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PERFORMANCE DIFFERENCES IN DIVERSE CONTEXTS: THE ROLE OF PERSONALITY

A Thesis

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Psychology:

Industrial/Organizational

---

by

Daniel Karl Cashmore

March 2010

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March 2010

Approved by:

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Dr. Mark Agars, Chair, Psychology — 3/1/2010 Date

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Dr. Michael Lewin

ABSTRACT

The study of demographic diversity and its effects on performance in the work place has yielded inconsistent conclusions (Williams & O'Reilly, 1998). The presence of demographic diversity, however, has shown to increase arousal in individuals (Lord & Saenz, 1985). The present study seeks to explain performance differences in demographically diverse settings by examining introverted and extraverted individuals and using the Inverted-U-Theory developed by Hans J. Eysenck. Eysenck suggests that introverts and extraverts have base cortical levels of arousal that inherently have a differential effect on performance (Eysenck, 1967). Additionally, Eysenck suggests that both introvert and extravert's performance follow an inverted-U function as arousal increases (Revelle, Humphreys, Simon, & Gilliland, 1980). The present study looked at two hypotheses, one with regards to introverts and extraverts arousal as diversity context increased, and the other looking at performance for both introverts and extraverts as diversity context increased. The present study found that arousal did not significantly increase as diversity context increased for both introverts and extraverts. Additionally, the current study supported some of the second hypothesis in regards

to performance differences between introverts and extraverts as diversity context increased.

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CHAPTER ONE

INTRODUCTION AND PRESENT STUDY

Demographic and specifically racial diversity in the work place and its potential impact on performance has been drawing considerable interest over the past fifteen years. An example of its importance was demonstrated in a review by Williams and O'Reilly (1998), who estimated that in the forthcoming decade in the United States, historically underrepresented groups such as women and ethnic minorities will fill 75% of all newly created jobs. In the years following the publication of this review, the Bureau of Labor Statistics was able to support some of these assumptions made by Williams and O'Reilly (1998) showing that in 2006, women, African-Americans, and Hispanics were more highly represented than in 2001 (Bureau of Labor Statistics, 2006). It is clear that levels of racial diversity in organizations are increasing at a fairly rapid pace. One impact that the influx of workforce diversity may have is on individual and team performance in an organizational setting. Additionally, Williams and O'Reilly (1998) propose that racial diversity often has the ability to bring competing views that promote novel ideas and healthy debates. While intuitively

one may think that groups with competing ideologies may spawn a broadened and more creative pool of ideas, several studies indicate the opposite. As noted by Horwitz and Horwitz (2007), homogenous teams may not face as many challenges and problems as demographically diverse teams. Horwitz and Horwitz (2007) speculate that homogenous teams share many characteristics, thus enhancing team cohesion and performance. Organizations therefore face a very real dilemma, to promote diverse work cultures, or to maintain the traditional stance? Do homogeneous groups reduce dissonance and achieve higher levels of productivity, or do heterogeneous groups have the ability to bring in a new perspective, thus increasing productivity?

A barrier that is often encountered in diverse work settings are the apparent differences in racial makeup between members. These differences have shown to have negative effects on some individuals, creating a feeling of under appreciation, inferiority, and underutilization (Lord & Saenz, 1985). In addition to these negative cognitive outcomes, women and minorities in the work place face other obstacles such as discrepancies in pay, and a lack of an opportunity to advance to leadership positions (Rossette, Philips, & Leonardelli, 2008). Furthermore, Jehn, Northcraft, and Neale (1999) discuss other potential

drawbacks and negative implications that occur when assembling diverse work groups. The work demonstrated that additional levels of demographic diversity had a negative impact on perceived performance, satisfaction, and commitment, all of which contributed to lowering overall group performance. Clearly, there is much to understand about the relationship between group demography and performance. In an attempt to further understand how individuals perform under varying levels of demographic diversity in the work place, the present study looks to identify differences in performance between introverts and extraverts using Eysenck's Inverted-U-Theory on arousal.

Homogenous versus Heterogeneous Groups: The Benefits and Drawbacks

Investigating the dynamics between individuals within an organization is of great interest to Industrial and Organizational Psychologists. When addressing demographic diversity and its impacts on an organization, it is imperative to evaluate work situations where demographic diversity is and is not present. These are known as heterogeneous and homogenous work groups. Williams and O'Reilly (1998) have researched the existing benefits and drawbacks of homogenous and heterogeneous groups and have found largely inconsistent conclusions. In their

publication, Riordan and Shore (1997) found that an increased level of demographic diversity in 98 insurance work groups reduced both commitment and productivity while Espinoza and Garza (1985) concluded that groups with particular diverse racial make-ups have shown to be productive.

Mcleod, Lobel, and Cox (1996), argue that demographically diverse work groups add a certain unique input that cannot be attained by most homogenous groups. The additional component of creativity and innovation is largely the backbone argument in favor of increasing demographically diverse teams in the work place. Conversely, Horwitz and Horwitz (2007) discuss how (due to their differences) demographically diverse work groups may become more dysfunctional and not be able to achieve this high level of creativity and productivity, showing that homogenous work groups may be indeed preferred.

Although many advocate that having heterogeneous groups create and spark innovation, vision and the creation of a better product (Mcleod et al., 2007), they are often countered by those who insist that diverse groups often lack cohesion, thus preventing them from working efficiently and attaining a product that is superior to a homogenous group (Crockett, Iturbide,

Torres, Stone, McGinley, Raffaelli, & Carlo, 2007). With a rapidly changing work force, it is more important than ever to understand why these performance discrepancies between demographically diverse work groups exist.

One of the major arguments in favor of implementing more homogenous work groups is the cohesion and uniformity typically associated with such groups (Richard, Murthi, & Ismail, 2007). Crockett et al., (2007) assert that homogeneous groups are less inclined to encounter some of the challenges and difficulties that demographically diverse groups sometimes face. Therefore, many have supported that homogeneous groups should be encouraged in the work place as groups less prone to conflict will attain better results, both in productivity as well as group cohesion (Horwitz & Horwitz, 2007; Richard et al., 2007).

Regardless of how researchers view homogeneous and heterogeneous groups in terms of their practicality or efficiency, one thing is clear; whether demographic or ideological, heterogeneous groups have greater obstacles to overcome. Ulrey and Amason (2001) conducted a study where they interviewed and measured anxiety levels following a health care consultation meeting between a specialist, and a client that was seeking guidance on a

new health care policy. The study found that the specialists conducting the consultations reported feeling greater amounts of anxiety and stress when working with an individual, couple or family that was of a different demographic background than themselves. The study suggested that demographic diversity in a professional setting resulted in higher levels of anxiety and stress. The researchers speculated that such a response may have occurred because the consultant felt less prepared to communicate with someone different from him or herself, and did not want to offend or even portray an attitude that seemed unfavorable to the client (Ulrey & Amason, 2001). Additionally, the authors suggested that the specialists were more focused on avoiding a negative encounter/consequence rather than helping the individual. These findings reveal that heterogeneous groups may have performance difficulties when attention is focused on the individual differences among its members.

The research reveals a fundamental challenge for organizations interested in encouraging heterogeneous workgroups and facilitating a supportive environment. Increasing the diversity of work teams will likely present obstacles, both for the team members as well as for the organization.

Investigating the interpersonal dynamics within groups is central in understanding how to attain productive work environments. Moreover, personality attributes that individuals within work groups possess have shown to have a significant impact on performance outcomes (Wilson & Languis, 1990). Because of this, Trait Theory may aid the current research on diverse teams and their given performance by explaining these characteristics and how they may have an effect on task performance in demographically diverse groups.

Trait Theory

Trait Theory, initially developed by Carl Jung argues that there are a few inherent traits in all human beings that help define the major characteristics about each one of us. The use of these various traits including openness, conscientiousness, extraversion, agreeableness, and neuroticism have aided psychologists in understanding and categorizing fundamental human traits. These traits individually and collectively have been used to explain individual behaviors. One trait, extraversion has been shown to play a particularly significant role in explaining social interactions (Downey, 1924). The present study seeks to integrate Eysenck's Inverted-U-Theory with

regards to introverts and extraverts as a means to explain performance differences in demographically diverse groups.

Jung referred to extraversion in his initial research on personality as a trait that helps identify if individuals have inherent proclivities to be drawn to and engage other individuals (Downey, 1924). In particular, extraversion is the trait that drives an individual to engage in situations that raise their arousal (Eysenck, 1967). Examples of extraverted tendencies include individuals speaking out with confidence in front of large groups, approaching and talking without hesitation to a stranger, and seeking to be seen, heard, or noticed during any given situation (Eysenck, 1967). Conversely, introversion is a trait found in individuals who do not seek a heightened level of arousal (Eysenck, 1967). This is due to the fact that introverts naturally have a higher basal cortical level of arousal, and avoid situations that further increase arousal (Movahedi, Sheikh, Bagherzadeh, Hemayattalab, & Ashayeri, 2007). Higher basal cortical levels in the introvert often make the individual feel anxious.

As explained by McCrae and Oliver (1992), The Five-Factor Model of personality defines and measures five different traits that are believed to be the primary

factors in explaining human behavior. These five traits include extraversion, agreeableness, conscientiousness, neuroticism, and openness. Understanding these five traits provides researchers with a clear, fundamental framework to identify and assess differences in human behavior across situations and cultures. Furthermore, Beauducel, Brocke, and Leue (2006) support the claim that personality differences have a direct effect on performance. Using EEG readings, they were able to show extreme differences in performance on vigilance tasks between extraverts and introverts. These findings, in addition to the previous research conducted by McCrae and John (1992), support the notion that personality type, specifically extraversion has an effect on performance.

A primary function of Trait Theory and of the Five-Factor Model is its ability to recognize specific traits in individuals that will pair them to individuals, situations, or even jobs to which they are well matched. Barrick and Mount (1991) used the Five-Factor Model as an avenue to match individuals with certain traits to jobs that fit them best. They found that by using the Five-Factor model as a comprehensive personality analysis tool, they were able to pair individuals with specific jobs with which they had a proclivity to be successful. By

utilizing the Five-Factor Model in conducting these personality assessments, in conjunction with previous job analyses, the researchers were able to provide an applied use for the Five-Factor Model. Barrick and Mount (1991) concluded that the model could also be used in personnel selection by identifying individuals who were successful on the job, and by using it to understand the personalities of these successful employees. Identifying individuals that may perform better in specific environments may be an important aspect to take into consideration when creating demographically diverse, or heterogeneous, workgroups.

Objections and Concerns regarding Trait Theory and the Five-Factor Model

Costa and McCrae (1991) emphasize that the research based on the Five-Factor Model has shown consistency and utility for males and females in varying situations and across cultures. Nonetheless, the central criticism that the Five-Factor Model continues to face is the limited number of actual factors used. As discussed by Costa and John (1991), personality psychologists have challenged the Five-Factor Model primarily by making the point that the use of only five factors simplifies the individual, and is not able to reveal the complexity of an individual's full

personality. However, Costa and John (1991) refute such objections by emphasizing that the model was never intended to give a detail-oriented portrayal of an individual. Rather, the model's primary intent is to derive as much information about an individual by using these traits as an avenue for understanding. Thus, the purpose is to give an overall representation of the individual, and to identify and objectively quantify apparent differences in personality between individuals (Costa & McCrae, 1995). The continued implementation of the Five-Factor Model and specifically extraversion has allowed researchers to gauge individual personality characteristics and understand in what situations subjects may optimally perform (Beauducel et al., 2006). While is been shown with some regularity that individuals with different trait types from the Five-Factor Model vary in performance (Bates & Rock, 2004), none have exhibited the wide variation that introverts and extraverts show. Clear differentiation in behavior between introverts and extraverts has allowed performance differences to be more easily identified than any other trait (Kilgore et al., 2007).

Although it is clear from trait theory that extraverts seek arousal-raising situations while

introverts seek the opposite (Kilgore et al. 2007), it is important to see if this indeed has an effect on performance when an arousal mechanism is presented. Using Eysenck's Inverted-U-Theory (Eysenck, 1967), the present study aims to understand performance differences in diverse contexts between introverts and extraverts.

Previous Research on Introversion and Extraversion

The primary difference between introverts and extraverts is the level of desired interaction with their environment. Introversion is a trait that leads the individual to be concerned primarily with his/her own thoughts and feelings rather than interacting with the external environment (Costa & McCrae, 1995). Conversely, extraversion is the act of directing one's interest outward to the external environment (Downey, 1924). The difference in interest in the external environment between introverts and extraverts can be best explained by basal cortical arousal (Eysenck, 1967). Basal cortical level refers to the average resting arousal level that an individual is experiencing. The initial arousal level puts extraverts at a base arousal point that is significantly lower than introverts (Bates & Rock, 2004). As researched by Cox-Fuenzalida, Angie, Holloway, and Sohl (2001),

extraverts possess a lower level of arousal (basal cortical levels) as opposed to their introverted counterparts. Introverts inherently have higher levels of arousal, preventing them from seeking any further stimulation. These statements have been supported with some regularity using an EEG to measure the level of arousal in the brain when both auditory and visual stimuli have been presented (Wilson & Languis, 1990). These lower basal cortical levels explain why extraverts seek arousal-raising activities (Bates & Rock, 2004). Pursuing additional arousal for extraverts results in greater satisfaction by attaining higher cortical arousal levels (Beauducel et al., 2006). Conversely, introverts at a basal state already have a level of arousal that is satisfactory to them, which can be seen in the mannerisms and activities in which introverts engage (i.e.: those that do not raise arousal). As discussed by Bates and Rock (2004), these differences in basal levels have a direct impact on behavior. For example, everyday as millions of Americans get ready to head off to work, they feel the urge to ingest coffee. Using caffeine as a stimulant, many Americans are able to alter these basal levels to a point where they feel an increase in sensitivity and ultimately performance. One point of interest for researchers is to

identify an optimum level of arousal for both introverts and extraverts. Previous research conducted by Eysenck has suggested that basal cortical levels change when an arousal mechanism is presented. Eysenck (1967) purposed that an introvert's or extravert's levels of performance would follow the Yerkes-Dodson law or an "inverted-u" in which individuals would attain a peak level of performance due to the amount of the arousal mechanism presented. Once this peak level is attained, additional arousal would hinder and ultimately reduce the performance of these individuals. It is believed due to base cortical levels of arousal that introverts will peak in performance with less arousal than extraverts.

When using a proper arousal mechanism, Cox-Fuenzalida et al., (2001) have shown that performance differences between introverts and extraverts can be easily identified. Demographic diversity has routinely shown to have a robust effect on individuals' arousal (Lord & Saenz, 1985; Ulrey & Amason, 2001). Exposing participants to different levels of demographic diversity may outline when it may be more advantageous to be introverted as well as extraverted, further explaining performance differences in demographically diverse contexts.

Differences in Performance in a Decreased Arousal Situation

Wilson and Languis (1990) emphasize the importance of an optimal level of cortical arousal with regards to performance. By altering participants level of arousal and measuring cortical levels in the brain by using electrodes to capture brain activity, they were able to pinpoint instances where both introverts and extraverts were able to peak in brain wave electrical activity. They then matched this level of activity with their performance levels. Wilson and Languis (1990) found that only a slight increase in arousal for introverts led to a peak level of brain activity which resulted in the ability to perform at a higher level. For extraverts, a major increase in their overall arousal led them to peak in brain activity, and resulted in an overall increase in their task performance. Thus, the additional levels of arousal varied in quantity to reach peak-performance in each group. Because introverts have a higher basal level of arousal than extraverts, it is important to understand the differences in performance when a heightened and then lessoned stimulus is presented. Introverts' higher base level of arousal allows them to sustain a heightened level of vigilant attention especially when the task is not very

stimulating. Indeed, the expectation that introverts will perform better on monotonous tasks has been established with some regularity (Hockey & Taylor, 1969). Due to differences in basal cortical arousal between introverts and extraverts, the research (Beauducel et al., 2006) has supported that introverts are more likely to perform better than extraverts in situations where arousal is low or has decreased. Keister and McLaughlin (1972) support this claim of superior performance for introverts in a decreased arousal situation. Using a signal detection task as a form of measurement device, they found that introverts under repetitive signal detection tasks, performed much better (58% detection rate) as opposed to extraverts (who had only a 42% detection rate). This study used this signal detection task to show that over time (the third task trial), extraverts eventually lose the level of arousal necessary to score at a level that is comparable to their introverted counterparts.

Differences in Performance in an Increased Arousal Situation

Revelle et al., (1980), looked at performance between introverts and extraverts using a quantitative and verbal test and caffeine as an arousal tool. The results found that caffeine had a detrimental effect on the performance

levels in introverts. Conversely, extraverts improved their performance when they ingested the caffeine. These results are consistent with Eysenck's Inverted-U-Theory, demonstrating performance differences between introverts and extraverts under varying levels of arousal.

In order to understand the different levels of performance between introverts and extraverts in a condition where arousal increases, it is important to address the research about the Inverted-U-Theory originally coined as the Yerkes-Dodson law and enhanced by Eysenck in 1967. Building on Jung's research with introversion/extraversion, Eysenck built on the Inverted-U-Theory (Downey, 1924) which proposes that introverts (those who are less inclined to interact, and seek arousal in various situations) naturally possess a basal cortical arousal level that is relatively high. This is due to the fact that introverts are inherently more aroused with lower levels of stimulus compared to non-introverts. Additionally, Eysenck (1967) proposes that extraverts (individuals who seek arousal and interactions with other humans) have a relatively low basal cortical arousal level in the absence of a stimulating mechanism. Using these basal cortical arousal levels as a starting point for introverts and extraverts, Eysenck claimed that

there is an eventual curvilinear relationship between arousal and performance where both introverts and extraverts increase performance as arousal increases to a certain point (Wilson & Languis, 1990). Once the apex of the curve is attained, additional arousal will begin to cause a decrease in performance.

> The theory of introversion/extraversion is that the personality differences between introverts and extraverts reflect some basic difference in the resting level of cortical arousal or activation. Assuming that there is a curvilinear relationship (an inverted U) between levels of stimulation and performance leads to a test of this arousal theory. That is, moderate increases in stress should hinder the performance of introverts who are presumably already highly aroused. However, the same moderate increase in stress might help the performance of the presumably under aroused extraverts. (Revelle et al., 1980, p. 1)

The previous study showed that placing introverts and extraverts in an environment that provides adequate levels of arousal is imperative for high levels of performance. If extraverts have shown through this research to have the ability to perform at a higher level than introverts in

environments that have higher levels of arousal, then it would make sense to pair extraverts to jobs in an organizational setting that may come in counter with high levels of arousal. Conversely, according to this research, it would suit introverts to be part of an environment that has lower levels of arousal, a means for them to perform at a higher level (Ulrey & Amason, 2001).

Present Study

An increased level of demographic diversity in the work place has ultimately changed the dynamics and fundamental relationships among employees. Furthermore, demographic diversity has shown to play a major role on work place creativity, morale, and productivity (Mcleod et al., 1996). With the influx of a demographically diverse work force, it is more important than ever to study how employee relations influence morale, behaviors and productivity. The purpose of the present study is to evaluate performance differences under varying levels of demographic diversity between introverts and extraverts. Understanding the differences and specific traits between introverts and extraverts will aid the present study in explaining performance discrepancies between the two groups. The study will use Hans J. Eysenck's

Inverted-U-Theory as a model to explain the relationship between arousal and performance.

The spectrum of demographic diversity studies in the work place has produced inconsistent conclusions. Horwitz and Horwitz (2007) maintain that demographically diverse teams may ultimately not be able to attain performance levels that homogenous teams can achieve. Conversely, Mcleod et al., (1996) presented findings showing that ingenuity and better products may be created when working in demographically diverse teams. It is evident in the literature that there are inconsistencies on how diversity affects performance. Understanding the attributes that introverted and extraverted individuals possess may play a significant role in explaining discrepancies in performance in diverse work groups. In the present study, arousal differences as a result of being introverted or extraverted are expected to explain the relationship between level of demographic diversity and individual performance (see figure 3). Due to the differences in base arousal levels between introverts and extraverts, it is believed that discrepancies in performance may be identified depending on the level of arousal presented (Eysenck, 1967). A central principle being investigated, which has been supported through numerous studies

(Crockett et al., 2007; Lord & Saenz, 1985), is the increased level of arousal for individuals when placed in a demographically diverse work group (see figure 2). The primary question is who (introverts or extraverts), and at what point (low, medium or high levels of demographic diversity) can optimal performance levels be reached.

Eysenck's Inverted-U-Theory (Eysenck, 1967) regarding the relationship between level of arousal and performance in introverts and extraverts will be the primary theory used to predict performance differences (see figure 1). The theory proposes that performance for both introverts and extraverts follows an inverted-u as a function of arousal. As arousal increases for both introverts and extraverts, performance will increase as well, up to a certain point. Eysenck proposed that because introverts and extraverts have different basal cortical arousal levels (different resting arousal levels), members of the group would reach their peak performance at different times. Introverts, who inherently have a higher natural arousal level than their extroverted counterparts, are according to this theory, believed to peak in their performance before the extravert. Using demographic diversity as an arousal mechanism, the present study looks to identify performance discrepancies between introverts

and extraverts in a group setting using an error detection task. In addition to identifying performance differences between introverts and extraverts, the current study also tests the Hypothesis that an increase in diversity will lead to an increase in arousal for introverts and extraverts under every situation (see figure 2). Using diversity as an arousal mechanism and heart rate as a way to measure individuals' arousal, the following hypotheses were made.

H1: Arousal measured through heart rate will increase between groups for both introverts and extraverts as diversity context increases (see figure 2).

H2: There will be an interaction between diversity context and personality type in predicting performance. Introverted groups are expected to peak in performance during the medium diversity context and then decline in performance in the high context condition. Conversely, extraverted groups should see a continual increase in performance as diversity context increases (see figure 3).

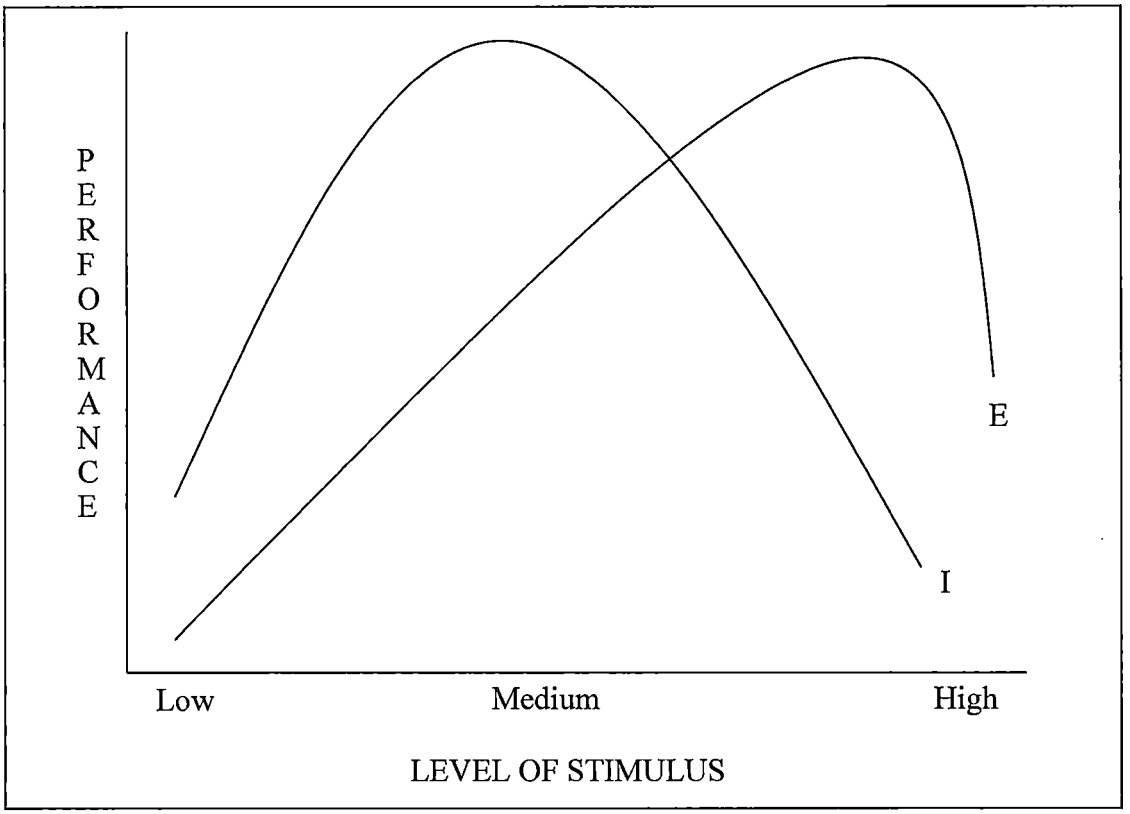

Figure 1. The Relationship between Stimulus and Arousal

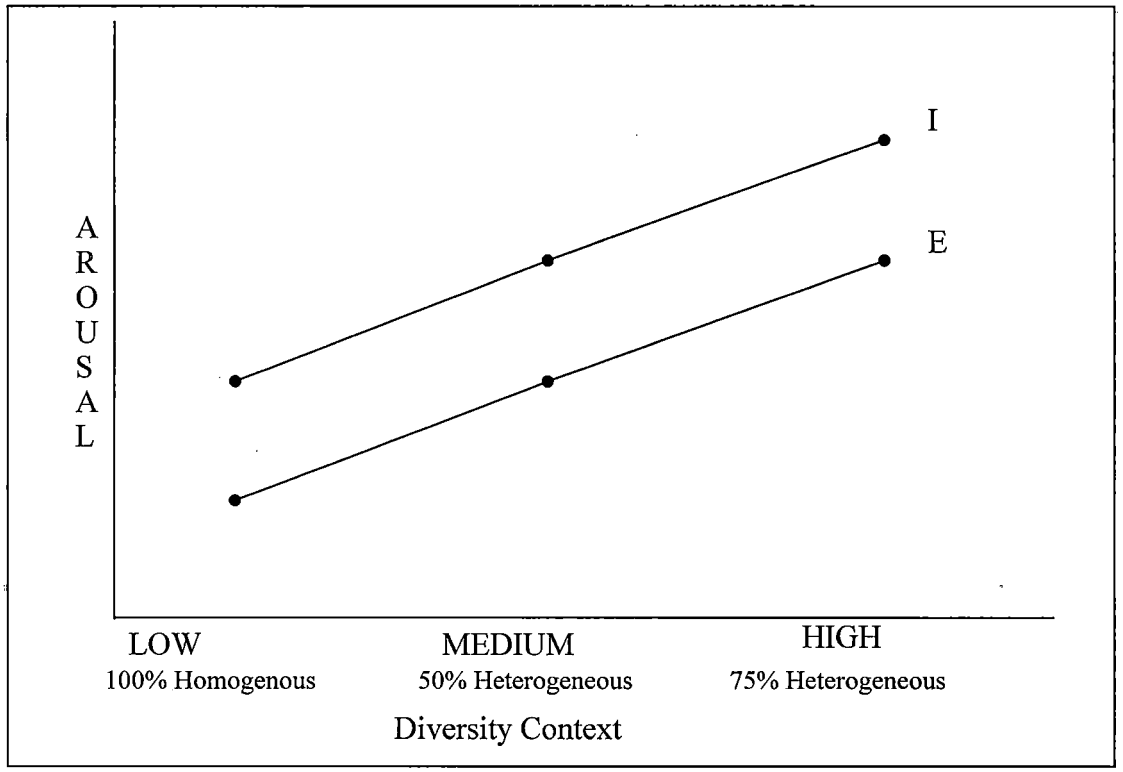

Figure 2. Relationship between Diversity Context and Arousal

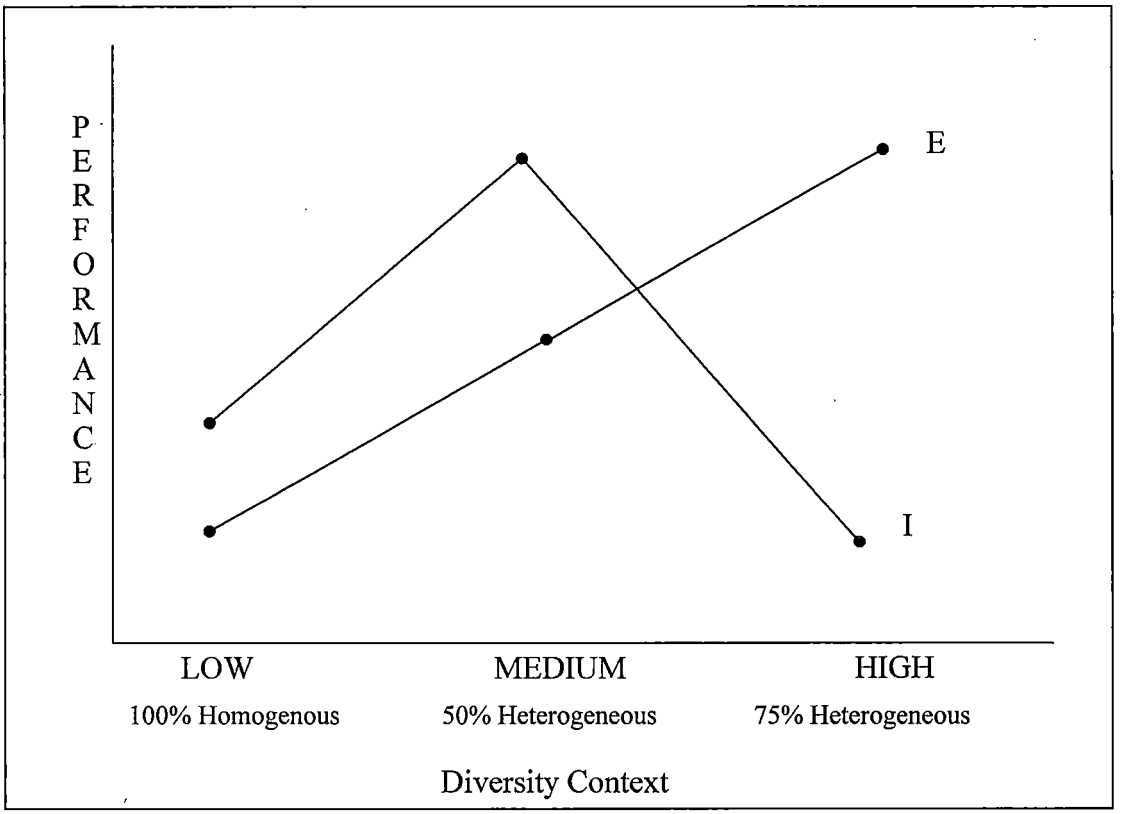

Figure 3. Predicted Relationship between Diversity Context and Performance

CHAPTER TWO

METHOD

Research Design

In the present study, arousal and performance differences on the error detection task were examined between introverts and extraverts under varying levels of demographic diversity. The present study was a 2x3 between subjects ANOVA design that was looking for simple main effects and an interaction between situation (level of diversity: low, moderate and high) and personality type (introvert or extravert).

Participants

The participants for this study were all undergraduate college students at California State University, San Bernardino. Given expectations for a small to moderate effect size, (Horwitz & Horwitz, 2007; Lau & Murnighan, 2005) the present study collected data from 120 participants (6 total groups with 20 participants per group) to obtain a necessary statistical power (Cohen, 1992). The present study included 51 males and 69 females. Of the 120 participants, 40 were Caucasian, 41 were Hispanic, 21 were African-American, 6 were Asian, and 12 identified as other. The initial pool of candidates that

completed the EPI are represented in Table One. The demographics of the participants who completed the EPI (phase one) were roughly equivalent to participants in phase two. The percentages of gender and demographics for the EPI (phase one) are as follows: Of the 403 participants, females comprised 60% while males comprised 40%. Hispanic students represented 46% while Caucasian, African American, Asian and "other" represented 30%, 11%, 7% and 5% respectively (see Table 1). Participants were not invited to phase two if they could not have been classified as introverts or extraverts. However, all data that was collected for the EPI was used to analyze the reliability of the EPI in the present study. Since the percentages of gender and demographics remained mostly consistent between phase one (EPI Test) and phase two (error-detection task), participants between both phases appear to be similar with exception of their EPI scores.

Table 1. Descriptive Data for Participants Who Completed the Eysenck Personality Inventory

Total Participants	403
Females	241
Males	162
Caucasian	124
Hispanic	184
Asian	28
African American	46
Other	21
Range	1-19
Average Score on EP1	12.9

Procedures

The present study was conducted in two phases. In the first phase participants completed the extraversion questions from the Eysenck Personality Inventory as a means to distinguish introverts from extraverts. Participants who qualified as an introvert or extravert were entered into the next phase. The Eysenck Personality Inventory was posted on Sona-Systems as an online study for students to complete. Participants had 5 minutes to complete the test. In addition to completing the EPI, participants were instructed to put their name, sex, race and email at the top of the test when turning it in so they could be contacted for phase two.

In the second phase, participants performed an error detection task. Before the participant entered the laboratory, the primary investigator began to play the videos on the three computer monitors of the confederates completing the error detection task. This was intended to create the perception that he/she was actually working with other team members to get an optimal performance score. Once the participant arrived at the laboratory, each was provided with, and read by the primary investigator, the instructions and directions to the error detection task as well as the heart rate monitor. Participants were able to put the heart rate monitor on themselves. The primary researcher explained and gave a brief demonstration over his shirt on how the heart rate monitor was correctly placed. At the conclusion of these instructions, the primary researcher exited the room while the participant put on the device. Upon completion, participants knocked on the door to let the primary researcher know that they had successfully put on the heart rate monitor. After a test check to make sure that the heart rate monitor was functioning correctly, participants were ready to begin the study. Participants began the study in a waiting room where an initial five-minute pre-task heart rate was collected. Heart rate

was collected at the end of each segment (pre, task, and post-task heart rates). Heart rate that was collected was an average throughout each segment, giving the participant an average heart rate for each segment. While the present study had core interest of investigating the relationship between arousal and performance, a primary concern was that simply putting on the heart rate monitor would alter participant arousal. However, the results suggest that the application of the heart monitor on all groups did not have an effect on arousal. This was supported by the clear trends in performance between introverts and extraverts. The participant was then placed in one of three conditions (low diversity, medium diversity, or high diversity, all which were controlling for gender). The primary investigator explained how they will be working as a collective unit with their other virtual team members. Additionally, the participant was informed that the other members of the group were disappointed that they were not able to meet the participant before the task but were counting on, and looking forward to meeting the participant following the conclusion of the task. The low diversity condition was comprised of three virtual members (the members faces appeared on three different computer monitors), all three members were the same race as the

participant. In the medium diversity condition, two of the virtual members working with the participant on the computer simulation were of a race that was different from the participant. In the high diversity condition, all three virtual team members were of a different race. Additionally, the participant was informed that his/her virtual team members will be able to see each other while they work on their error detection task (in addition to the three computer monitors, a web-cam was positioned in front of the participant). It should be noted that under the medium and high diversity conditions that the members on the computer monitors were composed of all different races thus preventing a "token effect" on the participant. The primary investigator then informed the participant that the purpose of this task will be to catch as many mistakes possible in the procedure manual in a ten-minute time frame. The participant was informed that their average heart rate would be collected during the error detection task (task heart rate).

After the participant had completed the error detection task, they were instructed to go back to the waiting room to take one last five minute reading of the participant's heart rate (post-task heart rate). Participants were then debriefed on the purpose and

intentions of the study. This debriefing session exposed all the deceptions that they were unaware of during the study. This included disclosing to the participant that the group they were supposedly working with on the computer was not actually there.

In addition to the analyses conducted, the primary investigator following the completion of the study collected verbal data from participants for a "believability" scale. Ranging from one to five (one being the study was not believable, five being the participant was deceived) the average number participants reported was a 4.2. This indicated that participants believed the manipulation and environment of the study. Participants who answered two and below on the believability scale (n = 12) were removed from the study.

Instruments

The present study used three instruments. The first was the Eysenck Personality Inventory used as an initial screening device to label introverts/extraverts. The second device was the heart rate vest (Timex Heart Rate Monitor) used to measure heart rate. The last device was the error detection task that was intended to assess performance.

The Eysenck Personality Inventory developed by Hans J. Eysenck and Sybil B.G. Eysenck (Eysenck, 1963) was the screening device to determine which participants were introverts and which participants were extraverts. The EPI assesseed two independent dimensions (neurotocism-emotional stability and introversion-extraversion). The extraversion portion of the inventory is comprised of 24 questions assessing if the participant prefers introverted or extraverted tendencies. Participants answered the questions in a yes/no format. Scores which may be reverse coded were added up to get an overall score on the participants level of extraversion. Research conducted on college students (Eysenck, 1963) suggested that participants who score in the upper 30 percentile (raw score of 14/24 and above) should be labeled as extraverts, while participants who score in the lower 30 percentile (raw score of 10/24 and below) have been labeled as introverts). The Eysenck Personality Inventory has shown to be very reliable measure with a coefficient alpha = .88 (Eysenck, 1963). Test-retest reliability for the EPI has been measured at .92 (Sato, 2005). Additionally, the Eysenck Personality Inventory has maintained a high level of construct and concurrent validity (Eysenck, 1963). The reliability

analysis for the present study found similar levels of reliability as the previous research (Eysenck, 1963) with a coefficient alpha = .81.

The heart rate vest measured the participant's heart rate throughout the study. A single strap with two sensor points was put on the participant just below the rib cage (all participants were able to put the vest on themselves). Once the vest was on, the primary investigator collected an initial heart rate over a five-minute span in order to compare base heart rates between participants during the study. The heart rate vest was able to store the participant's heart rate in a memory watch. Average heart rate during the error detection task was used as the tool to assess arousal.

The error detection task provided with permission of Southern California Edison, was a 5-page nuclear procedure manual where individuals were expected to identify grammar, spelling and punctuation errors (see appendix). The more mistakes they caught in the manual, the higher their performance score. Archival data in an applied setting has shown that individuals taking this test with 15 minutes accurately identify 70% or 44/63 of the errors (Southern California Edison, 2009). Participants were given 10 minutes to catch as many errors as possible.

CHAPTER THREE

RESULTS

Before conducting ANOVA to test study hypotheses, data were screened for missing data, outliers, and violations of normality. No missing data points were found. After identifying all skewness and kurtosis values for this analysis, it was concluded that none of the variables were significantly skewed or kurtotic (This followed the rule that the overall skewness and kurtosis for each of the variables were within the Z-scores of -3.3 & 3.3). Additional screening was performed to identify any possible outliers (Mertler & Vannatta, 2005) that existed on the performance test used in Hypothesis 2. No univariate outliers were found. Performance scores on the error detection task had a z-score range from -2.48 to 2.42 (Tabachnick & Fidell, 2006).

Before Hypothesis 1 could be tested (expected differences in heart rate for both introverts and extraverts as diversity level increases), differences in pre-task heart rates were compared between both groups (introverts and extraverts) and across diversity context (low, medium and high). No differences in pre-task heart rates indicates that both introverts and extraverts are

starting the study with the same average heart rate. There were no significant differences in pre-task heart rate $F(2, 117) = 1.321$, $p > .05$.

Hypothesis 1 was tested using a one-way ANOVA looking for an increasing difference in heart rate as diversity context increased for both introverts and extraverts. There were no significant differences in heart rate between introverts and extraverts across the three different contexts (see figure 4), $F(2, 117) = 1.062$, $p > .05$, partial $eta^2 = .018$.

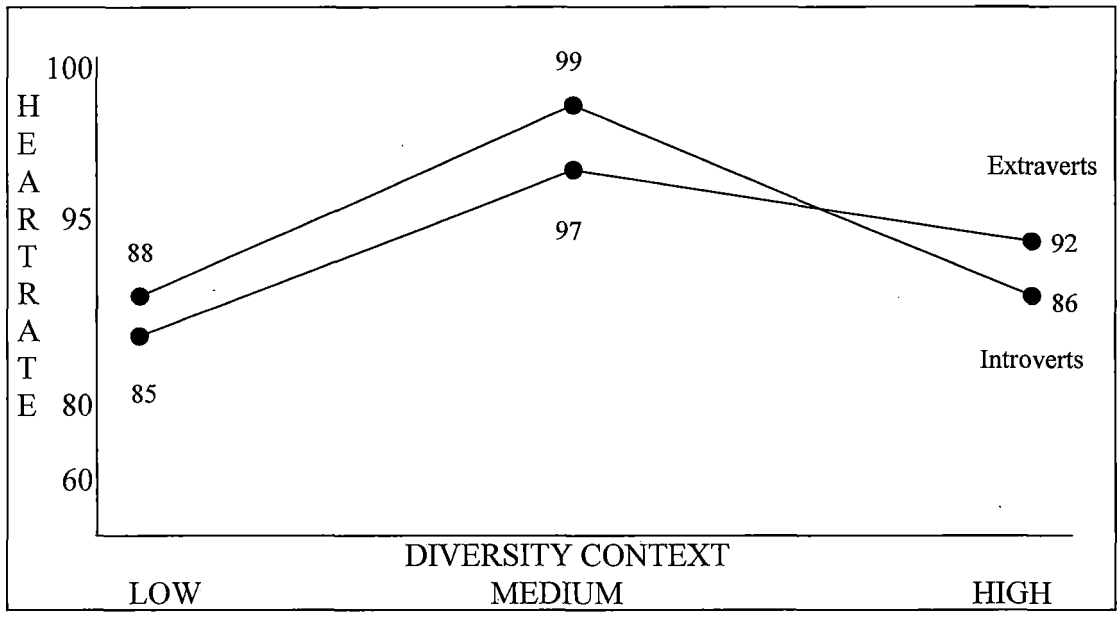

Figure 4. Heart Rate as a Function of Diversity Context for Both Introverts and Extraverts

Although the data seemed to trend in a way that supported the Hypothesis from the low diversity context to the medium diversity context, the trend was not significant. Additionally, independent t-tests between the low diversity, medium diversity, and high diversity contexts were conducted for both introverts and extraverts, none of the values were significant.

Hypothesis 2 examined the differences on the error-detection task under each diversity context between introverts and extraverts. There was an interaction between performance as a function of level of diversity, $F(2, 120) = 6.759$, $p < .05$, partial $eta^2 = .106$. From this interaction there were 7 simple main effects that were compared in order to identify significant differences (see figure 5).

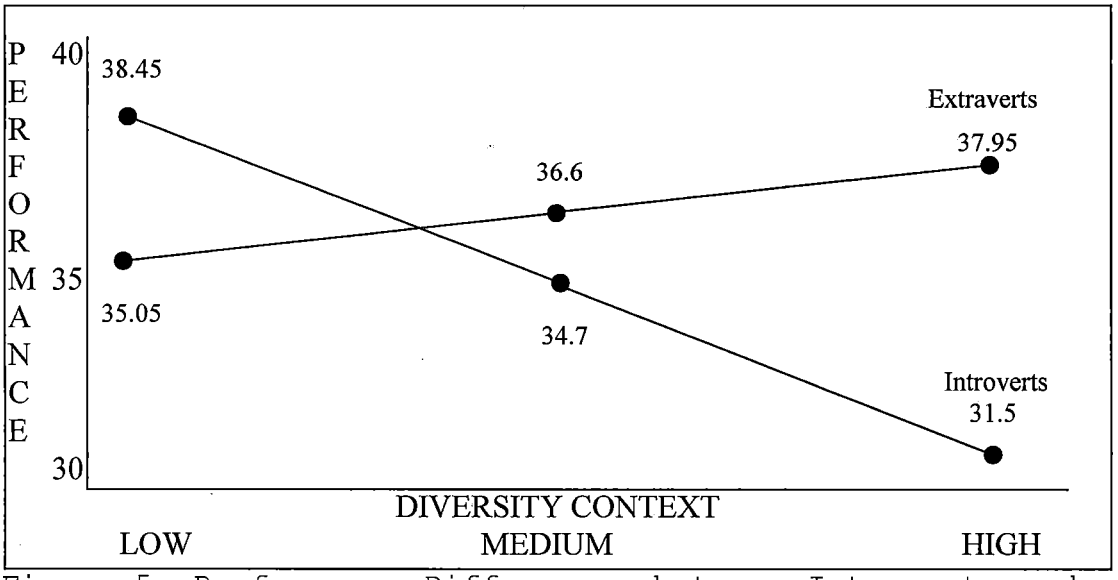

Figure 5. Performance Differences between Introverts and Extraverts

Post-hoc comparisons using Tukey's adjustment were conducted between introverts under the three diversity contexts, extraverts under the three diversity contexts, and introverts and extraverts scores were compared with each other between corresponding contexts.

There was a significant mean difference in introvert's performance scores from the low diversity context to the medium diversity context. On average, introverts in the low diversity context scored higher (38.45) than introverts in the medium diversity context (34.7) ($T = 1.998$, $df = 38$, $p < .05$). This result contradicts hypothesis two by finding that introverts in the low diversity context outperform introverts in the

medium diversity context. There was not significant mean difference in introvert's performance scores from medium diversity context to the high diversity context. There was a significant mean difference in introvert's performance scores from the low diversity context to the high diversity context. On average introverts in the low diversity context scored higher (38.45) than introverts in the high diversity context (31.5) ($T = 2.113$, $df = 38$, $p < .05$). There were no significant mean differences for extravert's performance scores between the low, medium, or high diversity contexts. There was a significant mean difference in performance scores between introverts and extraverts under the low diversity context. On average, introverts scored higher (38.45) compared to extraverts (35.05) ($T = 1.925$, $df = 38$, $p < .05$). Rather than supporting Hypothesis One which examined the relationship between arousal and performance, the results show an interaction between personality type and diversity context which had an effect on performance. There was not a significant mean difference in performance scores for introverts or extraverts in the medium diversity context. There was a significant mean difference in performance scores between introverts and extraverts under the high diversity context. In the high diversity context,

extraverts performed better (37.95) compared to introverts (31.5) ($T = -3.062$, $df = 38$, $p < .05$). Due to the fact that Hypothesis One was found not to be significant, this result again illustrates that performance appeared to be dependent on the relationship between personality type and diversity context. Tables 2, 3, 4, and 5 present descriptive statistics for Hypotheses One and Two.

Table 2. Hypothesis One: Heart Rate Means, Standard Deviations (Introverts)

	INTROVERTS		
Diversity Context	Low	Medium	High
Standard Deviation of Heart Rate	5.719	5.723	7.96
Male Participants	9	8	10
Female Participants	11	12	10
Heart Rate Average (BPM)	88	99	86

Table 3. Hypothesis One: Heart Rate Means, Standard Deviations (Extraverts)

	EXTRAVERTS		
Diversity Context	Low	Medium	High
Standard Deviation of Heart Rate	5.122	4.933	6.331
Male Participants	8	7	9
Female Participants	12	13	11
Heart Rate Average (BPM)	85	97	92

Table 4. Hypothesis Two: Performance Scores, Standard Deviations (Introverts)

	INTROVERTS		
Diversity Context	Low	Medium	High
Standard Deviation of Performance Scores	5.226	6.570	5.916
Male Participants	9	8	10
Female Participants	11	12	10
Performance Score Averages	38.45	34.7	31.5

Table 5. Hypothesis Two: Performance Scores, Standard Deviations (Extraverts)

	EXTRAVERTS		
Diversity Context	Low	Medium	High
Standard Deviation of Performance Scores	5.924	4.627	7.33
Male Participants	8	7	9
Female Participants	12	13	11
Performance Score Averages	35.05	36.6	37.95

CHAPTER FOUR

DISCUSSION

The current study aimed to explain performance differences between introverts and extraverts under demographically diverse work settings using Eysenck's Inverted-U-Theory to predict differences. Furthermore, the study looked to replicate previous research (Choi, 2007; Horwitz & Horwitz, 2007) showing that diversity in the work place will increase arousal in its members. Although the results show that significant findings for study hypotheses were mixed, the current study adds to the previous research (Horwitz & Horwitz, 2007; Jehn et al., 1999) showing that indeed the construct of personality (introversion/extraversion) has aided in explaining performance differences among individuals in diverse contexts.

Level of arousal has shown with some regularity to have an impact on performance for both introverts and extraverts (Kilgore et al., 2007; Smith, 1983). Using arousal as a mediator to predict performance, Eysenck proposed that performance for both introverts and extraverts would follow an inverted-u-function as arousal increased for both groups. Because demographic diversity

has routinely shown to have some effect on performance in the work place (Williams & O'Reilly, 1998), organizations are beginning to invest more time and money researching outcomes that arise as a result of a demographically diverse work force. While diversity in the work place continues to increase, a fundamental concern is maintaining a stable work place that is conducive for high productivity. Research conducted by Jehn et al., (1999) has confirmed that stability among employees changes as social categorical diversity (age, race, tenure) increases. The change in social categorical diversity usually leads to an overall increase in relationship conflicts between group members ultimately having an negative impact on group performance (Jehn et al., 1999) In the present study, Hypothesis Two proposed that there would be clear differences in performance between introverts and extraverts depending on the diversity context they were working in. The results found in this study for the introverted groups were similar to the results described by Jehn et al., (1999). An increase in demographic diversity from the low diversity context to the medium diversity context led to a decrease in performance. Although the current study did not specifically look at social conflict, information

diversity, or value diversity, the results found in Hypothesis Two give credence to the relationship between diversity and performance. The lack of support for Hypothesis One may be due to the instrument used to measure arousal. Previous research (Beauducel et al., 2006) used EEG to measure arousal for both introverts and extraverts. Since clear performance differences were found between the two groups, this suggests that using heart rate as the measure may not have captured arousal that was present in the study. Furthermore, it has been well documented (Wilson & Languis, 1990) that changes in basal cortical level arousal may not be revealed through heart rate. It may be beneficial in future replications of this study to use a device similar to an EEG in order to successfully capture changes in arousal. Although the present study would have liked to use an instrument that measured electrical activity in the brain (i.e. EEG), the time frame as well as funding for the present study prevented the use of an instrument that would have measured brain activity (another means to capture changes in basal cortical arousal). Additionally, previous research (Choi, 2007) suggests that heart rate has been used with some regularity in identifying changes in arousal. This research in conjunction with the limited

feasibility of using a device like an EEG, lead the present study to measure arousal through heart rate. Although the relationship between arousal and performance (Hypothesis One) was not found, Hypothesis Two supported previous research suggesting that increasing demographic diversity may have a negative impact on performance.

Unlike introverts, the extraverts did not show a difference in performance when compared across the three contexts. Previous research conducted by Smith (1983) suggested that an increase in arousal for extraverts would actually improve their performance due to the fact that extraverts are chronically under aroused. While the results in this study did not show a significant difference in performance for extraverts when placed in any of the three conditions, there was a pattern in scores between the extraverted groups as diversity context increased. Additionally, the interaction found between introverts and extraverts in the present study is consistent with existing literature (Eysenck, 1967; Revelle et al., 1980) that as diversity increases for extraverts they will likely see an increase in their task performance compared to their introverted counterpart. In a study conducted by Ulrey and Amason (2001), they identified and compared performance levels between health

care providers when working in demographically diverse groups. Much like the present study, the research conducted by Ulrey and Amason (2001) was able to support and supplement the previous research (Horwitz & Horwitz, 2007; Jehn et al., 1999; Smith, 1983) that working in demographically diverse groups had a significant impact on worker performance.

The present study added the variable personality type as a way to further explain performance discrepancies when working in diverse contexts. The results partially supported the predictions of Hypothesis Two. Specifically, there were two distinct patterns, as diversity increased for extraverts between contexts, performance increased. Conversely, as diversity increased for introverts, performance significantly decreased. The results of the present study support existing literature (Horwitz & Horwitz, 2007) showing that performance for introverts and extraverts may be dependent on level of diversity.

High levels of demographic diversity in the work place usually evoke one of two outcomes. The first being that the group, despite demographic makeup, can overcome their social categorical differences and ultimately create better results due to higher amounts of informational diversity (Horwitz & Horwitz, 2007). The second and

somewhat more typical (Jehn et al., 1999) is that the stark differences in a group's make-up inevitably create obstacles that cannot be overcome, leading to a decline and failure in performance (Richard et al., 2007). In these instances organizations typically begin to make drastic changes as a response to poor performance from the work group (Choi, 2007). However, the changes that are often implemented that aim to improve group productivity and cohesion fail to acknowledge factors like personality that may have been a key component to the groups shortcomings (Horwitz & Horwitz, 2007). The results of the present study add credence to investigating underlying variables such as personality. As the literature on demographic diversity and personality type progress, organizations should consider the research when constructing groups, a means to more favorable outcomes. The comprehensive review conducted by Williams and O'Reilly (1998), found mixed conclusions when comparing performance levels between groups when high levels of demographic diversity were and were not present. While the results of the review by Williams and O'Reilly were mixed, the literature on personality type suggest that specific personality traits may have a major effect on the performance, or lack of, in demographically diverse work

groups (Cox-Fuenzalida et al., 2006) Due to this possible moderating effect that personality may have on performance (Wilson & Languis, 1990), future research should continue to integrate the construct personality type when assessing individual and group performance. The results found in the present study support this idea. Specifically, the present study was able to reveal differences on the performance task between the introverted and extraverted groups. In the high diversity context of the present study, extraverts performed better on the task compared to introverts. Additionally in the low diversity context, introverts performed better on the task. Although performance differences between introverts and extraverts were not found under every context, there was a clear interaction between introverts and extraverts when assessing their performance under different diverse contexts. This finding supports much of the previous literature on the discrepancy in performance in high and low arousal situations between introverts and extraverts (Beauducel et al., 2006; Eysenck, 1967).

The implications of this result may additionally be able to be utilized when demographically diverse work groups are composed. Understanding personality factors such as introversion/extraversion, may help these groups

organize themselves in ways that allow them to perform and ultimately succeed. The study conducted by Beauducel et al., (2006) supports the notion that personality type should be considered when forming groups, showing that level of performance for introverts and extraverts may be dependent on the stimuli being presented (diversity level). The present study used the research by Beauducel et al., (2006) to investigate instances where extraverts outperform introverts and vice-versa, a means to create groups that are more likely to succeed. This result was found, showing that extraverts outperformed introverts when the diversity context was high, and introverts outperforming extraverts when diversity context was low. The continued exploration of the relationship between personality type and diversity context may eventually aid the creation of successful groups.

The effect of arousal level on individual performance has been established with some regularity (Horwath & Eysenck, 1968). In a study conducted by Wilson and Languis (1990), topographic brain mapping was used to identify different stimulus patterns in the brain between introverts and extraverts. The results found by Wilson and Languis (1990) supported some of the existing literature showing in fact that changes in arousal for both

introverts and extraverts led to physiological differences in the brain, a change that had an effect on performance. In addition, their study was able to show that arousal can be altered using different stimuli, such as drug, auditory, and visual signals. While the results of the study present evidence that there are stark differences in performance as arousal increases for both introverts and extraverts, Wilson and Languis (1990) were also able to show that within the groups, individual differences had an effect as well. The present study showed similar results when arousal was presented to different groups. Although there did appear to be a positive trend in arousal from the low diversity context to the medium diversity context, this difference was not significant. This result is consistent with some of the previous research (Bates & Rock, 2003; Revelle et al., 1980) that suggest while discrepancies in performance between introverted groups and extraverted have been supported, they are often not found. While the relationship between personality and arousal has helped to better predict individual performance, predicting group performance in demographically diverse settings has remained inconsistent (Williams & O'Reilly, 1998).

Demonstrating Support for the Inverted-U

Eysenck's Inverted-U, originally based off the Yerkes-Dodson Curve, has been one of the most practiced theories in regards to arousal and performance (Smith, 1983). Although the support for the theory has been inconsistent depending on the variables used to replicate it, it has supplemented the existing literature, providing an explanation on the relationship between arousal and performance (Beauducel et al., 2006). Revelle et al., (1980) presented a break through study using Eysenck's Inverted-U-Theory. Their research was able to delineate the validity and utility of the inverted-u replicating Eysencks initial research between arousal and performance. Using caffeine as an arousal mechanism, the study was able to reproduce an inverted-u in performance between introverts and extraverts (Revelle et al., 1980). Furthermore, the study was able to show performance differences between introverts and extraverts depending on the amount of caffeine ingested. The research conducted by Revelle et al., (1980) was not only able to repeat the inverted-u but actually showed two separate curves, one for introverts, and one for extraverts. The present study used this research as a foundation to predict differences

between introverts and extraverts when placed in demographically diverse work groups.

Although the research conducted by Revelle et al. (1980) was categorized as a complete success, others seeking to replicate the inverted-u have not been so lucky. Using the existing literature as a base, Beuducel et al., (2006) aimed to once again replicate Eysenck's Inverted-U using a vigilance task to detect performance under low, medium, and high arousal situations. The study was not able to replicate the previous research showing that performance differences between introverts and extraverts were scattered. Additionally, the differences between the groups were not significant. The present study ran into similar problems as the research conducted by Beauducel et al., (2006). Contrary to the results found by Beauducel et al., (2006), the present study was able to find significant differences and partial support for the inverted-u. For the introverted groups, it appeared that they were experiencing the last half of the inverted-u (performance steadily declined). This effect refers back to the base levels of arousal that participants had when they began the study. The results from the introverted scores suggest that their base level of arousal was already high (this may be due to simply participating in a

study). This is evident in the low diversity context where introvert's scores were the highest. As diversity context increased, introverts scores steadily declined. This finding suggests that the peak of the inverted-u for introverts was attained during the low diversity context. Although it was the "low diversity context" the results suggest that this context may have been interpreted by introverts as the "medium diversity context", explaining the peak in their performance and following the original hypothesis. Additionally, the medium and high diversity contexts for introverts may have been interpreted as high and very high diversity contexts respectively, explaining higher levels of arousal and decreased performance. Conversely, it appeared that extravert's performance was steadily rising (support for the first half of the inverted-u). Referring back to the results that were found in regards to introverts performance scores, extraverts may have had a similar but "reverse" effect. The results suggest that extraverts may have not been aroused at the beginning of the study or in the low diversity context. This would explain their low performance scores under the low diversity context. While introverts may have interpreted the "low diversity context" as the medium diversity context, the same idea may be true for

extraverts. Extraverts may have interpreted the "low diversity context" as a very low diversity context, explaining low performance scores. The subsequent contexts (medium and high) may have been interpreted as low and medium diversity contexts. This would explain the peak in performance in the high diversity context. It may be beneficial in future replication of this study to present a situation where the stimulus is even higher such as a "very high diversity context". The addition of this context may help complete the inverted-u for extraverts with a decrease in performance.

The issue of starting out for introverts and extraverts with a consistent level of arousal to begin the study is important in regards to replicating the inverted-u. As the present study revealed, base levels of arousal that are not expected (i.e. introverts arousal is too high or extraverts arousal is too low) may prevent replication of the inverted-u. The study conducted by Revelle et al., (1980) addressed a similar topic when looking at performance differences between introverts and extraverts when caffeine was ingested. The study cited a primary shortcoming that individuals have different effects when caffeine is ingested, making some of the results inconsistent with the arousal-performance

theories. The goal of the present study or even the previous research (Revelle et al., 1980) is to have an "expected" base arousal rate for introverts and extraverts. Without this, finding consistent results let alone the inverted-u is very challenging.

While replicating the inverted-u has been difficult (Beauducel et al., 2006), the present study delineates clear differences between introverts and extraverts performance scores. This is consistent with previous literature (Cox-Fuenzalida et al., 2006; Revelle et al., 1980; Wilson & Languis, 1990) that differences in performance exist between introverts and extraverts as a function of their arousal level. Additional research should be conducted using demographic diversity as an arousal tool to predict performance differences. Adjustments in the paradigm which may include participants working in a face-to-face environment rather than a virtual environment may still be able to produce the predicted performance differences outlined in Eysenck's Inverted-U-Theory.

Implications and Future Directions

Previous research has shown that until recently, demographic diversity in groups and its effect on

performance has been largely overlooked by organizations (Richard et al., 2007). However, these organizations are beginning to see tangible evidence that group composition and performance are closely tied (Ancona & Caldwell, 1992). Due to this trend, organizations are beginning to address diversity issues in the work place that had once been ignored. The present study added to the existing literature by finding an interaction between personality type and diversity and its effect on performance. Additionally, although the present study was not able to support the arousal hypothesis (an increase in diversity should increase arousal for both introverts and extraverts), performance differences between introverts and extraverts under different diverse contexts can add guidance to future research. In an ever-growing globalized work place, demographically diverse work groups are be being assembled with more regularity (Choi, 2007). Although this trend is occurring nationwide, certain areas of the United States see diverse work groups and organizations being formed at a higher frequency. An example of this can be shown through The Census Beurau for the County of San Bernardino. The agency reported in 2004 that more than half of the community's population (55%) was comprised of African-Americans, Hispanics, Hawaiian or

American-Indians (County of San Bernardino, 2004). Areas with densely diverse populations will inevitably lead to more diverse organizations in the area. Because of this, it is imperative that studies similar to the present study are performed to further understand how group members communicate, relate, and ultimately perform. The inclusion of personality type, as the present study has shown, may aid us in understanding the dynamics in diverse work groups and how to make them function. In addition to personality type, the variable time has also been used to assess success in diverse groups. Previous literature conducted by Richard et al., (2007) used the variable time through short-term and long-term performance to identify differences between groups. The study was able to support some of the previous literature showing short-term performance in these groups was non-linear (groups eventually saw decreases in performance). Conversely, their research was able to show that diverse work groups that worked for long periods of time saw a positive linear trend in performance (Richard et al., 2007).

In addition to further investigating performance differences in diverse work groups, other underlying factors may also have an impact on performance in diverse work groups. The present study examined "personality type"

as an avenue to help explain and predict performance differences in these groups. While the results were mixed, previous research suggests that it may be beneficial to continue to study personality type and its effects on performance (Bates & Rock, 2003). While finding results with some regularity between these variables (personality type, level of diversity, and performance) has been difficult, the research should continue to investigate the relationships that some of these underlying variables have on performance in diverse work groups.

The present study used an error detection task provided with the permission of Southern California Edison as a measure to capture performance differences between groups. Although the task had been used successfully for the company, it would be of interest to insert or use a different type of task in future replication. Previous research on arousal and performance have used signal detection tasks as a measure to capture performance differences (Keister & Mclaughlin, 1972). This different measure was able to capture clear differences between introverts and extraverts under varying levels of arousal. Even though auditory and visual detection tasks have identified performance differences with some regularity (Keister & Mclaughlin, 1972), error detection tasks that

require deeper cognitive processes have also identified performance differences (Smith, 1983). Due to practical reasons, the present study administered this error detection task to capture performance differences between introverts and extraverts. Additionally, the results support the reasoning by finding clear performance differences between groups as diversity context changed.

The present study was able to support and replicate some of the previous literature, but was not without limitations. A primary shortcoming was in the sample. Although the present study aimed to reach out to as many different categories of students as possible including sex, race, education, and major, all of the participants were college students. Most of the students ranged between the ages of 18 to 20 years old with a few student participants aging in their late twenties to early thirties. A core mission of this study was to see if the role of personality could add to the current literature in further understanding performance differences in demographically diverse work groups. Due to the fact that participants primarily ranged from 18 to 20 years of age, the present study only represented a single demographic which does not accurately represent the true population. This in turn reduced the overall external validity. The

same study should be conducted with a sample of participants from the community (families and working professionals), the results would yield higher levels of external validity.

Altering the way in which the group interacts may be a methodology that needs to be changed. The present study had a core mission to create an environment that was as real as possible. Although the present study was able to identify performance differences across and between groups, it may be beneficial to replicate the study using live confederates rather than working in a virtual environment. The present study looked to use live participants as confederates, however, the timing and logistics prevented it from materializing. Additionally, the previous research (Keister & Mclaughlin, 1972) suggest that the use of a virtual environment has produced robust effects on participants. This in conjunction with practical reasons made using a virtual environment very sensible. The use of live confederates may prove to be a more robust arousal mechanism rather than a virtual environment, a means to show greater differences between groups in arousal and performance.

Understanding attitudes and performance for individuals working in demographically diverse work groups

is a fascinating topic for Industrial/Organizational Psychologists. Although group performance in demographically diverse groups remain inconsistent, the results of the present study were able to show that the variable personality, specifically introversion/extraversion, may play a role in explaining these performance differences. Depending on the level of arousal presented, introverts or extraverts may be able to outperform one another, a finding that may be translated when creating demographically diverse groups. The present study looked to add to some of the existing literature to help explain some of the current issues that we face in demographically diverse work groups. Though this study found mixed results regarding personality type and performance in demographically diverse work groups, further research is warranted. Doing so will help I/O Psychologists explain and remedy some of the performance deficiencies that are experienced in demographically diverse work groups.

APPENDIX

SAMPLE OF ERROR DETECTION TASK

Sample of Error Detection Task

Northern Utility *Company*
Nuclear Organization Directive
Effective Date _____

SONGS (San Onofre Nuclear Generating Station) SAFETY CONSIOUS WORK ENVIRONMENT AND RESOLUTION OF NUCLEAR SAFETY CONCERNS

A. PURPOSE

1. The purpose of this dierective is to describe te Nuclear Organizations policies regarding:

    a. Establishing and assessing the Safety conscious Work Encionrment

    b. The free flow of safety information and achieveing and maintaining an envionrment in which worker's feel free to raise their concerns.

    c. SONGS Open Door Policy

    d. The Nuclear Safety Concerns (NSC) Program.

B. POLICIES

1. Safety Conscious Work Environment

    a. Northern Utility Companuy (NUC) is committed to the safe operation of the San Onofre Nuclear Generating Station (SONGS) and to establishing a Safety Conscious Work Environment (SCWE) in which workers feel free to raise concerns both to SCE and the Nuclear Regulatory Commission (NRC) without fear of retaliation. thus, NUCs policy is to establish and maintain effective lines of communication for safety concerns such that workers' are encouraged to raise concerns and that such concerns are promptly reviewed, propertly prioritized, and resolved with timely feedback to workers.

    b. The Executive Forum, with the assistance of the Manger in charge of the Action Request System and the Manager, NSC Program, are responsible for the SCWE.

B. POLICIES (Continued)

2. Free Flow of Safety Information

a. Because NUC bears the primary responsibility for safe operation of SAONGS, NUC expects workers to raise safety and compliance concerns to their chain of command, by using the action request process, or alternatively to the NSC Program, Contract workers may raise concerns to SCE or their employer.

b. NUCs' expectation that workers will raise safety concerns to trheir chain of command, by using the Action Request process or the NSC Program, doesn't mean that workers may not go directly to the NRC. NUC encourages workers to go to the NCR at any time they believe the NRC should be aware of their concerns.

c. Since workers also have a responsibility for maintaining a safe environment, NUC expects but does not require that workers will normaly have rased the concern with NUC either prior to or contemperaneosly with going to the NRC.

d. If a worker has notified the NRC or another federal authority of a nuclear safety concern, the worker shall not be compeled to revela there Nuclear Safety Concern to NUC, although all workers are encouraged to do so.

e. All supervisors and managers (NUC and contractor) are responsible for ensuring an atmosphere exists that encourages workers to raise nuclear safty concerns using the AR process, to them, to the NSC program, or to the NRC without fear of discrimination, harassment, intimidation, or retaliation.

f. SONGS executives, supervisors and managers shall have an "Open Door" policy to encourage workers to bring safety issues to there attention.

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