodied and active presence were the strongest and that the effects of monitoring fell in the middle. It is possible that the presence continuum is best represented by a trichotomy of presence saliencies: low social presence (absence, artificial, passive presence), moderate social presence (implied), and high salience social presence.
Study 2

As was stated above, social presence can be described as “the experience of real, implied, or imagined other(s).” The co-located active supervisors and passive conspecifics in study 1 can be described as examples of “real presence.” The invisible supervisor in the monitoring condition can be described as an “implied presence.” The agent and the avatar can be described as examples of real, albeit mediated presence. One can also attribute some implied presence to the avatar as well, since the image of the virtual human is representative of a real human whose presence is implied, but not seen.

Unlike study 1, study 2 manipulated types of imaginary presence. There is evidence that a performer’s neurons continue to fire, but slowly dissipate, after an eliciting observer has left the room (Cantor, Zillman, & Bryant, 1975). This “carryover” effect can be described as a type of “imagined” presence. Observers continue to feel the effects of an individual they recently observed, but who is no longer present. These effects originate from an individual who is still being “imagined.” When an individual is anticipating a supervisor, the anticipation involves expectancy, i.e., imagining that supervisor. One main difference between residual and anticipatory presence is how long it has been since the participant has seen the supervisor. The monitoring condition in study 1 constituted an implied presence. Nevertheless, it shares a few elements with an anticipatory presence scenario. Both involve a great deal of uncertainty. When individuals are monitored by videotape, their supervisor is invisible. Therefore, they are unable to take advantage of nonverbal cues to learn about their observer. When anticipating the arrival of a supervisor, similar to monitoring conditions, individuals must rely on prior knowledge and expectations.
Study 2 seeks to compare the effects of social presence stimuli presented concomitantly with a task with the carryover effects of social presence that linger after the eliciting stimulus has been extinguished and the effects of anticipating social presence. Because the effects of the residual presence will start to extinguish after the eliciting stimuli is completed, it is predicted that the effects of residual social presence will be weaker than the effects of active presence. Moreover, many of the same brain mechanisms are often involved in imagining and anticipating a stimulus as actually processing a stimulus (Nitschke et al., 2006). Although Zajonc and Cottrell had very different ideas about the mechanism causing social facilitation effects, both believed that anticipation was fundamental to the effect of social presence on task performance. Zajonc (1965) believed social facilitation was caused by the brain alerting the body after perceiving the presence of an individual. Therefore, one would expect the brain to still be on “alert” while anticipating the presence of another individual. Cottrell (1972) felt social facilitation was caused by social presence causing performer to anticipate a positive or negative evaluation. One would expect the anticipation of social presence could begin this process even before the supervisor enters the room. It is expected that the experience of “imagining” presence will produce some social facilitation effects, although these effects will be weaker than those produced more directly by live presence.

**Hypothesis 1a:** Residual social presence will cause simple task enhancement.

**Hypothesis 1b:** The effects of residual social presence on a simple task will be weaker than those of active presence.

**Hypothesis 2a:** Anticipating social presence will cause simple task enhancement.

**Hypothesis 2b:** The effects of anticipating social presence on a simple task will be weaker than those of active presence.
Hypothesis 3a: Residual social presence will cause complex task impairment.

Hypothesis 3b: The effects of residual social presence on a complex task will be weaker than those of active presence.

Hypothesis 4a: Anticipating social presence will cause complex task impairment.

Hypothesis 4b: The effects of anticipating social presence on a complex task will be weaker than those of active presence.

Study 1 provides some evidence of a proposed continuum ranking different types of presence and their ability to elicit social facilitation effects. The one dimensional continuum (see Figure 1) does not take into account the fact that a stimulus does not have to be presented concomitantly with a task to have an effect. Study 2 only compares the residual and anticipatory effects of an active presence. A more complete and more detailed model could be tested by comparing the residual and anticipatory effects of agents, peer conspecifics, supervisors monitoring live via video camera, and embodied virtual beings. However, the effects of residual and anticipatory active presence are expected to be the most robust. Therefore, the first step will be to compare residual and anticipatory active presence effects to active presence and control conditions.
Method

Subjects

The current study included 135 Rutgers psychology students. Sixty-eight students were female (50.4%) and 67 were male (49.6%). Sixty-two were Caucasian (45.9%), 13 were African-American (9.6%), 5 were Hispanic (3.7%), 50 were Asian (37.0%), and 5 were other (3.7%). As in study 1, most of these students were introductory students who completed the study as part of a course requirement. Nine participants were advanced psychology students who completed the study for extra credit. Ten participants were dropped from the study. Five were dropped due to computer malfunction, four were dropped due to experimenter error, and one was dropped because the participant did not understand the instructions.

Research Design

Participants in study 2 were assigned to 4 conditions: active presence, anticipatory presence, residual presence, and control (alone condition). The study followed a mixed-subjects design. Each participant completed a simple as well as a complex task. The type of presence remained the same during both tasks.

Materials and Procedures

Study 2 follows the same basic design as study 1 (see Figure 2 for study outline, see script in Appendix A). Participants were invited into the lab room by either a “formal” supervisor or by a “friendly” research assistant. In the lab room, participants were logged in and filled out a consent form. Afterwards they were informed that they would be completing two tasks that would measure their perceptual speed/accuracy and implicit memory. The observer, a research assistant (control and anticipatory) or
supervisor (active and residual), informed the participants that perceptual speed and accuracy are associated with proficiency in certain workplace tasks. Additionally, as in study 1, participants were told that their data would be used to evaluate undergraduates for internships and that the better they perform the more entries they would receive to win prizes such as gift certificates to area restaurants.

Simple Task

The perceptual (simple) task consisted of the “Finding A’s task” (Ekstrom, French, & Herman, 1976). This was the same simple task as used in study 1. Participants were treated differently during the task depending on the condition to which they were randomly assigned.

Control Condition- There was no supervisor during the control condition. Instead, there was a research assistant who gave instructions to the participant.

Active Presence Condition- In the active presence condition a supervisor stood stationary nearby the participants systematically making check marks, shuffling their papers, and writing “I am a salient supervisor” on a clipboard, while observing the participants. The supervisor told the participant that they are there only to observe and not to interact unless there is a problem. Supervisors stood 1.2 meters away from participants during the task (a setup similar to Sanders, Baron, & Moore, 1978). Supervisors stood in front of and to the left participants who were in their direct field of vision.

Residual Condition- Participants were told that while they completed the task that part of the time the supervisor will be there observing them. However, for the rest of the time they will be working on a task next door in their office. Similarly to the active
presence condition, the supervisor actively monitored the participant during trial 1 (standing still, making periodic checkmarks, paper shuffling, writing “I am a salient supervisor,”). Unlike the active condition, the supervisor left during the second trial and went to an adjacent room, only coming back at the very end of the trials.

*Anticipatory Condition*- Participants were greeted by a research assistant who went through the procedures of the experiment. They were told that while they completed the task that parts of the time their supervisor would be there observing them. However, for the other part of the time they would be working on a task next door in their office. The supervisor, who participants previously had not met, actively monitored the participant during trial 2 (including periodic checkmarks, paper shuffling, and writing “I am a salient supervisor” once per trial). A research assistant and a supervisor were used to provide a contrast between the more formal supervisors versus the more “friendly” research assistant. When the task was over, the research assistant came back to instruct the participants about the questionnaire and to debrief the participants.

*Complex Task*

An anagram task was used as the complex task (see Study 1). Participants were treated differently during the task depending on the condition to which they were randomly assigned.

*Active Presence Condition*- In the active presence condition the supervisor again stood 1.2m away from participants periodically making check marks and shuffling papers. The supervisor wrote “I am a salient supervisor” after participants finished each one of the 9 anagram trials. The supervisor told the participant that they were not to interact with him/her and that he/she was only there to observe, unless there was a
problem.

*Control Condition*- There was no supervisor during the control condition. Instead, there was a research assistant who gave instructions to the participant.

*Residual Condition*- Participants were told by their supervisor that while they completed the task that part of the time they would be observed by them. However, for the rest of the time they will be working on a task next door in their office. The supervisor actively monitored the participant during trials 1 to 4 (periodic checkmarks, paper shuffling, writing “I am a salient supervisor,” similar to the active presence condition). However, the supervisor, without notice, left the room in the middle of trial 5 and went to an adjacent room. The supervisor did not return to the room with the participant until the very end of the trial 9. The 9 trials took about 26 minutes to complete. Supervisors left midway into the anagram task (after 13 minutes).

*Anticipatory Condition*- Again participants were told by their research assistant that while they completed the task that part of the time the supervisor would be there observing them. However, for the other part of the time they will be working on a task next door in their office. The supervisor came back to the original room 13 minutes into the task. Since the 9 trials last roughly 26 minutes, the supervisor always arrived during trial 5 of the anagram task. Once the supervisor rejoined the participant, the supervisor actively monitored the participant. Again the monitoring consisted of periodic checkmarks, paper shuffling, and writing “I am a salient supervisor” after every anagram presented. When the task was over, the research assistant came back to instruct participants about the questionnaire and to debrief the participants.
Results

Simple Task Session

In study 2, two separate 3 level one-way analyses of variance were conducted. One analysis compared residual, active, and control participants. Another compared anticipatory, active, and control participants. One four level one way analysis of variance was not utilized since it was important to compare anticipatory and residual presence to active presence and control conditions. There was no a priori hypothesis about the difference between anticipatory and residual presence.

Participants identified whether their supervisor/research assistant was present in the room with them during some of the Finding A’s task, during none of it, or during all of it. Of the 37 residual condition participants, 33 (89.2%) correctly identified that their supervisor/research assistant was in the room part of the time. Twenty five out of 27 (92.6%) of the control participants correctly identified that they were alone during the Finding A’s task. In the active condition, 27 of the 29 participants (93.1%) identified that another person was in the room with them during the entire Finding A’s task.

Providing support for hypothesis 1a, residual participants \(M=27.0\) experienced simple task enhancement \(F(2, 92)=4.459, p<.05\) as compared to control participants \(M=21.7\). Failing to support hypothesis 1b, Tukey HSD tests revealed that participants in the active condition of trial 2 of the Finding A’s task \(M=24.6\) did not significantly differ from residual or control participants. Trial 2 was used as a comparison since it was the trial where participants could conceivably be affected by the carryover effects of presence. Although the Finding A’s task was designed to measure the number of words selected correctly, words missed and words selected incorrectly were recorded and
combined into “total errors.” The average participant made 12.50 errors and thus selected 79.8% of words correctly. There was no significant difference in accuracy across conditions, $F(2, 92) = .368, p > .10$. As would be expected, there was a significant correlation ($r = .738, p < .01$) between number of words selected correctly and the number of words attempted.

Participants in the residual presence condition responded relatively neutrally on a 7 point scale ($M = 3.90$) about whether or not they were relieved when the supervisor left the room. However, residual participants felt their supervisor affected their performance significantly more during residual presence conditions ($M = 3.36$) versus control conditions ($M = 2.32$), $F(1, 92) = 5.34, p < .05$. There was no significant difference among conditions for task difficulty $F(2, 92) = .851, p > .10$. Similar to study 1, the average participant rated task difficulty 3.3 on a 7-point Likert scale where 1 corresponded to not very difficult and 7 corresponded to very difficult.

A significant ANOVA and Tukey HSD test $F(2, 92) = 5.81, p < .05$, elucidated that participants in residual conditions believed they performed better ($M = 4.45$) than control participants ($M = 3.19$). A Tukey HSD test between active presence ($M = 3.90$) and control participants ($M = 3.19$) was not significant. A significant ANOVA, $F(2, 92) = 3.942, p = <.05$ as well as a significant Tukey HSD comparison showed that active participants ($M = 4.86$) felt significantly more evaluated than control participants ($M = 3.73$). There was no significant difference between residual participants ($M = 4.55$) and control participants ($M = 3.73$). Both active ($M = 4.97$) and residual participants ($M = 4.60$) felt they were being evaluated more than participants randomly selected to the control condition ($M = 3.85$), $F(2, 92) = 3.475, p < .05$. Furthermore, both participants exposed to
the active \((M=3.09)\) and residual manipulations \((M=3.17)\) tended to feel their
supervisor/research assistant made them more stressed than control participants
\((M=2.715), F (2, 92)=2.715, .05<p<.10\).

Participants identified whether their supervisor/research assistant was present in
the room with them during some of the Finding A’s task, during none of it, or during all
of it. Out of 32 anticipatory participants, 7 incorrectly reported that their supervisor was
in the room the entire time they completed the Finding A’s task. Twenty-five correctly
reported (78.1%) that the supervisor was in the room part of the time as they complicated
the task.

Anticipatory participants tended to score higher \((M=27.0)\) on the Finding A’s task
than control participants \((M=22.9), F (2, 87)=2.478, .05<p<.10\). Active presence
participants correctly marked 24.7 words with the letter A. Because this analysis did not
reach statistical significance, neither hypothesis 2a nor 2b was fully supported\(^8\), but
partial support can be found for hypothesis 2a. Participants rated task difficulty 3.2 on a
7-point Likert scale where 1 corresponded to not very difficult and 7 corresponded to
very difficult. Perceived task difficulty did not significantly differ by condition \(F
(2,87)=1.226, p<.10\). Words missed and words erroneously selected were combined into
total errors. The average participant made 14.90 errors and thus selected 76.8% of words
correctly. There was no significant difference in accuracy across conditions, \(F (2, 87)
=1.551, p>.10\). Again as expected, there was a significant correlation \((r=. 798, p<.01)\)
between the number of words selected correctly and the number of words attempted.

Presence influenced participant’s impressions of how much their
supervisor/research assistant affected their performance on the Finding A’s task, \(F (2,
Anticipatory participants felt significantly more affected ($M=3.50$) compared to control participants ($M=2.32$). Active participants ($M=3.07$) did not feel significantly different from either of the other experimental groups. Participants felt significantly more evaluated while working on the task ($M=4.97$) in the active condition versus the control condition ($M=3.85$), $F(2, 87)=3.199, p<.05$. This item did not differ significantly between anticipatory participants and participants in other conditions ($M=4.59$). Anticipatory participants also tended to feel their supervisor impacted their performance more ($M=3.69$) compared to active ($M=2.93$) and control participants ($M=2.62$), $F(2, 87)=3.031, .05<p<.10$.

Complex Task Session

Thirty-three residual participants (89.2%) correctly reported that their supervisor was in the room with them part of the time. Two reported the supervisor was in the room throughout the entire anagram task, while two did not report that the supervisor was in the room at all during the anagram trials. Twenty-seven out of 29 (93.1%) of active participants correctly reported that their supervisor was in the room with them throughout the anagram trials. Twenty-five out of twenty seven of the control participants (92.6%) correctly identified that their research assistant was not in the room during the anagram trials.

Hypothesis 3a and 3b were not supported. Anagram scores for trials 6 to 9 did not differ between active, residual, and control participants $F(1, 92)=352, p>.10$ (see Table 5). Trial 5 was not analyzed because it unclear whether words were unscrambled before or after the supervisor entered. There were a number of significant main effects for condition on the questionnaire responses. Participants in the residual presence
condition were slightly relieved ($M=4.50$ out of 7) when the supervisor left the room. One corresponded to “not at all” relieved and seven corresponded to “very relieved.” A repeated-measures ANOVA demonstrated that they were significantly more relieved than after the Finding A’s task ($M=3.90$ out of 7), $F(1, 36)=5.745$, $p<.05$. The average participant rated task difficulty a 4.8 on a 7-point Likert scale where 1 corresponded to not very difficult and 7 corresponded to very difficult. This dependent measure did not differ by type of presence, $F(1,92)=2.678$, $p<.10$. The 6-item anagram session salience scale (see Study 1) was used to measure participant’s perceptions of the salience of their research assistant/supervisor. The items included “I found the supervisor/research assistant to be distracting,” “to what extent did the supervisor/research assistant affect your performance,” “I felt like I was being judged,” “to what extent did I feel distracted,” “I would have preferred if the supervisor was quieter”, and “the supervisor impacted my performance during the anagram task.” The inter-item reliability was $\alpha=.885$.

Participants in residual conditions felt their supervisor was more salient ($M=3.69$) than in control conditions ($M=2.22$), $F(2,92)=9.161$, $p<.05$. Participants exposed to active presence did not significantly differ in their salience perceptions ($M=3.39$) from either of the other conditions. Participants in both active ($M=3.24$) and residual conditions ($M=3.64$) perceived the supervisor/research assistant to be more distracting than in control conditions ($M=2.97$), $F(2, 92)=7.62$, $p<.01$. In addition, participants felt their supervisor/research assistant distracted them significantly more during the anagram task ($M_{\text{Active}}=3.10$, $M_{\text{Residual}}=3.55$) versus control participants ($M=2.00$), $F(2, 92)=6.925$, $p<.05$. Participants in both active ($M=3.72$) and residual conditions ($M=3.76$) believed their supervisor/research assistant affected their performance more on the anagram task.
than control participants (M=1.88), F (2, 92)=9.175, p<.01. Participants reported that during the task their supervisor made them more stressed during residual (M=3.62) and active conditions (M=3.48) versus control participants (M=1.80), F (2, 92)=8.625, p<.01. Participants also reported that they would have preferred if the supervisor was quieter in residual conditions (M=3.29) and active presence conditions (M=2.75) as compared to control participants (M=2.33), F (2, 92)=9.195, p<.01. However, when participants were asked how much they were evaluated while working on the task, participants reported being most evaluated during residual presence conditions (M=4.88), an intermediate amount during active presence (M=4.67) and the least evaluated during control conditions (M=3.48, F (2, 92)=6.321, p<.05. A Tukey HSD test reveals a pairwise comparison between residual and control participants on this item. Participants in both the residual (M=3.33) and active (M=3.43) presence conditions would have preferred their supervisor was less immediate as compared to control participants (M=2.26), F (2, 92)=5.550, p<.005. Participants in the residual condition (M=3.90) felt that their supervisor impacted their performance significantly more than control participants (M=2.33), F (2, 92)=5.731, p<.005. Active presence individuals were not more significantly impacted (M=3.11) as compared to the other participants.

Among the anticipatory participants, 7 believed their supervisors were monitoring them throughout all the anagram trials, while 25 correctly identified (78.1%) that supervisors were in the room only during some of the anagram trials. Hypothesis 4 was not supported. There was no significant difference between active, anticipatory, and control participants anagram scores on trials 1 to 4 (2, 87)=.458, p>.10 (see Table 6). Trial 5 was not analyzed because it unclear whether words were unscrambled before or
after the supervisor entered. The average participant rated task difficulty 4.6 on a 7-point Likert scale where 1 corresponded to not very difficult and 7 corresponded to very difficult. There were no significant effects across experimental groups, $F(2, 87) = .700$, $p<.10$.

Subjects exposed to anticipatory presence felt their supervisor was significantly more distracting ($M=3.59$) than control participants ($M=1.89$), $F(2, 87) = 7.094, p=.001$. Participants exposed to the active presence manipulation ($M=3.24$) did not differ significantly from participants in the other conditions. Participants in anticipatory conditions ($M=3.43$) would have preferred that the supervisor be less immediate than those in control conditions ($M=2.26$), $F(2, 87) = 8.109, p<.01$. The mean of the active participants was not significantly different than either of the other conditions ($M=3.43$). Similarly, participants exposed to anticipatory presence believed their performance was most impacted by their supervisor ($M=2.87$), as compared to control participants ($M=2.33$), $F(2, 87) = 4.420, p<.05$. Active participants again did not significantly differ with any of the other condition ($M=3.11$). However, subjects felt more judged in the active presence conditions ($M=4.69$) than control participants ($M=3.41$), $F(2,87) = 2.620, p<.05$. Anticipatory participants ($M=3.72$) did not differ significantly from the other conditions. Both anticipatory ($M=3.38$) and active presence participants ($M=3.72$) believed their supervisor affected their performance significantly more than control participants ($M=1.89$) during the anagram trials, $F(2, 87) = 8.65, p<.01$. Similarly, both anticipatory ($M=3.66$) and active presence participants ($M=2.75$) would have preferred if the supervisor was quieter significantly more than control participants ($M=1.74$), $F(2, 87) = 12.16, p<.01$. Furthermore, anticipatory ($M=3.47$) and active
presence individuals \((M=3.48)\) were significantly more stressed than control individuals \((M=1.89)\), \(F(2, 87)=7.588, p<.01\).
Discussion

Participants in residual presence conditions in trial 2 of the Finding A’s task outperformed participants in control conditions even though the eliciting stimuli had been extinguished (i.e., the active supervisor left the room). Study 2 demonstrates that just like an invisible observer can affect task performance, so can an observer who has already left the room. This finding supports evidence from neuroscience research that the sympathetic nervous system does not terminate abruptly when the eliciting conditions terminate, but it slowly declines resulting in residual effects (Cantor, Zillman, & Bryant, 1975). It is also consistent with data on the effects of crowding, noise and exercise on subsequent performance (Aiello et al., 1977; Davey, 1973; Glass & Singer, 1972). This study is the first social facilitation study since Sanders and Baron (1975), to demonstrate that a “carryover effect” elicited by previous social presence can cause simple task enhancement. Responses on affective measures also heavily support the claim that the participants experienced residual effects of social facilitation on the simple and complex task. During the simple task, participants felt more affected by supervisors and more evaluated than control participants. They also tended to feel more stress from their supervisor.

Unfortunately, similar to study 1, none of the experimental manipulations had any significant effect on complex task performance. If carryover effects would have been observed in the anagram task, this would have allowed for better temporal tracking of residual effects. Participants completed 4 full trials after the supervisor had left the room. The simple task data only provides evidence of a carryover effect lasting for at least part of one 2-minute trial. Performance was not time stamped during the trial, which was
administered by paper and pencil. Therefore it is difficult to measure when residual effects start to dissipate. A computerized version of the Finding A’s task was not used since piloting of a computerized Finding A’s task did not produce simple task enhancement.

It was provocative that although residual presence produced simple task enhancement for trial 2, active presence did not. Active presence produced a mean in the expected direction but one that was not significantly higher than performance in the control condition. Similar to study 1, perhaps four minutes of performing while being observed by a distracting and evaluative supervisor produced a more salient than optimal effect. This could have led to a loss of processing ability on the Finding A’s task. It is possible that being exposed to two minutes of the same active supervision, and then receiving a “breather” was closer to the apex of an inverted U-shaped curve, i.e. the optimum amount of social presence for simple task enhancement. Participants exposed to active presence in both trials, unlike those in only trial 1, reported feeling significantly more evaluated than control participants.

Students exposed to an evaluative and distracting supervisor in only trial 1 of the Finding A’s task, successfully predicted they would score higher than control participants. Those exposed to active supervisors in both trials, successfully predicted that they would not perform better than control participants. Residual presence participants, unlike active participants, felt more affected by their supervisor than control participants. Although the mean for active presence after the simple task session was still larger than the control mean, it is counterintuitive that those with a supervisor in the room half the time would possibly feel more affected by their supervisor. One explanation for
this is that the act of the supervisor leaving the room was distracting for participants.
This is also supported by the fact that participants with supervisors present only during
trial 2 of the Finding A’s task (anticipatory participants), also felt more affected by their
supervisor than control participants. Similar to residual participants, those exposed to
anticipatory presence did not feel more evaluated than control participants, as active
participants did.

Participants in anticipatory presence conditions not only felt more affected by
their supervisor during the simple task session than control participants, but they also
tended to feel that their supervisor impacted them more as well. Surprisingly, a
significant amount of simple task enhancement was not observed for anticipatory
participants. It was expected that like residual presence, anticipating a supervisor would
produce simple task enhancement. However, anticipatory participants did score a good
amount higher than control participants.

In general, simple task enhancement is not always observed even with active
supervisors (Baron and Titus, 1983). Perhaps a stronger anticipatory presence
manipulation would have been necessary to achieve simple task enhancement in trial 1 of
the Finding A’s task. Maybe an anticipatory manipulation would be stronger if there was
more at stake (e.g., grades, salary, a new job) than just entries to win prizes. It is possible
that the anticipatory presence manipulation is weaker than the residual presence one,
even though both consist of 2 minutes of active presence. Possibly during trial 1, the
sympathetic nervous system has not yet been affected by viewing the physical image of a
conspecific. This is in line with the fact that during the Finding A’s task, active, and not
anticipatory presence participants, felt more evaluated than control participants.
Similar to study 1, no between group differences were observed for performance on the anagram task. The perceived difficulty was only slightly higher than neutral, much lower than among pilot participants, and possibly too simple to produce complex task impairment. In contrast, many between group differences were observed for post-anagram task questionnaire items. Participants exposed to active presence during both trials (active participants) and those exposed to active presence for just the first trial (residual presence participants) felt the supervisor was more distracting than control participants. Participants in active and residual conditions believed the supervisor affected their performance more than control participants. They also felt more stressed than control participants and would have preferred if the supervisor were quieter and less immediate than participants who performed the Finding A’s task alone.

It appears that participants in the residual presence condition actually perceived that they were more affected by their supervisor during the complex task than those in the active presence condition. On the 6-item salience scale, unlike active participants, residual ones believed their supervisor was significantly more salient than control participants. Residual participants, unlike active ones, also felt significantly more evaluated and more impacted than control participants during the anagram task. The fact that they felt more evaluated than control participants, unlike active participants, was the opposite of what was found during the Finding A’s session. It is surprising given that the residual presence manipulation involved the same checkmarks, notes, and shuffling papers as in the active presence condition. The only difference is that the supervisor was only present half the time. One explanation is that the act of the supervisor leaving in the middle of trial 5 increased the salience of evaluation over and above that when
supervisors staying in the room throughout the 26-minute anagram task which participant. It is possible participants habituated to the supervisor’s presence, check marks, notes, etc. during that period.

Supervisors affected residual participants during the complex ask more than anticipatory participants. Anticipatory participants, unlike residual participants, did not report feeling that their supervisors were more salient than control participants on the 6-item salience scale. Anticipatory participants, unlike active ones, did feel more distracted and impacted than control participants. However, they did not feel more evaluated. It is interesting to note those active participants, and not anticipatory ones, actually felt more judged than control participants. Unlike the residual “session” which was in the second half of the anagram task, there was no questionnaire immediately after the anticipatory session. Baron (1986) cautions researchers that it is often difficult to recall earlier psychological states.

Residual presence produced simple task enhancement. However, there was only partial support for anticipatory presence producing simple task enhancement. This was in spite of the fact that anticipatory participants felt more affected by their supervisors than individuals in the control condition. The lack of simple task enhancement observed in the anticipatory presence condition provides evidence that the same active presence manipulation is weaker when delivered in the second half versus the first half of a task. Additional evidence is provided by the fact that the items on the salience scale did not differ significantly with control participants as they did for residual presence individuals. The present investigation offers several extensions of social facilitation research.

However, this study is just a starting point for investigation into the mechanisms and
outcomes of residual and anticipatory presence. More conceptual clarity would require that a post-task questionnaire would need to be administered while participants anticipate the presence of a supervisor but before he/she actually encounters the supervisor.
General Discussion

Studies 1 and 2 are useful because they compare more direct and indirect types of social presence than any social facilitation studies to date. Each type of social presence is not only compared in terms of social and complex task performance, but also in terms of distraction, evaluation, and overall impact. Study 1 provides some evidence that the types of social presence can be divided into 3 categories: low, intermediate, and high salience. Although the data falls short as far as providing support for the proposed social presence continuum, it does provide evidence that social presence should not be viewed as a dichotomous variable, but as a variable differing on the salience of presence (Aiello, 1998; Feinberg & Aiello, 2006).

Study 2 provides evidence that the “carryover” effects of a past presence can cause simple task enhancement. This provides support for distraction-conflict theory (Baron, 1986). One could attribute the carryover effect to a distracting stimulus whose effects have not dissipated. However, this effect conflicts with Zajonc (1980), who states that mere presence is mandatory to observe social facilitation effects. It also conflicts with Cottrell (1972), who attributes social facilitation affects to the anticipation of being evaluated. After an individual has left the room, he/she are unable to evaluate a participant. In addition to performance effects, study 2 also provides evidence that “carryover” effects, as well as the anticipation of a supervisor, affect performers a great deal on both simple and complex tasks.

Studies 1 and 2 provide numerous applications to managers. Workers often perform in the presence of others (active or virtual) for long periods of time. These studies may therefore help to understand workplace performance. Managers not only
observing individuals “over their shoulders,” but also using technology such as video surveillance or even communication by avatar, should be aware of the fact that these types of social presence can have a strong effect on task performance. Managers need to be careful about how they present information about when their employees will be monitored. They should be aware of the fact that on simple tasks, employees might perceive being more impacted by the anticipation of a supervisor, than by actually being observed by a supervisor. Supervisors should keep in mind that the effect of looking over employee’s shoulders has the potential to affect their performance on subsequent tasks. They may need to rethink issues such as the frequency of employer and trainer observations. These lessons also apply to teachers, coaches, and mentors.

Even though there are a great deal of possible applications to studies 1 and 2, there are also many limitations as well. For example, participants were told that if they did well on the Finding A’s and anagram tasks, participants could win prizes such as gift certificates to area restaurants. However, students were aware that the result of being evaluated during this study had no effect on their grades or on a current job.

Complex task impairment was not observed in study 1. Had more extensive piloting been conducted, perhaps an anagram task would be used that involved only non-dominant responses. A more difficult anagram task may have reflected the affects of the varying forms of social presence. However, an anagram task too difficult might have increased the risk of a floor effect.

Only one significant pairwise comparison was observed on the salience scale made up of questionnaire items following the simple task. The means for active and passive presence were significantly different. Perhaps a longer simple task also might
have produced a wider performance distribution, and thus, more significant pairwise comparisons. It also may have given participants more time to consciously determine the impact of the social presence they experienced. In addition, had the simple task been longer, possibly less of the passive presence participants would have forgotten that they performed the Finding A’s task in the presence of a conspecific.

Further research is needed to fully explicate the strength of the various types of social presence and how this affects task performance. The current study found that, in general, that as the presence became more salient, the participants felt more evaluated and distracted. The research conditions each contained some degree of distraction and evaluation (besides the control condition), which makes it difficult to determine how each individually affects performance. Further investigation that uses conditions that solely are distracting or evaluative may eliminate some confusion of how evaluation apprehension and distraction affect performance. Future testing can utilize a more complex task such as more difficult anagrams with only one 6-letter solution and no twisting option. Demonstrating complex task impairment caused by many different types of social presence would provide more evidence that the social presence continuum applies to complex tasks.

As far as future investigation on the effect of social presence on simple tasks, it would be useful to test less salient active and embodied presence manipulations. As was stated above, there is evidence that there is an inverted U-shaped relationship between salience and simple task performance. More evidence for the social presence continuum would be provided if social facilitation effects were produced by active and embodied presence. Questionnaire responses showed that supervisors in these conditions were
very salient and were perceived as having an extremely strong effect on participants. Perhaps less salient active supervisors (e.g., no checkmarks) and less active avatars (e.g., avatars that participants had friendly interactions with before the task) would still be perceived as very salient, but would not be too distracting to produce simple task enhancement. Additional research involving avatars is crucial since only one other study to date, Park and Cantrambone (2007), has tested the effect of avatars on simple and complex task performance. Virtual worlds continue to grow in popularity. Today corporate meetings as well as political rallies take place in virtual worlds such as Second Life (Yee, Bailenson, Urbanek, Chang, & Merget, 2007). Intelligent computer agents continue to grow in popularity as well. Further research is needed to understand in which contexts agents can produce social facilitation effects (Read, 2003).

Additional research is also needed to “fill in the gaps” and compare different saliencies within the same type of presence. For example, could passive presence be salient enough to cause too much distraction to produce simple task enhancement? What if the conspecific is located extremely close to the performer? New salience categories can also be developed based on new technologies. It would be interesting to investigate how participants would respond to different types of augmented reality and different types of robots.

Future experimentation will also be needed to test if the effects of anticipating the presence of an observer are enough to cause social facilitation effects. One future step will be to test other types of residual and anticipatory effects and eventually devise a model incorporating types of presence as well as residual and anticipatory effects. This study only deals with anticipating active presence and the carryover effects of active
presence. However, other types of presence could be anticipated as well. One would expect additional types of presence to produce residual effects as well. Although the carryover effect of social facilitation has been observed on a simple task, additional research is needed to identify how long these effects last and exactly how they compare to the effects of supervisors presented concomitantly with a task. Time stamp technology could be incorporated in order to increase knowledge of temporal dimensions of social facilitation. This way it can be determined if “carryover” effects last more than a couple minutes and if the effects of more salient types of social presence take longer to extinguish. In conclusion, a great deal of unanswered questions still arises after study 1 and study 2. In spite of the unanswered questions, these two studies greatly expand knowledge about the oldest area of experimental social psychology.
References


Paper presented at the annual meetings of the American Psychological Association in Washington, D.C.


Footnotes

1 An analysis of variance comparing introductory psychology students and advanced students showed that there was no significant difference in Study 1 performance on the Finding A’s task $F(1, 173)=.009, p>.10$ or anagram task $F(1, 173)=.001, p>.10$.

2 An analysis of variance comparing passive students who incorrectly reported that nobody was in the room with them versus other students showed that there was no significant difference in Study 1 performance on the Finding A’s task, $F(1, 22)=.052, p>.10$.

3 An analysis of variance was also performed where the outliers were removed (top and bottom 2.5% of all scorers on the Finding A’s task). Again there was a significant effect for condition. Again the only significant pairwise comparison was between monitoring and control participants, $F(5, 164)=2.422, p<.05$.

4 An analysis of variance was also performed where the outliers were removed (top and bottom 2.5% of all scorers on the anagram task). Again there was no significant main effect for condition, $F(5, 164)=2.191, .05<p<.10$.

5 An analysis of variance comparing introductory psychology students and advanced students showed that there was no significant difference in Study 2 performance on the Finding A’s task $F(1, 124)=.545, p>.10$ or on the anagram task $F(1, 124)=.888, p<.05$.

6 An analysis of variance comparing residual presence, anticipatory presence, active presence, and control participants yielded no significant effect in Study 2 performance on the Finding A’s task, $F(3, 152)=1.859, p>.10$.

7 An analysis of variance was also performed where the outliers were removed (top and bottom 2.5% of all scorers on the Finding A’s task). There was only a marginally significant main effect for condition, $F(2, 90)=2.711, .05<p<.10$. However, after removing active participants, a t-test elucidated a significant difference between residual and control participants, $t(60)=2.470, p<.01$.

8 An analysis of variance was also performed where the outliers were removed (top and bottom 2.5% of all scorers on the Finding A’s task). Again there was no significant main effect for condition, $F(2, 85)=.663, p>.10$.

9 An analysis of variance was also performed where the outliers were removed (top and bottom 2.5% of all scorers on the anagram task). Again there was no significant main effect for condition, $F(2, 90)=.340, p>.10$.

10 An analysis of variance was also performed where the outliers were removed (top and bottom 2.5% of all scorers on the anagram task). Again there was no significant main effect for condition, $F(2, 85)=.950, p>.10$. 
Table 1

*Study 1 Finding A’s (Simple Task) Performance by Different Types of Presence*

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Artificial Presence</th>
<th>Passive Presence</th>
<th>Implied Presence</th>
<th>Embodied Presence</th>
<th>Active Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding A’s Task</td>
<td>44.6*a</td>
<td>51.1*ab</td>
<td>55.9*ab</td>
<td>55.3*b</td>
<td>51.5*ab</td>
<td>49.2*ab</td>
</tr>
</tbody>
</table>

*Note.* Means sharing the same subscript do not differ according to Tukey HSD post-hoc test

* p < .05, ** p < .01

*a* Total number of words selected in both trial 1 and trial 2
<table>
<thead>
<tr>
<th>Study 1 Simple Task Session Supervisor/Research Assistant Perception by Condition</th>
<th>Control</th>
<th>Artificial Presence</th>
<th>Passive Presence</th>
<th>Implied Presence</th>
<th>Embodied Presence</th>
<th>Active Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Supervisor Salience Scale**</td>
<td>2.583ab</td>
<td>2.539ab</td>
<td>1.977a</td>
<td>2.565ab</td>
<td>2.840ab</td>
<td>2.908b</td>
</tr>
<tr>
<td>How much did the supervisor/research assistant affect you?*</td>
<td>2.320ab</td>
<td>2.000ab</td>
<td>1.591a</td>
<td>2.243ab</td>
<td>2.222ab</td>
<td>3.069b</td>
</tr>
<tr>
<td>I felt like I was being evaluated while working on the task**</td>
<td>3.864ab</td>
<td>3.833ab</td>
<td>2.913a</td>
<td>4.158ab</td>
<td>3.741ab</td>
<td>4.966b</td>
</tr>
<tr>
<td>I found the supervisor/research assistant to be distracting**</td>
<td>2.292ab</td>
<td>2.000ab</td>
<td>1.409a</td>
<td>1.946ab</td>
<td>2.407ab</td>
<td>2.828b</td>
</tr>
<tr>
<td>During the task the supervisor/research assistant made me stressed*</td>
<td>2.231ab</td>
<td>1.767ab</td>
<td>1.652a</td>
<td>2.237ab</td>
<td>2.185ab</td>
<td>3.034b</td>
</tr>
<tr>
<td>During the task the supervisor/research assistant made me nervous*</td>
<td>5.115ab</td>
<td>5.700b</td>
<td>6.000b</td>
<td>5.474ab</td>
<td>4.111a</td>
<td>5.069ab</td>
</tr>
<tr>
<td>How much did you like your supervisor/research assistant?**</td>
<td>5.346c</td>
<td>2.000a</td>
<td>1.591a</td>
<td>5.105c</td>
<td>3.593b</td>
<td>5.207c</td>
</tr>
<tr>
<td>Did you feel your supervisor/research assistant was evaluating your performance?***</td>
<td>3.731bc</td>
<td>2.200a</td>
<td>3.000abc</td>
<td>3.921bc</td>
<td>3.000b</td>
<td>4.862c</td>
</tr>
<tr>
<td>How would you rate the expertise of the supervisor/research assistant**</td>
<td>2.731a</td>
<td>4.333b</td>
<td>2.696a</td>
<td>3.079a</td>
<td>4.185b</td>
<td>3.379ab</td>
</tr>
</tbody>
</table>

*Note.* Means sharing the same subscript do not differ according to Tukey HSD post-hoc test

* p < .05, ** p < .01

*a* Scale made up of 6 items. 1=low salience, 4=neutral, 7=high salience

*b* 1=not at all, 4=neutral, 7=quite a lot

*c* 1=strongly disagree, 4=neutral, 7=strongly agree

*d* 1=strongly agree, 4=neutral, 7=strongly disagree

*e* 1=very high, 4=neutral, 7=very low
Table 3

*Study 1 Anagram (Complex Task) Performance in Trials 1-9 by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Artificial Presence</th>
<th>Passive Presence</th>
<th>Implied Presence</th>
<th>Embodied Presence</th>
<th>Active Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of points</td>
<td>5674.44</td>
<td>5245.3</td>
<td>6335.2</td>
<td>6342.1</td>
<td>5426.0</td>
<td>5674.4</td>
</tr>
</tbody>
</table>

Note. Five letter words were worth 250 points, 6-letter words were worth 460 points.
### Table 4

*Study 1 Complex Task Session Supervisor/Research Assistant Perception by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Artificial Presence</th>
<th>Passive Presence</th>
<th>Implied Presence</th>
<th>Embodied Presence</th>
<th>Active Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Supervisor Salience Scale**a</td>
<td>2.200a</td>
<td>2.400a</td>
<td>2.000a</td>
<td>2.800ab</td>
<td>3.400b</td>
<td>3.400b</td>
</tr>
<tr>
<td>To what extent did the supervisor/research assistant affect your performance on the Anagram task?**b</td>
<td>1.885a</td>
<td>1.900a</td>
<td>1.682a</td>
<td>2.405ab</td>
<td>3.222bc</td>
<td>3.724c</td>
</tr>
<tr>
<td>I found the supervisor/research assistant to be distracting**b</td>
<td>1.885a</td>
<td>1.733a</td>
<td>1.455a</td>
<td>2.459ab</td>
<td>3.556b</td>
<td>3.241b</td>
</tr>
<tr>
<td>The supervisor/research assistant impacted my performance during the task**c</td>
<td>2.333ab</td>
<td>2.000a</td>
<td>2.105ab</td>
<td>2.514ab</td>
<td>3.370b</td>
<td>3.107ab</td>
</tr>
<tr>
<td>I would have preferred that the supervisor/research assistant was less immediate**b</td>
<td>2.259a</td>
<td>3.103ab</td>
<td>2.526ab</td>
<td>2.800ab</td>
<td>3.429b</td>
<td>3.741b</td>
</tr>
<tr>
<td>During the task the supervisor/research assistant made me stressed**b</td>
<td>1.889ab</td>
<td>1.800a</td>
<td>1.739a</td>
<td>2.000ab</td>
<td>3.074b</td>
<td>3.483c</td>
</tr>
<tr>
<td>The anagram task made me nervous**d</td>
<td>4.852ab</td>
<td>4.233a</td>
<td>5.696b</td>
<td>4.289a</td>
<td>4.111a</td>
<td>4.103a</td>
</tr>
<tr>
<td>Leisurely**</td>
<td>2.167a</td>
<td>2.367ab</td>
<td>2.609ab</td>
<td>2.921ab</td>
<td>3.000b</td>
<td>2.966ab</td>
</tr>
<tr>
<td>How much did you like your supervisor/research assistant?**b</td>
<td>5.346c</td>
<td>4.333b</td>
<td>5.435bc</td>
<td>5.105bc</td>
<td>3.593a</td>
<td>5.207bc</td>
</tr>
<tr>
<td>How would you rate the expertise of the supervisor/research assistant?**f</td>
<td>2.519a</td>
<td>4.433c</td>
<td>2.474a</td>
<td>3.343ab</td>
<td>4.333c</td>
<td>3.250ab</td>
</tr>
<tr>
<td>I would have preferred if the supervisor/research assistant was quieter**b</td>
<td>1.741a</td>
<td>2.500ab</td>
<td>1.737a</td>
<td>2.412ab</td>
<td>3.407b</td>
<td>2.750ab</td>
</tr>
</tbody>
</table>

**Note.** Means sharing the same subscript do not differ according to Tukey HSD post-hoc test

* p < .05, ** p < .01

1 Scale made up of 6 items. 1=low salience, 4=neutral, 7=high salience

2 1=not at all, 4=neutral, 7=quite a lot

3 1=strongly disagree, 4=neutral, 7=strongly agree

4 1=strongly agree, 4=neutral, 7=strongly disagree

5 1=definitely feel, 2=slightly feel, 3=not sure if I feel, 4=definitely do not feel

6 1=very high, 4=neutral, 7=very low
Table 5

*Study 2 Anagram (Complex Task) Performance in Trials 6-9 by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Active Presence</th>
<th>Residual Presence</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of points</td>
<td>2832.4</td>
<td>2750.5</td>
<td>2714.8</td>
</tr>
</tbody>
</table>

Note. Supervisor arrived during Trial 5. Therefore, the subsequent trials were used to investigate “residual effects.” Five letter words were worth 250 points, 6-letter words were worth 460 points.
Table 6

*Study 2 Anagram Round 1 to 4 (Complex Task) Performance in Trials 1-4 by Condition*

<table>
<thead>
<tr>
<th></th>
<th>Active Presence</th>
<th>Residual Presence</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of</td>
<td>2075.5</td>
<td>2338.8</td>
<td>2213.7</td>
</tr>
<tr>
<td>points</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Supervisor arrived during Trial 5. Therefore, the previous trials were used to investigate anticipatory effects. Five letter words were worth 250 points, 6-letter words were worth 460 points.
Figure 1. Social Presence Continuum
Figure 2. Flow Diagram of Studies 1 and 2
Figure 3. Charlie from MASH (Microsoft Agent Scripting Helper)
Figure 4. Hubb 2 Mock Security Camera
Figure 5. Mr Tompkins, avatar
Appendix A: Study 1 and 2 Scripts

Setup
1. The condition sheet will indicate what condition is being run and what subject number the participant will be assigned.
2. Before the study begins, set up the anagram task by clicking on texttwist_150sv6.html. Make sure it is set on Internet Explorer for this file. Minimize the window since participants will start with the “Finding A’s” task. The mac password is “1234”

Intro
<<Note: Demeanor for monitoring, active, residual, anticipatory conditions should be stern and very supervisor-like. Task climate should be a bit negative. Demeanor for other conditions should be “friendly.”

Hi, my name is ___________________ and I will be your supervisor for this study. If you have a cell phone or pager, please turn it off at this time. Thanks. You are welcome to use the bathroom at this time since the study will last about an hour. Thanks.

Please sit over here near the computer. We are going to be reading from the script because the procedure "has many steps and we want to make sure we don't skip anything. Just for participating in addition to receiving RPUs you will also be entered in a drawing where you can win at least half a dozen prizes such as gift certificates to area restaurants. The better you perform today the more additional entries you will get to win the prizes.

<Hand out “Informed Consent” Form>

<NOTE: Unless specified (e.g., during actual tasks) task supervisor gives instructions about 1 foot to the right of participant within their field of view>

Before we begin I’d like you to first read over and sign this consent form. I’ll sign it after you do.

<Collect, Sign, and Date Form>

Next, I need to log you in to make sure you will get credit for being here.

<Take down participant’s name, age, professor on “the login sheet.” Guess ethnicity and gender. Also put down information about whether you spoke to the participant by phone or left a message on their machine.>

Now that that’s all finished we can move on. In addition to being a student here at Rutgers, I also work part-time as an intern at a local organization. During this study, you will be performing a perceptual speed task.

Before and after you complete the perceptual speed task you will fill out a questionnaire.

Simple Task--Practice
First I want to explain the purpose of this task. We are studying perceptual speed. We will use this data to evaluate undergraduates for internships. Our research will give us a greater understanding of perceptual speed which is associated with proficiency in certain workplace tasks. It is important for the study that you try to perform at your highest level. Your results will be completely confidential and will be processed within the next few months.

Now we are ready to begin the Finding A’s task. Please read along on page 68 as I read the directions.

<Hand out Finding A’s task, place the sheet to the right of the computer>
This is a test of your speed in finding the letter “a” in words. Your task is to put a line through any such word. Listed below are five columns of words. Each column has five words containing the letter “a.” The first two columns have already been marked “correctly.” Now, on the other three columns, practice for speed in putting a line through the words with an “a.” Your score on this test will be the number of words marked correctly. Work as quickly as you can without sacrificing accuracy. After the practice trial as well as the official trials you will be filling out a questionnaire about your experience with the perceptual speed task. Past research has shown that both speed and accuracy are important components to your overall performance. You may begin. Please let me know when you are done with the 3 columns.

### Simple Task-Official Trial

*You will have 2 minutes for each of the two parts of this task. Each part has five pages. When you have finished part 1 (page 73), STOP. Do not go on to Part 2 unless you are asked to do so.*

**Control**

As you complete the actual task I will leave the room and close the door. I will be working on a project next door in my office. When you have completed part 1, please wait for me to come back before starting part 2. When you have completed part 2, please wait for me before starting the questionnaire. As soon as you’re ready you may begin. You have 2 minutes. *<Say as you leave, GRAB STOPWATCH BEFORE YOU LEAVE>*

**Part 1**

Stop!! Please start part 2 on page 74 <turn pages so participant sees page 74>. You have 2 minutes. Once again as I complete the trial I will be in my office working on the project <Say as you leave, GRAB STOPWATCH BEFORE YOU LEAVE>.

**Part 2**

Please start the post task questionnaire. I will be in my office checking on something. When you have completed all the questionnaire items, press the button so I know you are done.

*<Participant works on post-task questionnaire>*

### Artificial Presence (Agent)

You will have 2 minutes for each of the two parts of this task. Each part has five pages. When you have finished part 1 (page 73), stop and please. do not go on to Part 2 unless you are asked to do so.

As you complete the actual task I will leave the room and close the door. I will be working on a project next door in my office. However, a computer-controlled agent named Charlie will be observing you. Charlie is a graphical character controlled by a computer program that possesses artificial intelligence. The company I work for wants Charlie to supervise participants during the perceptual speed trials because during hiring, the applicants will be observed while doing the tasks. When you have completed part 1, please wait for me to come back before starting part 2. When you
have completed part 2, please wait for me before starting the questionnaire.

<Maximize Charlie, the computer agent>
As soon as you’re ready you may begin. You have 2 minutes. <Say as you leave, GRAB STOPWATCH BEFORE YOU LEAVE>

<Part 1>
Stop!! Please start part 2 on page 74. You have 2 minutes. Once again as you complete the trial I will be in my office working on the project, but Charlie will be observing you. <Say as you leave, GRAB STOPWATCH BEFORE YOU LEAVE>

<Part 2>
<Minimize Charlie>
Please start the post task questionnaire. I will be in my office checking on something. When you have completed all the questionnaire items, press the button so I know you are done.

Passive presence
Please press the button when you are done. <Unlike other conditions supervisors do not stay for short questionnaire, but leave the room and get the confederate>

<Enter with confederate dressed as participant. Confederate should be sitting at table, facing window so that he/she only peripherally can observe the participant> ____ will be working on another study. We are short on rooms at Rutgers and are running multiple studies at one time. Can you guys please not interact? I do not want it to affect the results. As you complete the actual task I will leave the room and close the door. I will be working on a project next door in my office.

You have two minutes you may begin.

<PARTICIPANT SHOULD WORK ON FAKE PACKET. PARTICIPANT NEEDS TO BE OPEN UP TO A PAGE SO IT IS PLAUSIBLE HE/SHE IS WORKING ON A QUESTIONNAIRE STUDY>
Stop!! Please start part 2 on page 74 <turn pages so participant sees page 74>. You have 2 minutes.
STOP!!

Confederate interruptions the supervisor quietly and asks “May I go to the bathroom?”

Please start the post task questionnaire. I will be working on the project in my office. When you have completed all the questionnaire items, press the button so I know you are done.

<Confederate leaves the room, leaving the packet behind and participant works on post-task questionnaire>

Implied presence (Monitoring)
As you complete both trials of the actual perceptual speed task I will leave the room and close the door. The company I work for wants us to supervise participants during the perceptual speed trials because during hiring, the applicants will be supervised while doing the tasks. I will be monitoring you in my office next door. As you can see, I am able to monitor you using a surveillance camera <show them the camera placed in their field of vision on the computer desk/turn on camera>. At the beginning when the camera first calibrates your position, a red light will blink. Once the scanning is complete the camera will continue to monitor you throughout the rest of the task.

The company I work for wants us to monitor you because during hiring, the applicants will be supervised while doing the tasks. I will monitor you only while you complete the task and not during the rest of the study. After you finish the task, I will delete the file containing the video of you performing the task. <Give them the
Please sign your name for permission to be monitored electronically. The institutional board at Rutgers requires us to make you sign an additional consent form giving us permission to monitor you. I will know when you are done with the task and I’ll come back then and tell you to stop.

As soon as you’re ready you may begin. You have 2 minutes. <Say as you leave for part 1, MAKE SURE YOU HAVE STOPWATCH>

STOP!! Please start part 2 on page 74  <turn pages so participant sees page >. Remember you will continue to be monitored during trial 2. You have 2 minutes. <Say as you leave for part 2, USE STOPWATCH BUT HIDE FROM PARTICIPANT>

STOP!!< Turn off camera>

<Participant works on post-task questionnaire>

**Embodied presence (Avatar)**

As you complete the actual task, your supervisor, Mr. Tompkins, will be watching you. The company I work for wants him to supervise participants because during hiring, applicants will be observed. As you can see there is a webcam connected to the computer. The avatar, a graphical representation of Mr. Tompkins, will reflect his movements and through the avatar you will be connected to him. Even though his mouth may be moving, you will not be able to hear him. More and more employees are working in different locations from their supervisor, and we are testing different ways of connecting remotely with supervisors. Please do not minimize the window with Mr. Tompkins When you have completed part 1, please wait for me to come back before starting part 2. When you have completed part 2, please wait for me before starting the questionnaire.

As soon as you’re ready you may begin. You have 2 minutes. <Say as you leave, GRAB STOPWATCH BEFORE YOU LEAVE and MAXIMIZE VIDEO. BY MAXIMIZE THE VIDEO SHOULD TAKE UP 25% of the screen (top left corner)>

<Part 1>

Stop!! <Minimize Video> Please start part 2 on page 74. You have 2 minutes. Once again as you complete the trial, Mr. Tompkins will be observing you. <Say as you leave, GRAB STOPWATCH and MAXIMIMIZE VIDEO BEFORE YOU LEAVE>

<Part 2>

<Stop and Minimize Video>

<Participant works on post-task questionnaire>

**Active presence**

As you complete the actual task I will be standing here evaluating you as you complete the task. The company I work for wants us to supervise participants during the perceptual speed trials because during hiring, the applicants will be supervised while doing the tasks. I am here only to observe and not to interact unless there is a problem. When you have completed part 1, wait for me before starting part 2. As soon as you’re ready you may begin. You have 2 minutes.

While you are in the room 1) Grab STOPWATCH 2) Go to position C in front of the participant 3) Every other 10 second period make 4 check marks 4) Every other 10 second period you make check marks also shuffle your papers. 5) At :50 and 1:50
write “I am a salient supervisor”

STOP!! Please start part 2 on page 74 <turn pages so participant sees page 74>. You have 2 minutes.

While you are in the room 1) Grab STOPWATCH 2) Go to position C in front of the participant 3) Every other 10 second period make 4 check marks 4) Every other 10 second period you make check marks also shuffle your papers. 5) At :50 and 1:50 write “I am a salient supervisor”

STOP!! Please start the post task questionnaire. I will be in my office working on a project. When you have completed all the questionnaire items, press the button so I know you are done.

**Residual presence**

As you complete the actual task, part of the time I will monitoring you. The company I work for wants us to supervise participants during the perceptual speed trials because during hiring, the applicants will be supervised while doing the tasks. However, for part of the time I will be working on a project next door in my office. I will be near you only to observe and not to interact unless there is a problem. As soon as you’re ready you may begin. You have 2 minutes.

<Stay for part 1. While you stay 1) Grab STOPWATCH 2) Go to position C in front of the participant 3) Every other 10 second period make 4 check marks 4) Every other 10 second period you make check marks also shuffle your papers. 5) At :50 and 1:50 write “I am a salient supervisor”>

Stop!! Please start part 2 on <turn pages so participant sees page 74>. You have 2 minutes. <Say as you leave room for part 2, GRAB STOPWATCH BEFORE YOU LEAVE> STOP!! Please start the post task questionnaire. I will be in my office continuing to work on that project. When you have completed all the questionnaire items, press the button so I know you are done.

<Participant works on post-task questionnaire>

**Anticipatory presence**

<Research assistant gets supervisor and leaves the room>

<Supervisor must read deliberately slow>

As you complete the actual task I will leave the room and close the door (EMPHASIZE). I will be working on a project next door in my office. However, at some point while you’re working on the task, I will come back here to evaluate you. The company I work for wants us to CLOSELY MONITOR participants during the perceptual speed trials because during hiring, the applicants will be CLOSELY MONITORED while doing the tasks. I will be standing near you observing you. The company I work for REQUIRES us to observe a number of criteria related to your outcome and performance on the perceptual speed task. I will watch closely and make notes and CHECK MARKS as you work on the task. I will be here only to observe and not to interact unless there is a problem. As soon as you’re ready you may begin. You have 2 minutes. <Say as you leave for part 1 GRAB STOPWATCH BEFORE YOU LEAVE>

Stop!! Please start part 2 on Page 74 <turn pages so participant sees page 74>. You have 2 minutes.

<Supervisor stays for part 2, While they: 1) Grab STOPWATCH 2) Go to position C in front of participants 3) Every other
10 second period make check marks 4) Every other 10 second period you make check marks also shuffle your papers.
5) At :50 and 1:50 write “I am a salient supervisor”>>:

STOP!! Please start the post task questionnaire. When you have completed all the post task questionnaire items, press the button so I know you are done.

<Participant works on post-task questionnaire>

Complex Task-Practice
Read the following as they follow along on the screen:

First I want to explain the purpose of the second task. We are studying implicit memory. Anagram solution tasks are often used as a measure of implicit memory, that is, the type of memory in which previous experiences aid in the performance of a task without conscious awareness of these previous experiences. We will use this data to evaluate undergraduates for internships. Our research will give us a greater understanding of implicit memory which is associated with proficiency in certain workplace tasks. It is important for the study that you try to perform at your highest level. Your results will be completely confidential and will be processed within the next few months.

Now we are ready to begin the anagrams task. Please read along on the screen as I read the directions.

<Maximize Anagram Task so “Instructions” is at the top of the screen>

You will be asked to rearrange the letters into words.

Read the following from the screen: <<You will be presented with sets of six letters. You will scramble those letters and make words. Different puzzles will accept different combinations of 5 and 6 letter words. You will know the maximum number of words that can be created at each word length based on the number of boxes.
The object of the task is to form as many words as possible from the letters provided. There will be ten different puzzles. Each one should last 2 minutes and 30 seconds. You will be scored on the number of words that you create overall, with more points being given for longer words.

Use the TWIST button when you want to reorder the letters. Please do not use the right click button. If for some reason you accidentally right click the mouse, you’ll see a menu pop up. Just left click anywhere in the browser outside that menu, and go back to working on the task. We want for there to be as little interruption as possible so your implicit memory performance is not affected.” Past research has shown that both speed and accuracy are important components to your overall performance. Before we begin the experiment, let’s do a practice trial to get acquainted with the anagram task. You will be given 2 minutes and 30 seconds. When I say “you may begin,” click on “click here to start.” If you have any questions during the practice trial please let me know because you will not be able to ask questions during the official trials.

You may begin.

<Participant practice task and a few questionnaire items, supervisor/research assistant stays in room during practice trial yet goes to other part of room so as not to be intrusive during short questionnaire. Supervisor makes sure participant is using program correctly e.g., knows how to submit a “guess,” knows not to use the keyboard, knows how to use the twist>

Before and after completing the word task you will be asked questionnaire items. Please complete this short questionnaire
Complex Task-Official Trial

Control
Similar to the “Finding A’s task, as you complete the actual task I will leave the room and close the door. I will be continuing to work next door in my office. At this point all instructions will be presented via the computer monitor. When you finish the task please press the button <show button> so I know you are done. You will know you are done when your scores for all the trials are on the screen. When you get to this point do not touch the keyboard or mouse. Here is a list (hand sheet out) of all the letter codes. As soon as I tell you “you may begin” type in “C,” the first continue code and then click on “click here to start.” If you unscramble all words in a particular puzzle, please wait until the 2:30 has elapsed in that trial before going on to the next one. As soon as you’re ready you may begin.

<When the participant finishes the anagram task, the computer should be on page listing all their scores. The supervisor is to turn off the computer monitor at the end of the anagram trials and to record all the scores on the login sheet after the participant is debriefed.>

Please start the post-task questionnaire as soon as I leave. I will once again be in my office working on that project. When you have completed all the questionnaire items, press the button so I know you are done.

Artificial presence (Agent)
Similar to the “Finding A’s task, as you complete the actual task I will leave the room and close the door. I will be continuing to work next door in my office. However, Charlie will again be observing you. As I stated earlier, the company I work for wants Charlie to supervise participants during the perceptual speed trials because during hiring, the applicants will be observed while doing the tasks.

At this point all instructions will be presented via the computer monitor. When you finish the task please press the button <show button> so I know you are done. You will know you are done when your scores for all the trials are on the screen. When you get to this point do not touch the keyboard or mouse. Here is a list (hand sheet out) of all the letter codes. As soon as I tell you “you may begin” type in “C,” the first continue code and then click on “click here to start.” If you unscramble all words in a particular puzzle, please wait until the 2:30 has elapsed in that trial before going on to the next one.

<Load Charlie, make sure she is in the left side of the screen and the anagram task is on the right>

As soon as you’re ready you may begin.

<When the participant finishes the anagram task, the computer should be on page listing all their scores. The research assistant is to turn off the computer monitor at the end of the anagram trials and to record all the scores on the login sheet after the participant is debriefed.>

Please start the post-task questionnaire as soon as I leave. I will once again be in my office working on that project.
When you have completed all the questionnaire items, press the button so I know you are done.

Please complete the final questionnaire. Press the button so I know you are done.

Passive presence
Similar to the “Finding A’s task, as you complete the actual anagram task I will leave the room and close the door. I will be busy working on the project next door in my office. At this point all instructions will be presented via the computer monitor. You will know you are done when your scores for all the trials are on the screen. At this point do not touch the keyboard or mouse.

At the end of each anagram you will need a letter code to go on to the next anagram. Here is a list (hand sheet out) of all the letter codes. When you finish the task please press the button <show button> so I know you are done. You will know you are done when your scores for all the trials are on the screen. When you get to this point do not touch the keyboard or mouse.

<Confederate quietly comes back to the same spot and does not make eye contact. Confederate comes back 10 seconds after button is pushed. Confederate continues to work on packet> 

As soon as I tell you “you may begin” type in “C,” the first continue code and then click on “click here to start.” If you unscramble all words in a particular puzzle, please wait until the 2:30 has elapsed in that trial before going on to the next one. As soon as you’re ready you may begin.

<When the participant finishes the anagram task, the computer should be on page listing all their scores. The supervisor is to turn off the computer monitor at the end of the anagram trials and to record all the scores on the login sheet after the participant is debriefed.>

Please start the post-task questionnaire as soon as I leave. I will once again be in my office working on that project. When you have completed all the questionnaire items, press the button so I know you are done.

**Implied presence (Monitoring)**

Similar to the “Finding A’s task, as you complete the actual anagram task I will leave the room and close the door. The company I work for wants us to supervise participants again using the camera during the anagram trials because during hiring, the applicants will be supervised while completing the anagram trials. I will be monitoring you in my office next door <points to camera, turns camera on>. I will come back soon after you finish. You will know you are done when your scores for all the trials are on the screen. At this point do not touch the keyboard or mouse.

At this point all instructions will be presented via the computer monitor. At the end of each anagram you will need a letter code to go on to the next anagram. Here is a list (hand sheet out) of all the letter codes. As soon as I tell you “you may begin” type in “C,” the first continue code and then click on “click here to start.” If you unscramble all words in a particular puzzle, please wait until the 2:30 has elapsed in that trial before going on to the next one. As soon as you’re ready you may begin.

<Leave as participant works on anagram trials, come back in 27 minutes giving participant plenty of time to finish>

<When the participant finishes the anagram task, the computer should be on page listing all their scores. The supervisor is to turn off the computer monitor at the end of the anagram trials and to record all the scores on the login sheet after the participant is debriefed. Turn camera off> 

Please start the post-task questionnaires as soon as I leave. Please complete the
following questionnaire first (show them AD/ACL). I will be working in my office.
When you have completed all the questionnaire items, press the button so I know you
are done.

**Embodied presence (Avatar)**

Similar to the “Finding A’s task, as you complete the actual task, Mr. Tompkins will
again be observing you. As I stated earlier, the company I work for wants Mr.
Tompkins to supervise participants during the perceptual speed trials because during
hiring, the applicants will be observed while doing the tasks.

At this point all instructions will be presented via the computer monitor. You will
know you are done when your scores for all the trials are on the screen. When you get
to this point do not touch the keyboard or mouse. Mr. Tompkins will notify me when
you are done and I will come soon after that. Here is a list (hand sheet out) of all the
letter codes. As soon as I tell you “you may begin” type in “C,” the first continue
code and then click on “click here to start.” If you unscramble all words in a
particular puzzle, please wait until the 2:30 has elapsed in that trial before going on
to the next one.

<Maximize Video of Mr. Tompkins>
As soon as you’re ready you may begin.

<When the participant finishes the anagram task, the computer should be on page
listing all their scores. The research assistant is to turn off the computer monitor at
the end of the anagram trials and to record all the scores on the login sheet after the
participant is debriefed.>

<Minimize Video of Mr. Tompkins>

Please start the post-task questionnaire as soon as I leave. When you have completed
all the questionnaire items, press the button so I know you are done.

**Active presence**

Similar to the “Finding A’s task, as you complete the actual task I will be standing
here observing you as you complete the anagram trials. The company I work for
wants us to supervise participants because during hiring, applicants will be
supervised while completing the anagram trials. I am here only to observe and not to
interact unless there is a problem. At this point all instructions will be presented via
the computer monitor. You will know you are done when your scores for all the trials
are on the screen. When you get to this point do not touch the keyboard or mouse.
Here is a list (hand sheet out) of all the letter codes. As soon as I tell you “you may
begin” type in “C,” the first continue code and then click on “click here to start.” If
you unscramble all words in a particular puzzle, please wait until the 2:30 has
elapsed in that trial before going on to the next one. As soon as you’re ready you
may begin.

Stay in the room throughout 9 official trials. While in the room, 1) Grab
STOPWATCH 2) Go to position C in front of the participant 3) Every other 30 second
period make 4 check marks 4) Every other 30 second period you make check marks
also shuffle your papers. 5) After each anagram write “I am a salient supervisor.”

<When the participant finishes the anagram task, the computer should be on page
listing all their scores. The supervisor is to turn off the computer monitor at the end
of the anagram trials and to record all the scores on the login sheet after the
participant is debriefed.>
Please start the rest of the post-task questionnaire items as soon as I leave. I will be continuing to work on that project in my office. When you have completed all the questionnaire items, press the button <show button> so I know you are done.

Residual presence
Similar to the "Finding A’s task, as you complete the actual task, part of the time I will be monitoring you. The company I work for wants us to supervise participants at least part of the time because during hiring, applicants will be supervised while completing the anagram trials. For part of the time I will be working on a task next door in my office. I will be here only to observe and not to interact unless there is a problem. At this point all instructions will be presented via the computer monitor. If you finish all the anagram trials while I am not here please press the button <show button> so I know you are done. You will know you are done when your scores for all the trials are on the screen. When you get to this point do not touch the keyboard or mouse. At the end of each anagram you will need to enter a letter code to go on to the next anagram. Here is a list (hand sheet out) of all the letter codes. As soon as I tell you “you may begin” type in “C,” the first continue code and then click on “click here to start.” If you unscramble all words in a particular puzzle, please wait until the 2:30 has elapsed in that trial before going on to the next one. As soon as you’re ready you may begin.

<Stay for part 1. While you stay 1) Grab STOPWATCH 2) Go to position C in front of participant 3) Every 30 second period make 4 check marks 4) Every other 30 second period you make check marks, not only make check marks but also shuffle your papers.
5) Each time you are in the room and they enter a continue code write “I am a salient supervisor”>>
<<Leave after 13 minutes, halfway into the task.>>

<When the participant finishes the anagram task, the computer should be on page listing all their scores. The supervisor is to turn off the computer monitor at the end of the anagram trials and to record all the scores on the login sheet after the participant is debriefed.>

Please complete the following questionnaire. I will be continuing to work on that project in my office. When you have completed all the questionnaire items, press the button <show button> so I know you are done.

Anticipatory Presence
<Research assistant gets supervisor and leaves the room>
<Supervisor must read deliberately slow>
Similar to the “Finding A’s task, as you complete the actual task I will leave the room and close the door. I will be working on the project next door in my office. However, at some point while you’re working on the task, I will come back here to CLOSELY MONITOR you.
Again the company I work for wants us to CLOSELY MONITOR participants during the perceptual speed trials because during hiring, the applicants will be CLOSELY MONITORED while doing the tasks. I will be standing near you observing you. The company I work for requires us to observe a number of criteria related to your outcome and performance on the anagram task. I will watch closely and make
notes and CHECK MARKS as you work on the anagrams.
At the end of each anagram you will need a letter code to go on to the next anagram. Here is a list (hand sheet out) of all the letter codes. As soon as I tell you “you may begin” type in “C,” the first continue code and then click on “click here to start.” If you unscramble all words in a particular puzzle, please wait until the 2:30 has elapsed in that trial before going on to the next one. As soon as you’re ready you may begin.

<< GRAB STOPWATCH. Leave the room and then supervisor enters halfway (13 minutes) into task.

<Supervisor stays for the final 13 minutes. While supervisor in the room
1) Grab STOPWATCH 2) Go to position C in front of the participants 3) Every other 30 second period make check marks 4) Every other 30 second period you make check marks also shuffle your papers. 5) When you are in the room with the participant, every time they enter a continue code write “I am a salient supervisor” Let me get your research assistant.

<Supervisor gets research assistant from adjacent room>
<When the participant finishes the anagram task, the computer should be on page listing all their scores. The research assistant is to turn off the computer monitor at the end of the anagram trials and to record all the scores on the login sheet after the participant is debriefed.>

Please complete the following questionnaire. I will be continuing to work on that project in my office. When you have completed all the questionnaire items, press the button <show button> so I know you are done.

End of Study:
Debriefing
Now I will debrief you about the purpose of this study. This study was designed to determine how different states of supervision affect task achievement. We are touching on a topic in Social Psychology called Social Facilitation. I am a college student here at Rutgers, but I am not an intern for an outside organization. The results from this study will contribute greatly to knowledge on the topic of how supervision affects employee performance and other general knowledge to society. It is extremely important, for the sake of not corrupting the study’s results that you do not disclose what occurred during this experiment to anyone. Can you promise to keep what happened here confidential?
Appendix B: Questionnaires, including additional items for residual participants and anticipatory participants

Participant Name __________________________________________

For all items below circle the number corresponding to the most appropriate response.

Pre-task Questionnaire 1 (Before Finding A’s Task)

1) I generally perform

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not well</td>
<td>Neutral</td>
<td>Very well</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) In general, how well do you expect to perform

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not well</td>
<td>Neutral</td>
<td>Very well</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) I do not like having my work compared to that of others

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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>Neutral</td>
<td>Strongly disagree</td>
<td></td>
<td></td>
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</tbody>
</table>

4) Today, I expect to perform very well on the tasks.

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</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>Neutral</td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Participant Name __________________________________________

Answer each question based on how you felt during the Finding A’s task:

1) When working on the Finding A’s task, I felt

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<thead>
<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stressed</td>
<td>Neutral</td>
<td>Not stressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

2) When working on the previous task, I felt

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<th>4</th>
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<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uptight</td>
<td>Neutral</td>
<td>Calm</td>
<td></td>
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</tbody>
</table>

3) When working on the previous task, I felt

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<tr>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frustrated</td>
<td>Neutral</td>
<td>Not frustrated</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4) When working on the previous task, I felt

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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distressed</td>
<td>Neutral</td>
<td>Not distressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5) I would describe the climate/atmosphere for working on the previous task as: 
6) While working on the Finding A’s task, I felt
   1   2   3   4   5   6   7
   Anxious                      Neutral                   Not anxious
7) I felt I was being evaluated for the quality of my work.
   1   2   3   4   5   6   7
   Not at all                      Neutral                   Quite a lot
8) I felt like I was being evaluated for the speed of my work.
   1   2   3   4   5   6   7
   Not at all                      Neutral                   Quite a lot
9) If you were being observed, how much pressure did you feel from your supervisor/research assistant while working on the Finding A’s task?
   1   2   3   4   5   6   7
   Not at all                      Neutral                   Quite a lot
   8=Not observed
10) I found the supervisor/research assistant to be distracting
    1   2   3   4   5   6   7
    Not at all                      Neutral                   Quite a lot
11) To what extent did the supervisor/research assistant affect your performance on the Finding A’s task?
    1   2   3   4   5   6   7
    Not at all                      Neutral                   Quite a lot
12) Before you began the task, how important was it for you to do well on the task?
    1   2   3   4   5   6   7
    Not very important                      Neutral                   Very important
13) Before you began the task, you thought you would perform
    1   2   3   4   5   6   7
    Not very well                      Neutral                   Very well
14) How much effort did you exert on the task?
    1   2   3   4   5   6   7
    Very little                      Neutral                   A lot
15) How well do you think you performed on the task?
    1   2   3   4   5   6   7
    Not very well                      Neutral                   Very well
16) How satisfied were you with your performance on the task?
1) Not satisfied                      Neutral                   Very satisfied

2) Not very difficult                      Neutral                   Very difficult

3) Strongly agree                      Neutral                   Strongly disagree

4) Strongly agree                      Neutral                   Strongly disagree

5) Strongly agree                      Neutral                   Strongly disagree

6) Not at all                      Neutral                   Quite a lot

7) Not at all                      Neutral                   Quite a lot

8) Strongly disagree                      Neutral                   Strongly agree

9) Not at all                      Neutral                   Highly evaluating

10) Not at all                      Neutral                   Quite a lot

11) I enjoyed the Finding A’s task
28) I expect to perform at the ______________ percentile (0-100) today on the Finding A’s task.
   1 = 0-20          2 = 21-40           3= 41-60             4= 61-80           5= 81-100

29) During the task the supervisor/research assistant made me stressed
   Not at all                      Neutral                   Quite a lot

30) During the task the supervisor/research assistant made me nervous.
   Not at all                      Neutral                   Quite a lot

31) The previous task made me nervous.
   Strongly agree                      Neutral                   Strongly disagree

32) The previous task made me uptight.
   Strongly agree                      Neutral                   Strongly disagree

33) How able were you to cope with this task?
   Not at all able                      Neutral                   Quite able

34) I was motivated to do well on the task
   Not at all                      Neutral                   Quite a lot

35) I am confident in my perceptual speed abilities.
   Not at all                      Neutral                   Quite a lot

36) I felt the task got easier as I progressed.
   Strongly disagree                      Neutral                   Strongly agree

37) I would have preferred the supervisor/research assistant was quieter.
   Strongly disagree                      Neutral                   Strongly agree

38) When working on the task I felt
   Not happy                      Neutral                   Happy
39) Which set of emotions better describes how you felt right before starting the task
   1=Anxious, Worried, Fearful               2=Confident, Hopeful, Eager

40) How much did your heart-rate increase during this task?
   1  2  3  4  5  6  7
   Not at all                      Neutral                   Quite a lot

41) How would you rate the expertise of the supervisor/research assistant?
   1  2  3  4  5  6  7
   Very high                      Neutral                   Very low

42) I would have preferred that the supervisor/research assistant was less immediate.
   1  2  3  4  5  6  7
   Strongly disagree                      Neutral                   Strongly agree

43) The supervisor/research assistant impacted my performance during the task.
   1  2  3  4  5  6  7
   Strongly disagree                      Neutral                   Strongly agree

44) Was there somebody in the room with you as you completed the task?
   1=Yes                        2=No                       3) Part of the time

45A) The fact that the supervisor/research assistant might come to the room and observe me affected me a great deal at the beginning of the task.
   1  2  3  4  5  6  7
   Strongly disagree                      Neutral                   Strongly agree

45R) I was relieved when the supervisor/research assistant left the room.
   1  2  3  4  5  6  7
   Strongly disagree                      Neutral                   Strongly agree

46R) I felt I performed better when the supervisor/research assistant was in the room with me.
   1  2  3  4  5  6  7
   Strongly disagree                      Neutral                   Strongly agree

47R) I felt I performed better when the supervisor/research assistant was in the adjacent room.
   1  2  3  4  5  6  7
   Strongly disagree                      Neutral                   Strongly agree

Participant Name ______________________________________

For all items below circle the number corresponding to the most appropriate response.
**Pre-task Questionnaire 2 (Before Anagram Task)**

1) I generally perform

1 2 3 4 5 6 7
Not well Neutral Very well

2) In general, how well do you expect to perform

1 2 3 4 5 6 7
Not well Neutral Very well

3) I do not like having my work compared to that of others

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

4) Today, I expect to perform very well on the tasks.

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

**Participant Name**

**Answer each question based on how you felt during the Anagrams task:**

1) When working on the Anagram task, I felt

1 2 3 4 5 6 7
Stressed Neutral Not stressed

2) When working on the Anagram task, I felt

1 2 3 4 5 6 7
Uptight Neutral Calm

3) When working on the Anagram task, I felt

1 2 3 4 5 6 7
Frustrated Neutral Not frustrated

4) When working on the Anagram task, I felt

1 2 3 4 5 6 7
Distressed Neutral Not distressed

5) I would describe the climate/atmosphere for working on the previous task as:

1 2 3 4 5 6 7
Stressful Neutral Not stressful

6) While working on the Anagram task, I felt
7) I felt I was being evaluated for the quality of my work.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Quite a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

8) I felt like I was being evaluated for the speed of my work.

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Quite a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

9) If you were being observed, how much pressure did you feel from your supervisor/research assistant while working on the Anagram task?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Quite a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

8=Not observed

10) I found the supervisor/research assistant to be distracting

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Quite a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

11) To what extent did the supervisor/research assistant affect your performance on the Anagram task?

<table>
<thead>
<tr>
<th>Not at all</th>
<th>Neutral</th>
<th>Quite a lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

12) Before you began the task, how important was it for you to do well on the task?

<table>
<thead>
<tr>
<th>Not very important</th>
<th>Neutral</th>
<th>Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

13) Before you began the task, you thought you would perform

<table>
<thead>
<tr>
<th>Not very well</th>
<th>Neutral</th>
<th>Very well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

14) How much effort did you exert on the task?

<table>
<thead>
<tr>
<th>Very little</th>
<th>Neutral</th>
<th>A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

15) How well do you think you performed on the task?

<table>
<thead>
<tr>
<th>Not very well</th>
<th>Neutral</th>
<th>Very well</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

16) How satisfied were you with your performance on the task?

<table>
<thead>
<tr>
<th>Not satisfied</th>
<th>Neutral</th>
<th>Very satisfied</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
17) In general, how difficult was the task you just completed?

<table>
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<tr>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not very difficult</td>
<td>Neutral</td>
<td>Very difficult</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

18) I felt time pressure during the Anagram task?

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly agree</td>
<td>Neutral</td>
<td>Strongly disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19) I felt I was being judged.

<table>
<thead>
<tr>
<th>1</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Quite a lot</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

20) Did you like your supervisor/research assistant?

<table>
<thead>
<tr>
<th>1</th>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Quite a lot</td>
<td></td>
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</table>

21) I felt distracted while working on the Anagram task.

<table>
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<tr>
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<th>4</th>
<th>5</th>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Quite a lot</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

22) I felt like I was being evaluated while working on the task.

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<tr>
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<th>4</th>
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<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>Neutral</td>
<td>Strongly agree</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

23) Did you feel the supervisor/research assistant was evaluating your performance on the Anagram task?

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<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Highly evaluating</td>
<td></td>
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</table>

24) Was there someone in your room evaluating your performance as you were working on the task?

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<tr>
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<th>7</th>
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<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Quite a lot</td>
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25) I enjoyed the task

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<tr>
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<th>4</th>
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<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Quite a lot</td>
<td></td>
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</table>

26) I expect to perform at the _______________ percentile (0-100) today on the Anagram task.

<table>
<thead>
<tr>
<th>1 = 0-20</th>
<th>2 = 21-40</th>
<th>3 = 41-60</th>
<th>4 = 61-80</th>
<th>5 = 81-100</th>
</tr>
</thead>
</table>

27) During the task the supervisor/research assistant made me stressed

<table>
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<th>5</th>
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<th>7</th>
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<tbody>
<tr>
<td>Not at all</td>
<td>Neutral</td>
<td>Quite a lot</td>
<td></td>
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</tbody>
</table>
28) During the task the supervisor/research assistant made me nervous.

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

29) The previous task made me nervous.

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

30) The previous task made me uptight.

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

31) How able were you to cope with this task?

1 2 3 4 5 6 7
Not at all able Neutral Quite able

32) I often solve anagrams or play anagram related games (e.g. Text Twist, Word Womp) for fun.

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

33) I often play non-anagram word games (newspaper or computer) for fun.

1 2 3 4 5 6 7
Strongly agree Neutral Strongly disagree

34) What did you score on the SAT verbal section?

1) 200-300 2) 310-400 3) 410-500 4) 510-600 5) 610-700 6) 710-800 7) Did not take

35) I was motivated to do well on the task.

1 2 3 4 5 6 7
Not at all Neutral Quite a lot

36) I am confident in my verbal abilities.

1 2 3 4 5 6 7
Not at all Neutral Quite a lot

37) I felt the task got easier as I went along.

1 2 3 4 5 6 7
Strongly disagree Neutral Strongly agree

38) I would have preferred if the supervisor/research assistant was quieter.

1 2 3 4 5 6 7
Strongly disagree Neutral Strongly agree
39) When working on the task I felt

<table>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Not happy</td>
<td>Neutral</td>
<td>Happy</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

40) Which set of emotions better describes how you felt right before starting the task

|   | 1=Anxious, Worried, Fearful | 2=Confident, Hopeful, Eager |

41) How much did your heart-rate increase during this task?

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<td>Quite a lot</td>
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42) How would you rate the expertise of the supervisor/research assistant?

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<tbody>
<tr>
<td></td>
<td>Very high</td>
<td>Neutral</td>
<td>Very low</td>
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</table>

43) I would have preferred that the supervisor/research assistant was less immediate.

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<td>Quite a lot</td>
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44) The supervisor/research assistant impacted my performance during the task.

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<th>4</th>
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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>Neutral</td>
<td>Strongly agree</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

45) Was there somebody in the room with you as you completed the task?

<table>
<thead>
<tr>
<th></th>
<th>1=Yes</th>
<th>2=No</th>
<th>3=Part of the time</th>
</tr>
</thead>
</table>

46A) The fact that the supervisor/research assistant might come to the room and observe me affected me a great at the beginning of the task.

<table>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

46R) I felt relieved when the supervisor/research assistant left the room.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>Neutral</td>
<td>Strongly agree</td>
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</tbody>
</table>

47R) I felt I performed better when the supervisor/research assistant was in the room with me.

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</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
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<td>Strongly agree</td>
<td></td>
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</tr>
</tbody>
</table>

48R) I felt I performed better when the supervisor/research assistant was in the adjacent room.

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<thead>
<tr>
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<tbody>
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</tbody>
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